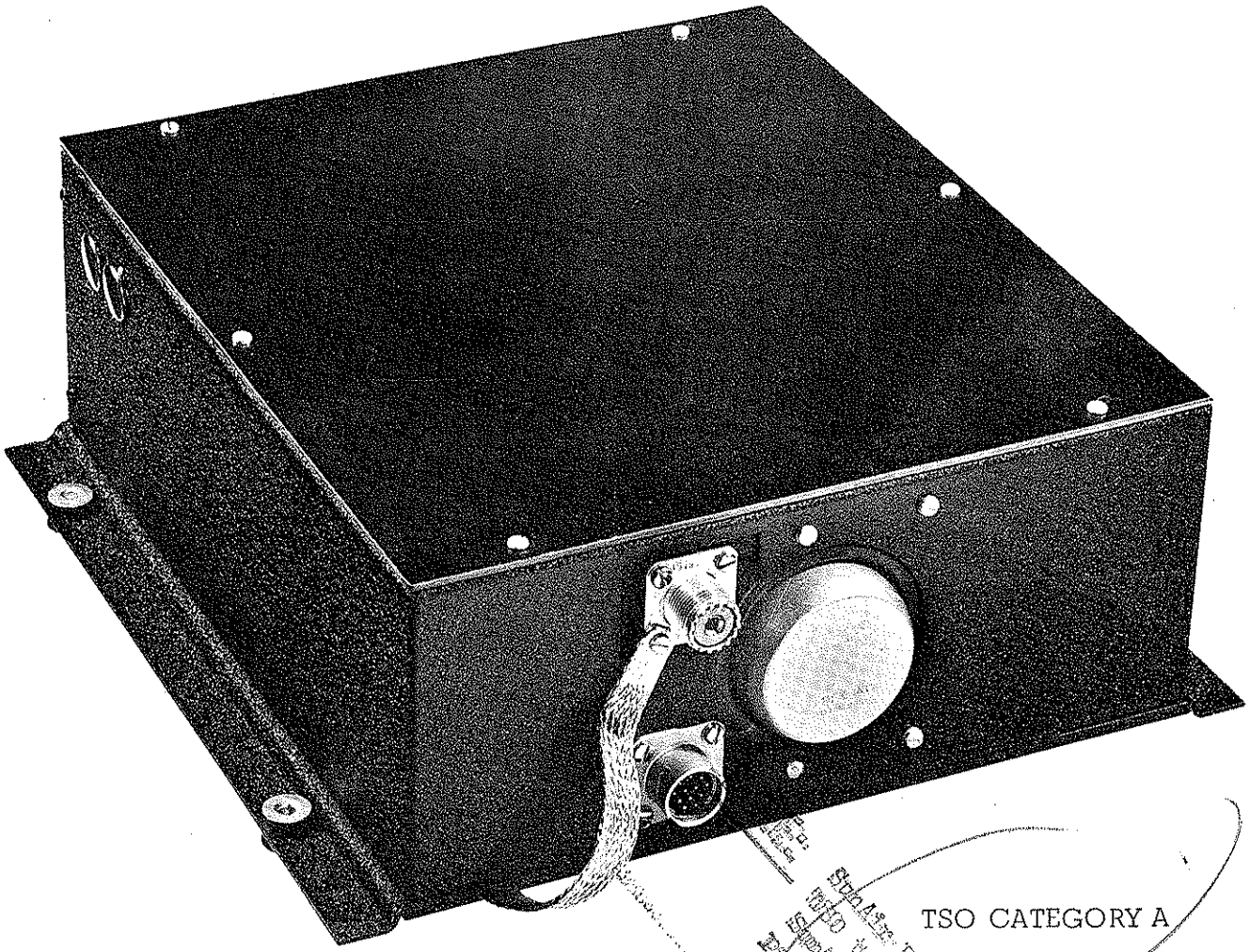
SUNAIR ANTENNA COUPLER

Model No.	Part No.
CU-2200	95249
CU-1400	93986
CU-1000	98356
CU-500A	98411
CU-500	95952



TSO CATEGORY A

ANTENNA COUPLER

SUNAIR ELECTRONICS, INC.

3101 SOUTHWEST THIRD AVENUE

FORT LAUDERDALE, FLORIDA, U. S. A.

TABLE OF CONTENTS

NOTE: SunAir [illegible] TSO [illegible] for TSO tests, all [illegible] SunAir CU series antenna couplers is pending, SunAir will ship TSO equipment certification tags as soon as FAA TSO administrative processing is complete.

1. SPECIFICATIONS

Power requirement: 13.75 V or 27.5 V
Pin H for 27.5 V
Pin L for 13.75 V

Fuse: 5 Ampere 3AG Slo-Blo.

TSO: Category A when used with SunAir all-attitude shock isolators part No. 15330.

SUNAIR SHOCK ISOLATOR KIT 98928 (ALL ATTITUDE) MUST BE USED WITH THIS COUPLER WHEN INSTALLED IN

ROTARY WING AIRCRAFT
TURBO ENGINE FIXED WING AIRCRAFT
MULTI-ENGINE, PISTON, FIXED WING AIRCRAFT OVER 12,500 LBS.

THIS COUPLER CAN BE USED WITHOUT SHOCK ISOLATORS WHEN FASTENED DIRECTLY TO THE FUSELAGE IN MULTI-ENGINE OR SINGLE ENGINE FIXED WING AIRCRAFT UNDER 12,500 LBS.

ANTENNA COUPLER MODEL	PART NUMBERS	VOLTAGE	FOR SUNAIR TRANSCEIVERS	WEIGHT
CU-500A	98411	13.75 or 27.5	S5-DTR, S5-RTR, T-5-D, T-5-R, T-5-DA	5.00 lb.
CU-500	95952	13.75 or 27.5	T-5-RA	5.00 lb.
CU-1000	98356	13.75 or 27.5	T-10-D, T-10-R	6.50 lb.
CU-1400	93986	13.75 or 27.5	SA-14, SA-14R	7.00 lb.
CU-2200A	98423	13.75	S-22-RTR, T-22-R	8.75 lb.
CU-2200A	98435	27.5	S-22-RTR, T-22-R	8.75 lb.
CU-2200	95249	27.5	T-22-RA	8.75 lb.

2. GENERAL INFORMATION

PARTS REPLACEMENT

A complete stock of replacement parts for all SunAir equipment is maintained at the factory. In some cases, the part supplied against an order for a replacement item may not be an exact duplicate of the original part where the original item has been superseded by a newer and more efficient design. Such replacement parts will be interchangeable electrically. If the new part has a different size or shape, all necessary hardware to permit installation in older sets will be available.

Parts for SunAir equipment may be secured from SunAir distributors and dealers throughout the world. When direct orders from the factory are required, please specify the following:

a) serial number, model number and voltage of the unit
b) description of part required, and
c) quantity required

CAUTION The SunAir warranty and the TSO qualification is dependent upon SunAir approved replacement parts.

EQUIPMENT AND PARTS REPAIR

Complete factory service is available on any SunAir equipment. Repairs, adjustments or modifications which are of such a nature as to warrant factory service will be made in accordance with the instructions of the customer. A labor charge, cost of parts and shipping charges will apply to all non-warranty work.

RETURN OF EQUIPMENT OR MATERIAL

To return equipment or material, under warranty or otherwise, advise SunAir Electronics, Inc. giving full particulars.

If the item is thought to be defective, give full information concerning the nature of the defect. SunAir will then authorize the return. Failure to secure this authorization prior to forwarding the equipment or material, or failure to provide complete information may cause unnecessary delay in processing.

PARTS SHORTAGE OR DAMAGE

Unpack and inspect all parts and equipment as soon as received. Do not accept a shipment where there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage or if any evidence of damage is noted, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier.

If concealed damage is discovered after a shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report of the damage should also be forwarded to SunAir.

a) Order number
b) Model and serial number
c) Name of transportation agency
d) Waybill number

When SunAir receives this information, arrangements will be made for repair or replacement.

PRODUCTION CHANGES

Engineering changes may be made from time to time in order to incorporate any feature or design which will improve performance, increase reliability or improve the usefulness of the equipment. Notice of such changes will be made through periodic service letters to all SunAir distributors.

When such changes affect the parts list or schematic diagram, a record of the "first used" serial number will be made and noted on the new parts list or schematic. By referring to the serial number, service personnel can quickly determine the proper schematic diagram for a given transceiver.

WARRANTY

SunAir warrants all parts of new equipment for one (1) year from date of installation providing the defective part is returned to the factory - transportation charges prepaid.

SunAir will assume warranty labor costs for 90 days from date of installation of new equipment in reasonable amount and at its discretion for the actual bench repair of the equipment involved.

Warranty card must be properly completed and returned to SunAir within ten (10) days from installation.

The obligation and responsibility of SunAir does not apply unless expressly provided herein. SunAir reserves the right to make improvements, additions or changes in design without obligation to install such changes designs or improvements in equipment previously manufactured.

3. ANTENNA

One fixed antenna of exact electrical characteristics is impossible to recommend due to the variation in aircraft configurations.

Through experience, SunAir has chosen two antenna lengths as standards. These are 29 and 34 feet. It has been found that an "open V" antenna of one of these lengths can be properly installed on the majority of small aircraft. Larger aircraft will accommodate a straight 29 or 34 foot antenna.

Page through page show recommended configurations and antenna fittings for different aircraft. When ordering the antenna coupler the following information is needed:

1. Exact antenna length including lead-in.

2. Antenna configuration.

3. Model and year of aircraft.

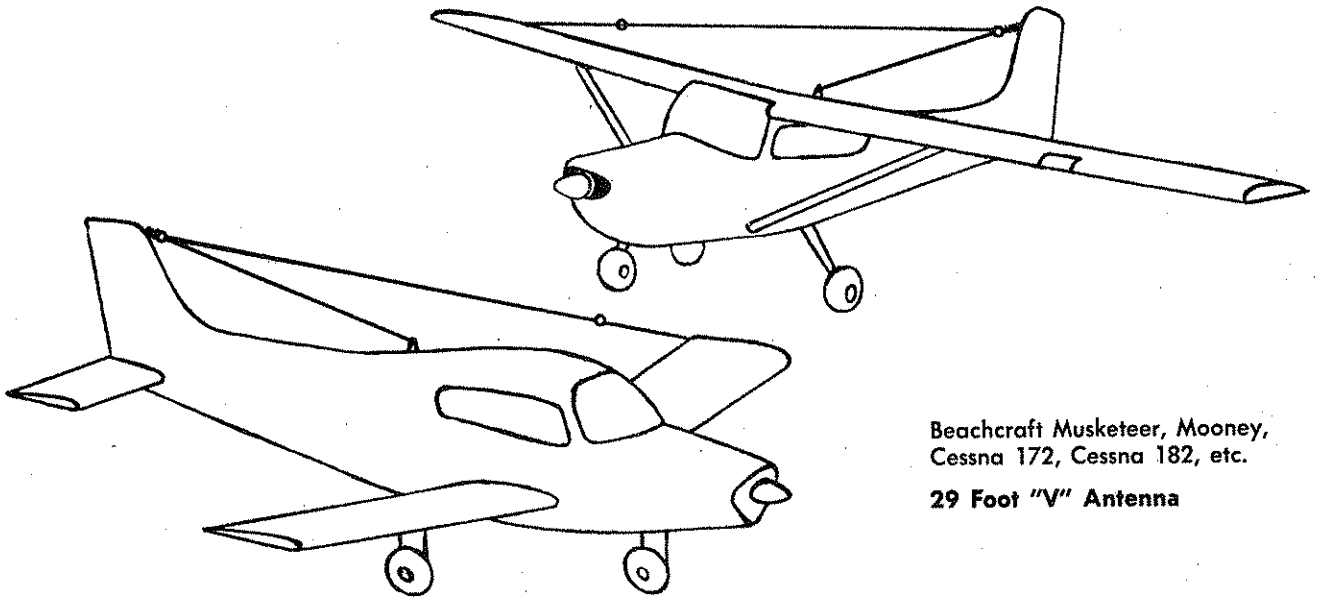
This will aid SunAir in providing an antenna coupler that will minimize the final alignment time.

CAUTION

It is important to have a good antenna installation. Be sure the antenna has adequate tension and secure mountings, as slack in the antenna will cause detuning in flight.

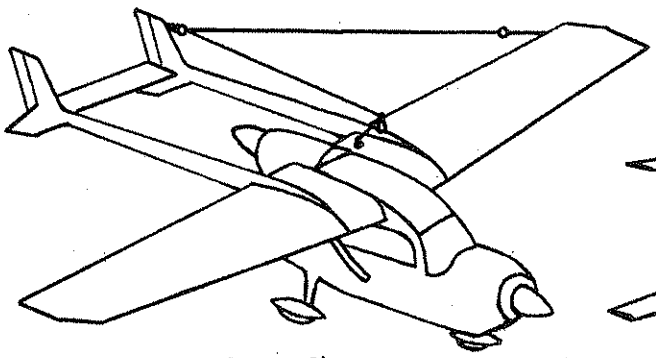
After a complete tuning of the coupling unit is finished on the ground, a flight check should be made with the watt-meter installed in the transmission line to assure no detuning while in flight.

TYPICAL ANTENNA CONFIGURATIONS



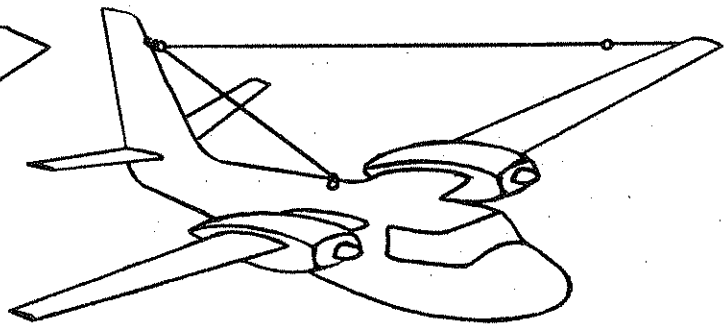
Beachcraft Musketeer, Mooney, Cessna 172, Cessna 182, etc.

29 Foot "V" Antenna



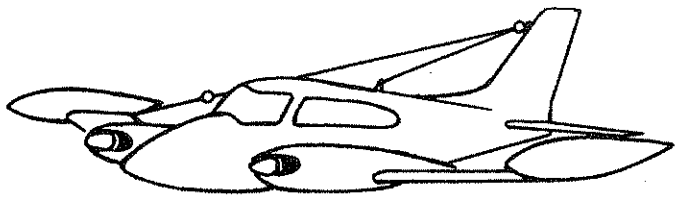
Cessna Skymaster

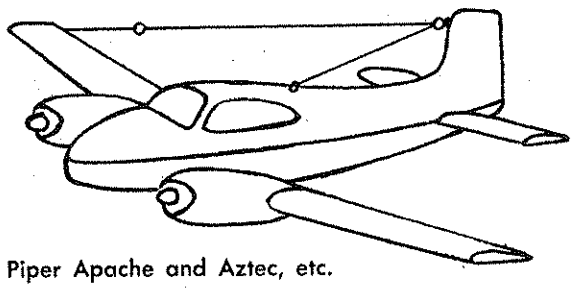
34' "V" Antenna



Aero Commander 680F

34' "V" Antenna





Cessna 310, Beachcraft Baron and Bonanza, Piper Apache and Aztec, etc.

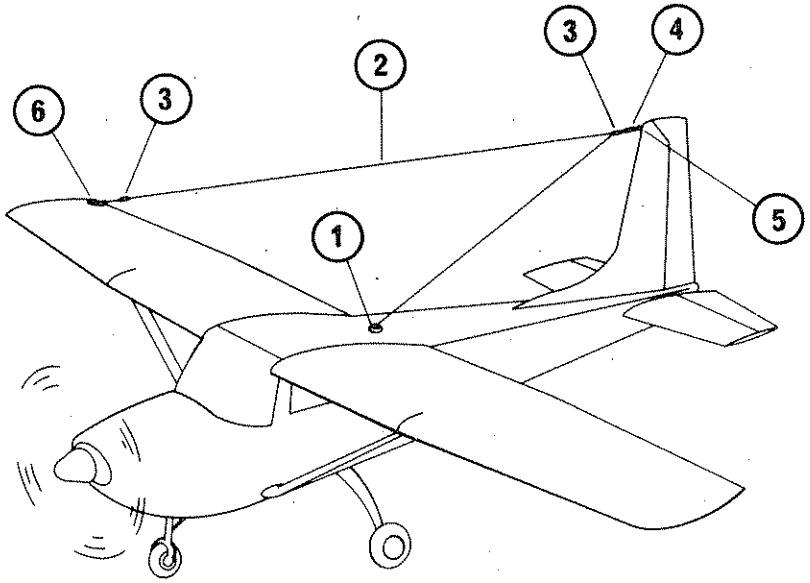
29 Foot "V" Antenna

WHEN ORDERING: Indicate exact antenna length.
Indicate configuration. i. e. Closed V (as used on helicopter) Open V (as used on fixed wing) Straight wire (as used on DC3 or Caribou)

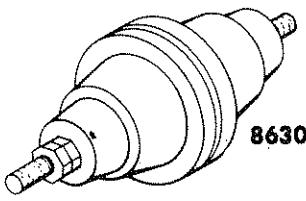
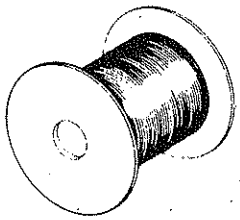
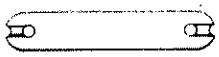
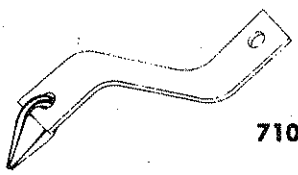
NOTE: All measurements include antenna on the outside of the aircraft plus the wire inside the aircraft from the feedthru insulator to the antenna coupler.

95146 FIXED ANTENNA KIT

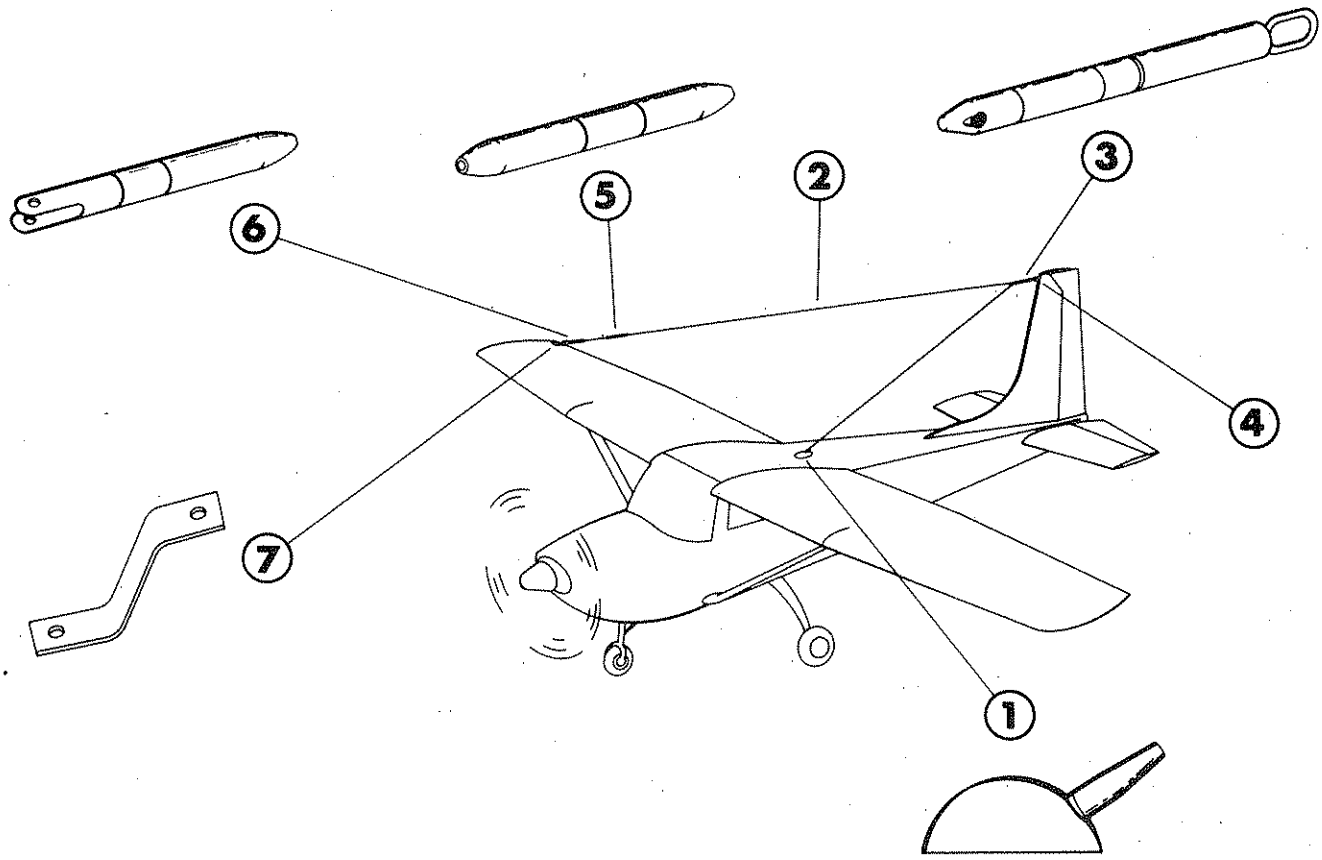
(H. F. BARE WIRE)



INSTALLATION

①  86303 FEED THROUGH INSULATOR	②  58863 100 FEET #18 COPPERWELD WIRE
③  71279 (2 Req.) STRAIN INSULATOR	④  71281 TENSION SPRING
⑤  71293 VERTICAL FIN ANCHOR	⑥  71009 WING TIP BRACKET

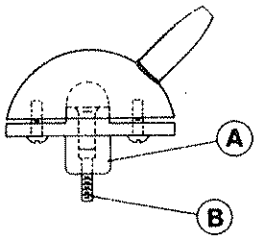
SUNAIR 95158 HF ANTI-PRECIPITATION STATIC ANTENNA KIT



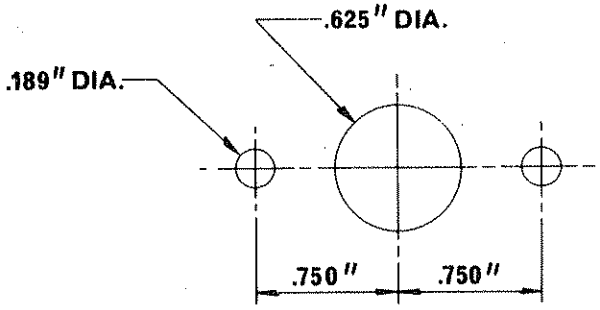
INSTALLATION

ITEM	DESCRIPTION	PART NO.
1	Feed Through Insulator	71308
2	60 Feet Insulated Antenna Wire	71310
3	Insulated Tension Unit	71322
4	Vertical Fin Anchor Not supplied, (see fig. 4, page	
5	Strain Insulator	71267
6	Insulated Tension Anchor	71334
7	Wing Tip Bracket	71009
8	Wire Retraction Tool	71346

FEED-THROUGH INSULATOR 71308
(ITEM 1)



A NYLON BASE PLATE
B ANTENNA WIRE CONNECTOR BOLT
C ANTENNA WIRE
D WASHER
E TERMINAL LUG
F LOCK NUT



Mounting Dimensions

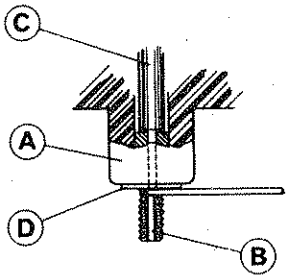


Fig. 1

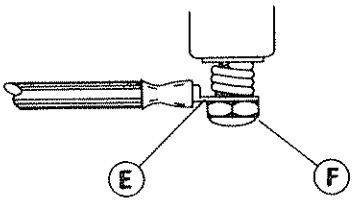


Fig. 2

STRIP BACK POLYETHYLENE SHIELD (C) TO EXPOSE APPROXIMATELY 4" OF ANTENNA WIRE CORE. INSERT WIRE CORE INTO CONNECTOR BOLT (B) AND EXTRACT FROM SLOT. INSERT WASHER "D" AS SHOWN IN FIG. 1

WIND WIRE AROUND CONNECTOR BOLT (B) 3½ TO 4 TURNS. INSTALL TERMINAL LUG (E) OF ANTENNA LEAD AND SECURE WITH LOCK NUT (F), AS SHOWN IN FIG. 2

INSULATED TENSION UNIT 71322
(ITEM 3)

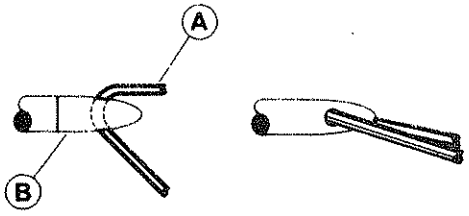


Fig. No. 3

A INSULATED ANTENNA WIRE

B INSULATED TENSION UNIT

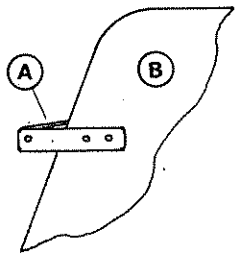
APPLICATION — THE ANTENNA (A) IS CONNECTED TO THE FEED-THROUGH INSULATION ITEM 1, AND ROUTED VIA THE VERTICAL STABILIZER BY THE USE OF THE INSULATED TENSION UNIT (B), AS SHOWN IN FIG. NO. 3.

VERTICAL FIN ANCHOR 71293

(ITEM 4)

(NOT SUPPLIED, MUST BE FABRICATED)

Suggested method of fabrication only: The anchor can be of two pieces of metal, one mounted each side of vertical fin, and bolted to insulated tension unit.



A VERTICAL FIN ANCHOR
B VERTICAL FIN

Fig. No. 4

STRAIN INSULATOR 71267

(ITEM 5)

APPLICATION — THE STRAIN INSULATOR IS USED FOR ADJUSTING THE ANTENNA WIRE TO THE DESIRED LENGTH AND IN SOME CASES MAY NOT BE REQUIRED BECAUSE THE DESIRED LENGTH EXTENDED TO THE ANCHOR INSULATOR 71334.

ANCHOR INSULATOR 71334

(ITEM 6)

APPLICATION — THE ANCHOR INSULATOR IS USED TO CONNECT THE ANTENNA WIRE TO THE WING TIP BRACKET, ITEM 7.

WING TIP BRACKET 71009

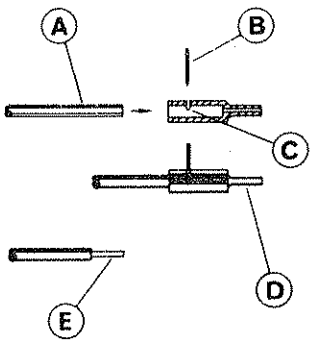
(ITEM 7)

APPLICATION — THE WING TIP BRACKET IS CONNECTED TO THE TOP SIDE OF THE WING TIP BY REMOVING ONE OF THE WING TIP SCREWS AND REPLACING IT WITH A LONGER SCREW.

WIRE RETRACTION TOOL 71346

(ITEM 8)

THIS IS A DUAL PURPOSE TOOL DESIGNED TO PREPARE THE POLYETHYLENE WIRE FOR INSERTION INTO THE INSULATOR UNIT WITHOUT DAMAGING THE WIRE CONDUCTOR. ITS SECONDARY USE IS DESCRIBED IN FIG. NO. 7.



A POLYETHYLENE WIRE
B BLADE
C BLADE RECESS
D WIRE RETRACTION TOOL
E WIRE CONDUCTOR

Fig. No. 5

INSTRUCTIONS:

INSERT POLYETHYLENE WIRE (A) INTO APERATURE OF TOOL, TO THE FULL EXTENT, AS SHOWN IN FIG. NO. 5. CUT POLYETHYLENE COATING BY PRESSING BLADE (B) FIRMLY INTO RECESS (C) AND ROTATING WIRE ONE COMPLETE TURN. EXPOSE WIRE CONDUCTOR (E) BY REMOVING THE ½" OF UNWANTED POLYETHYLENE (A). THE WIRE IS NOW READY FOR INSTALLATION ONTO THE NYLON INSULATOR.

NYLON INSULATORS

(ITEMS 5 & 6)

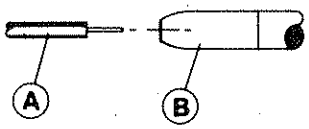
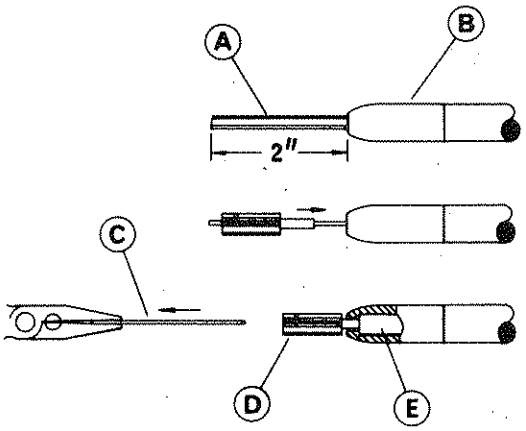


Fig. No. 6

INSERT POLYETHYLENE WIRE (A) AS SHOWN IN FIG. NO. 6, INTO THE NYLON INSULATOR (B) TO THE FULL EXTENT. AT THIS POINT IT IS FIRMLY LOCKED.

IF IT SHOULD BECOME NECESSARY TO REMOVE THE WIRE FROM THE NYLON INSULATOR, IT CAN ONLY BE DONE WITH THE WIRE RETRACTION TOOL 71346, AND THE FOLLOWING METHOD SHOULD BE USED:



A POLYETHYLENE WIRE
B NYLON INSULATOR
C WIRE CONDUCTOR
D WIRE RETRACTION TOOL
E CONNECTOR

Fig. No. 7

INSTRUCTIONS:

CUT OFF WIRE (A) AS SHOWN IN FIG. NO. 7 NOT LESS THAN 2" FROM THE FITTING (B) AND REMOVE THE POLYETHYLENE SO AS TO EXPOSE THE WIRE CONDUCTOR. SLIDE TOOL (D) ONTO THE WIRE AND PRESS THE RETRACTION PRONG FIRMLY INTO THE INSULATOR. BY THIS ACTION THE CONNECTOR (E) IS "TRIPPED", THEREBY RELEASING THE GRIP ON THE WIRE (C).

4. ANTENNA COUPLER INSTALLATION

Mounting dimensions, weight and space requirements are shown on Page .

Particular emphasis is placed on the following:

1. The coupling unit must be located as close to the antenna feed-thru insulator as possible. The antenna lead from the feed-thru to the coupling unit should not be in excess of 6 inches.

2. The location of the coupling unit should afford easy access to the top and allow adequate space for tuning.

3. The coupling unit must be securely grounded to the aircraft with the bonding strap provided.

4. The wire size required for the channeling cable running from the transceiver to the coupling unit should be as follows:

   #22 wire for lengths to 14'
   #20 wire for lengths 14' to 24'
   #18 wire for lengths 24' to 40'

CHANNELING CIRCUITRY

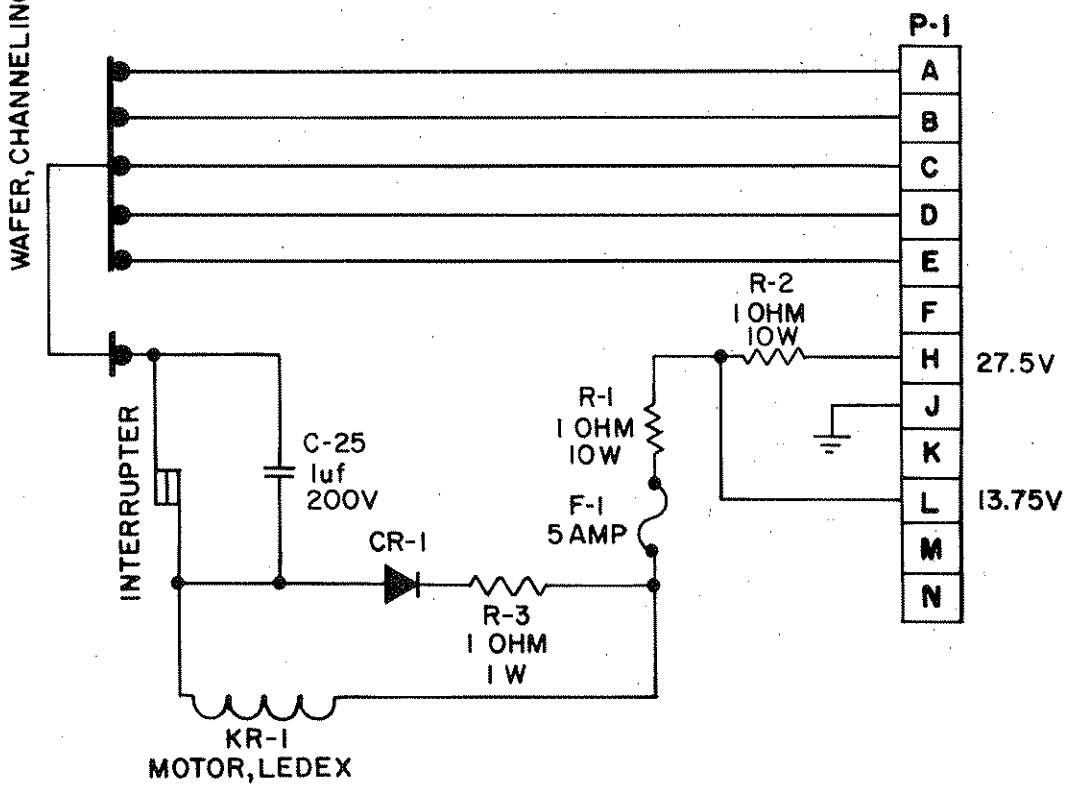


Fig. No. 8

COUPLER	"A"	"B"	"C"	WEIGHT
CU-500	5.000	8.000	1.000	5.00 LBS
CU-1000	6.500	10.000	1.500	6.50 LBS
CU-1400	6.500	10.000	1.500	7.00 LBS
CU-2200	9.000	13.125	2.125	8.75 LBS

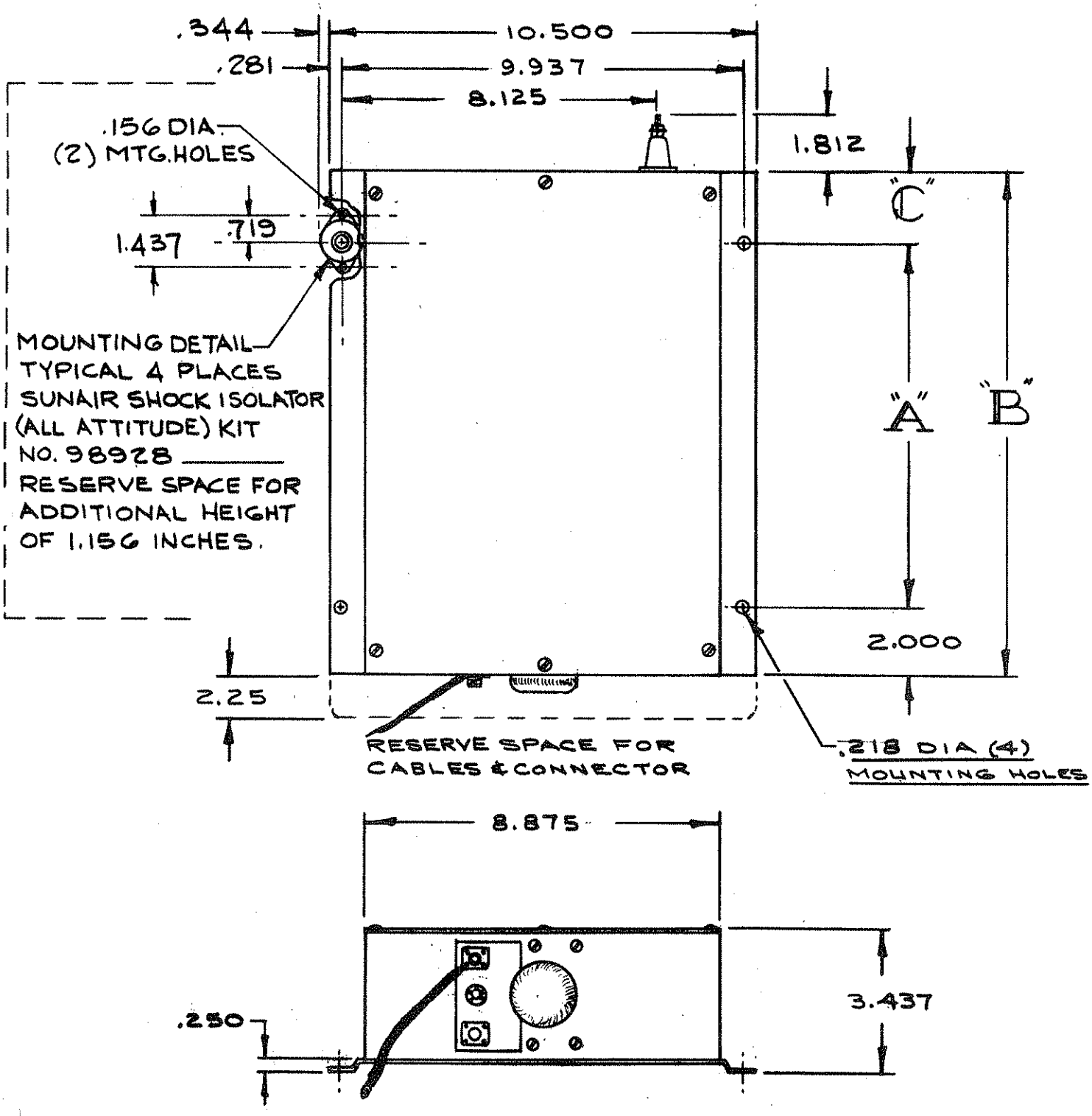


Fig. No. 9

Antenna Coupler Mounting Dimensions

5. ANTENNA COUPLER TUNING

As indicated on the previous pages, the antenna coupler is designed for the two basic antenna lengths (29 feet and 34 feet) and is customized at the factory to the configuration the customer requests. On most standard antenna configurations, SunAir has the electrical data available to establish the correct air duct taps and correct value of capacitors. HOWEVER, ALL ANTENNA COUPLERS MUST BE ADJUSTED TO THE AIRCRAFT INSTALLATION.

Equipment required:

1. A Bird Electronic Corporation Thru Line Wattmeter, Model No. 43 (Cleveland, Ohio, U.S.A.) or equivalent, with line impedance of 50 ohms and having a 2 through 30 MC, 100 watt plug-in element.

2. Standard insulated alignment tool to fit tuning slot of tunable inductors.

3. Screwdriver (when movement of the taps on the air duct is required)- if the antenna is a specified length and properly installed, such changes should not be required.

The wattmeter should be inserted into the coax cable line running from the radio to the antenna coupler, as shown below:

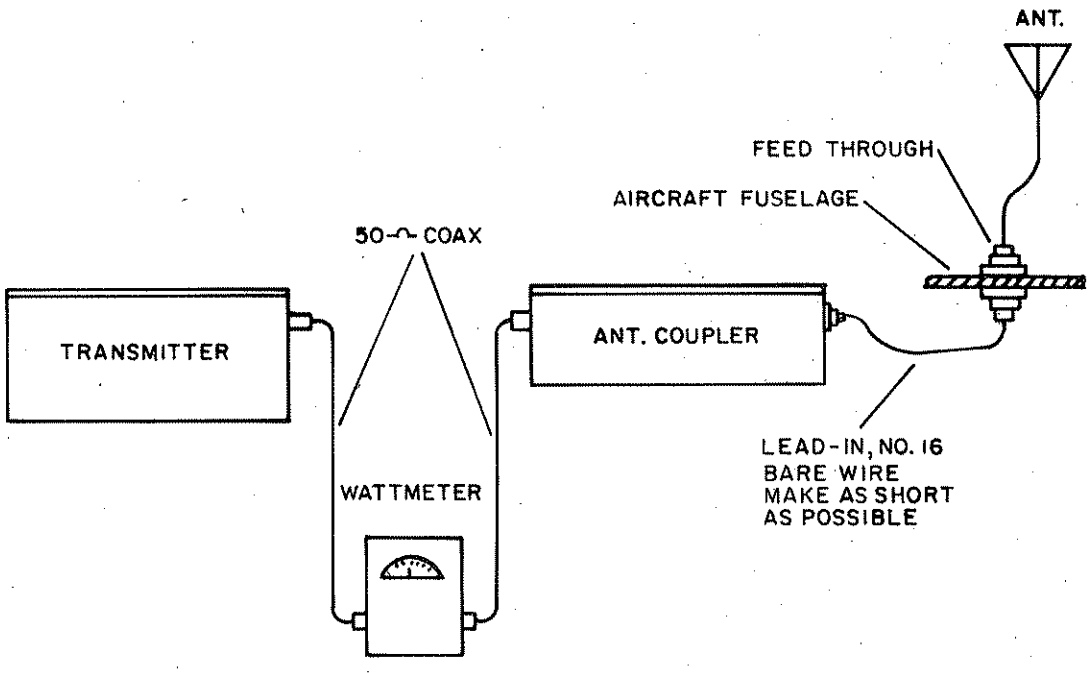


Fig. No. 10

A schematic is supplied with each antenna coupler. Refer to the schematic while tuning the antenna coupler.

Maximum inductance on the variable inductors is when the screw is extended full out.

Minimum inductance is when the screw extends approximately 1/8 inch from full in.

The inductance of the air duct increases as the tap is moved away from the porcelain antenna feed-thru insulator.

PROCEDURE

1. Turn the transmitter on and channel to lowest active channel.

2. When channeling transmitter, check coupling unit channeling to assure proper channel positioning.

3. Turn the element of the wattmeter to read "reflected power".

4. REFER TO ANTENNA COUPLER CONFIGURATION FIGURE 11 PAGE 17. Key the transmitter. Turn the variable inductor (L_1) of the channel being tuned in the direction that shows a decrease in reflected power. When the dip is observed, tune the respective padder (C_p) to bring the dip to zero. It may be necessary to go back to L_1, repeak, then back to C_p and repeak for optimum tuning.

   a) If the inductor reaches maximum inductance when approaching the dip, the tap on the air duct should be moved one turn away from the porcelain antenna feed-thru insulator.

   b) If the inductor reaches minimum inductance when approaching the dip, the tap on the air duct should be moved one turn toward the porcelain antenna feed-thru insulator.

   c) If no indication of tuning is observed, the tap on air duct will have to be changed. Move the tap from the channel being tuned along the air duct until a noticeable dip is detected. Then proceed with tuning L_1 and C_p.

   d) When a major change in air duct tap is required, the value of C_1 may change. Approximate values for C_1 are indicated on the graph on Page 21.

5. Switch to the next channel and repeat Step 4. All channels using the air duct taps will require Step 4 procedure.

6. REFER TO ANTENNA CONFIGURATION FIGURE 12 PAGE 17. As frequencies approach the quarter wave length of the antenna, no air duct tap will be required and the jumper will be connected as shown. Use same procedure in tuning L_1 and C_p as in Step 4.

7. REFER TO ANTENNA CONFIGURATION FIGURE 13 PAGE 18. When frequencies fall on the natural quarter wave length and slightly above, the shorting bus will be replaced with a capacitor (C_s). The value of C_s can be approximated from the graph on Page 21. Use same procedure in tuning L_1 and C_p as in Step 4.

8. REFER TO ANTENNA CONFIGURATION FIGURE 14 PAGE 18. When frequencies are high enough, (12 to 13 mc and above on standard 29 foot configurations) to require 30 pf or less as a value for C_s, L_1 will be used as shunt rather than series inductance. On the higher frequencies where the value of inductance required for shunt is less than 2 uh, capacitor C_t will be used. The value of C_s and C_t can be approximated from the graph on Page 22. Use same procedure in tuning L_1 and C_p as in Step 4.

CAUTION

Coil tuning screws should not be turned more than 1/8" from full in as the locking device will become ineffective and the tuning slug will bottom on the chassis.

Good tuning of the coupling unit is dependent upon a good electrical ground. The grounding strap provided on the front of the box must be securely bonded to the aircraft.

The lead from the coupling unit to the aircraft antenna feed-thru insulator should be as short as possible, the suggested length is 6 inches. It should not exceed 12 inches.

When tuning the coupling unit, care should be taken not to short turns on the air duct by allowing the Johnson clips to be poorly positioned. After final tuning, all Johnson clips on the air duct should be rechecked for proper positioning and tightness.

6. ANTENNA COUPLER CONFIGURATION

The antenna coupler is a matching device that will present a 50 ohm termination to the transmitter when using a fixed antenna of given length over frequencies of 2 to 18 mcs. This coupler is designed to match end fed antennas.

The ledex motor with its slave wafer and switch deck assembly is actuated and positioned by a master wafer in the transceiver. In this manner, a given channel position in the radio dictates a respective ledex position in the antenna coupler. The switch assembly is thus positioned to form the proper pre-selected reactive circuitry required to match the transceiver to antenna at any given frequency.

The following is typical for a standard 29 foot antenna:

On frequencies below the natural quarter wave length of the antenna (2 mc to 5 mc) the coupler circuitry is as follows:

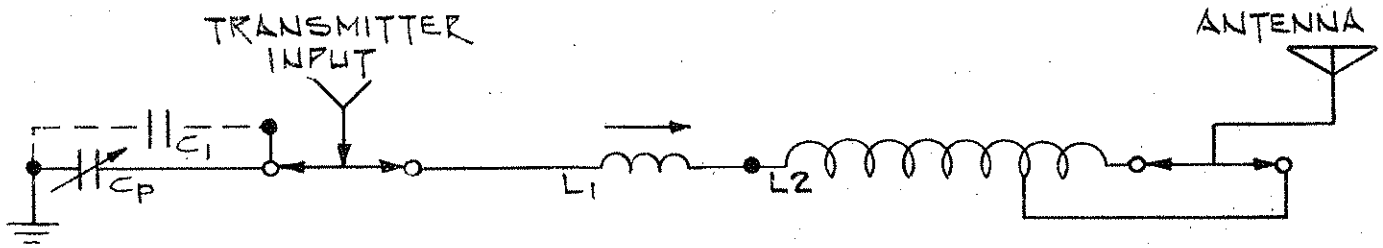


FIGURE NO. 11

In this configuration the amount of series inductance required is adjusted by taps on the air duct and the tunable inductor L_1. The required shunt capacity is obtained by choosing the value of C_1 and the adjustable padder C_p. All padders used in the coupling unit (C_p) have a maximum of 590 pf and a minimum of 170 pf. In the case of a 3 mc frequency, the total shunt capacity usually required is 1400 pf. C_1 will be 1000 pf and the remaining 400 pf will be obtained from the padder C_p.

On frequencies approaching the natural quarter wave length of the antenna (5 mc to 6.5 mc) the coupler circuit is as follows:

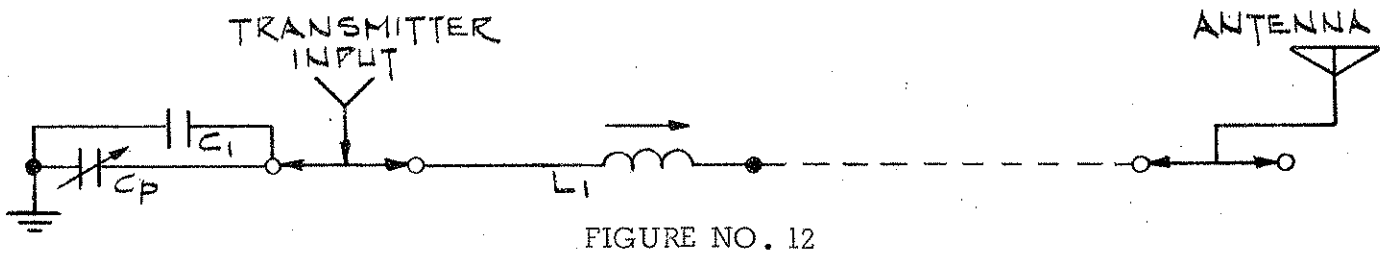


FIGURE NO. 12

The required series inductance for these frequencies ranges from 2 uh to 3.85 uh which is within the tuning range of the inductor L_S. The air duct is not required so is jumpered out.

On frequencies on the natural quarter wave length of the antenna and slightly above (6.5 mc to 12 mc) the coupler circuitry is as follows:

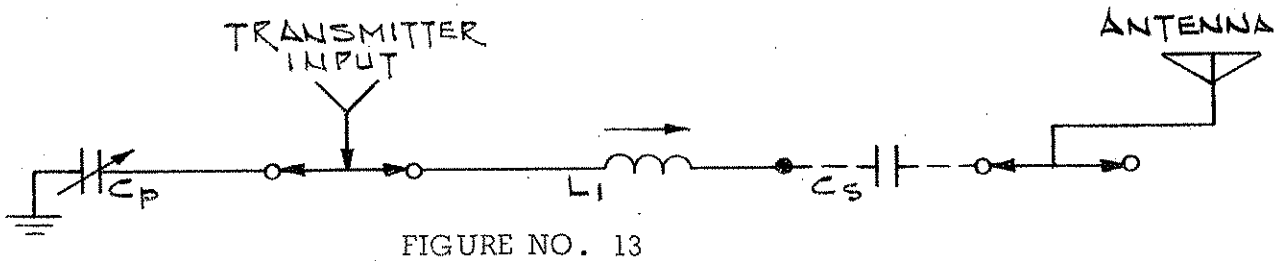


FIGURE NO. 13

Since series capacity is required rather than the series inductance, capacitor C_s is used in place of the air duct. L_s serves as the tunable element in the series circuit. The shunt capacity requirement is usually between 500 pf and 200 pf so the padder C_p requires no parallel capacitor.

On frequencies well above the natural wave length of the antenna (12 mc to 18 mc) the coupler circuitry is as follows:

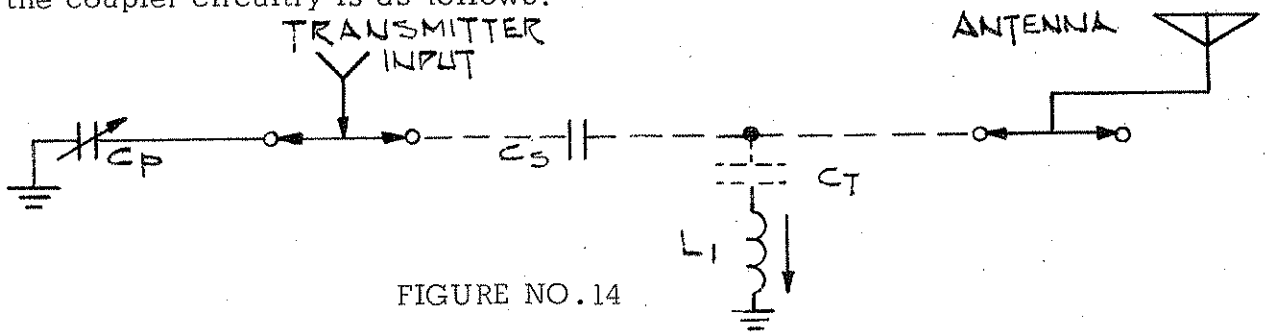
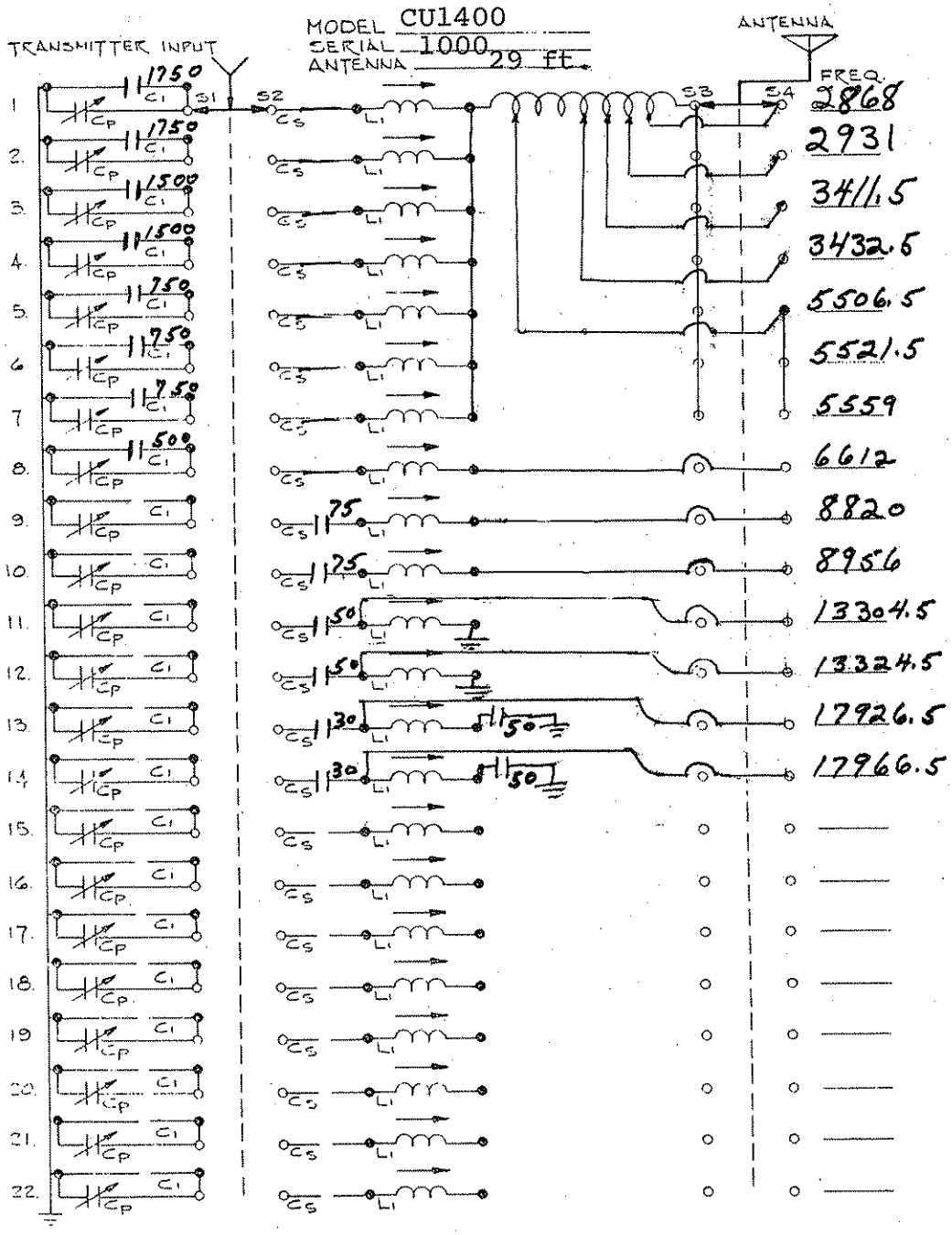


FIGURE NO. 14

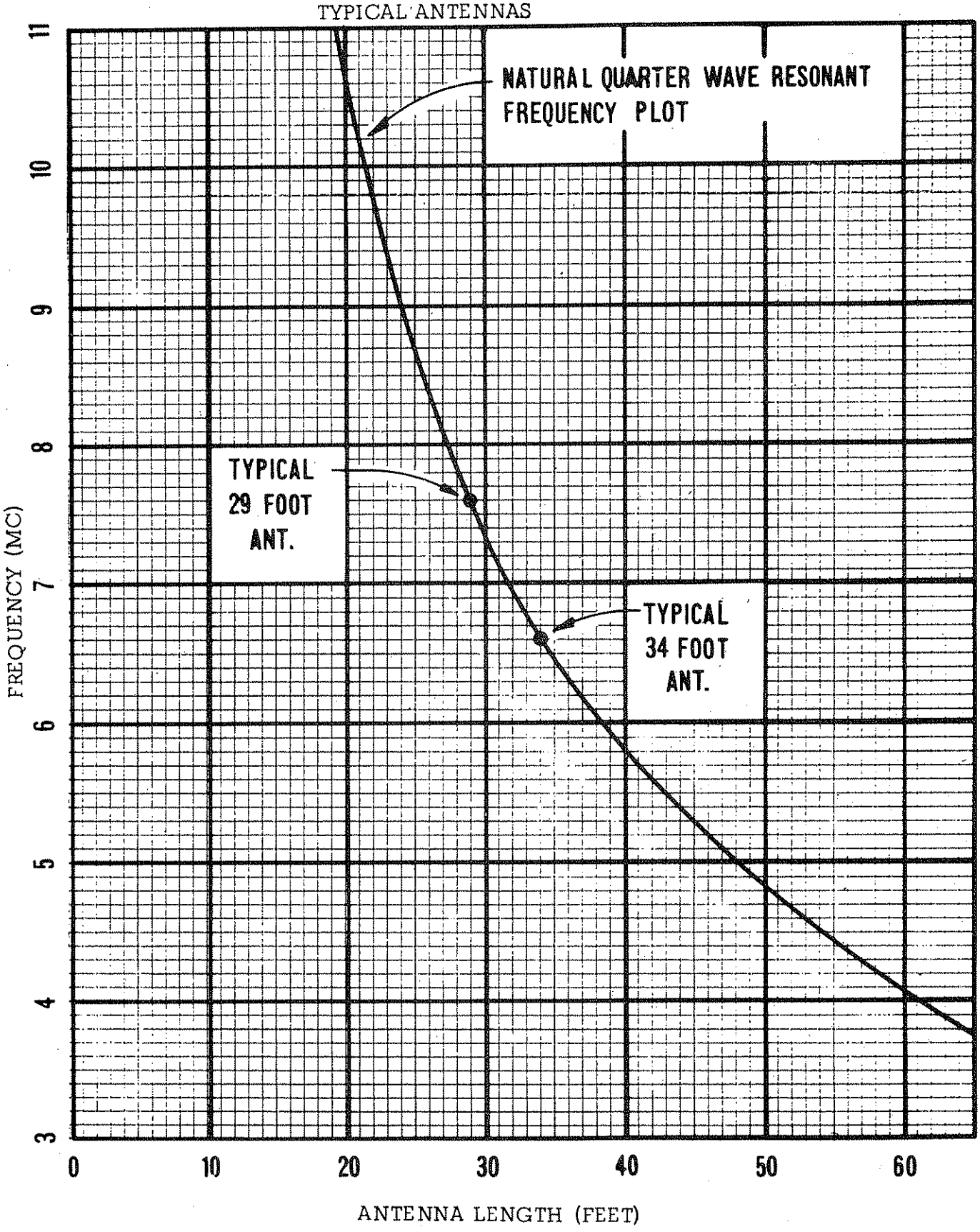
The fixed capacitor C_s is the only series element and the tunable inductor L_s is used as a shunt. Since L_s is of one inductance range (2 uh to 3.85 uh) a capacitor is inserted in series with L_s on frequencies requiring less than 2 uh shunt inductance (14 mc to 18 mc).

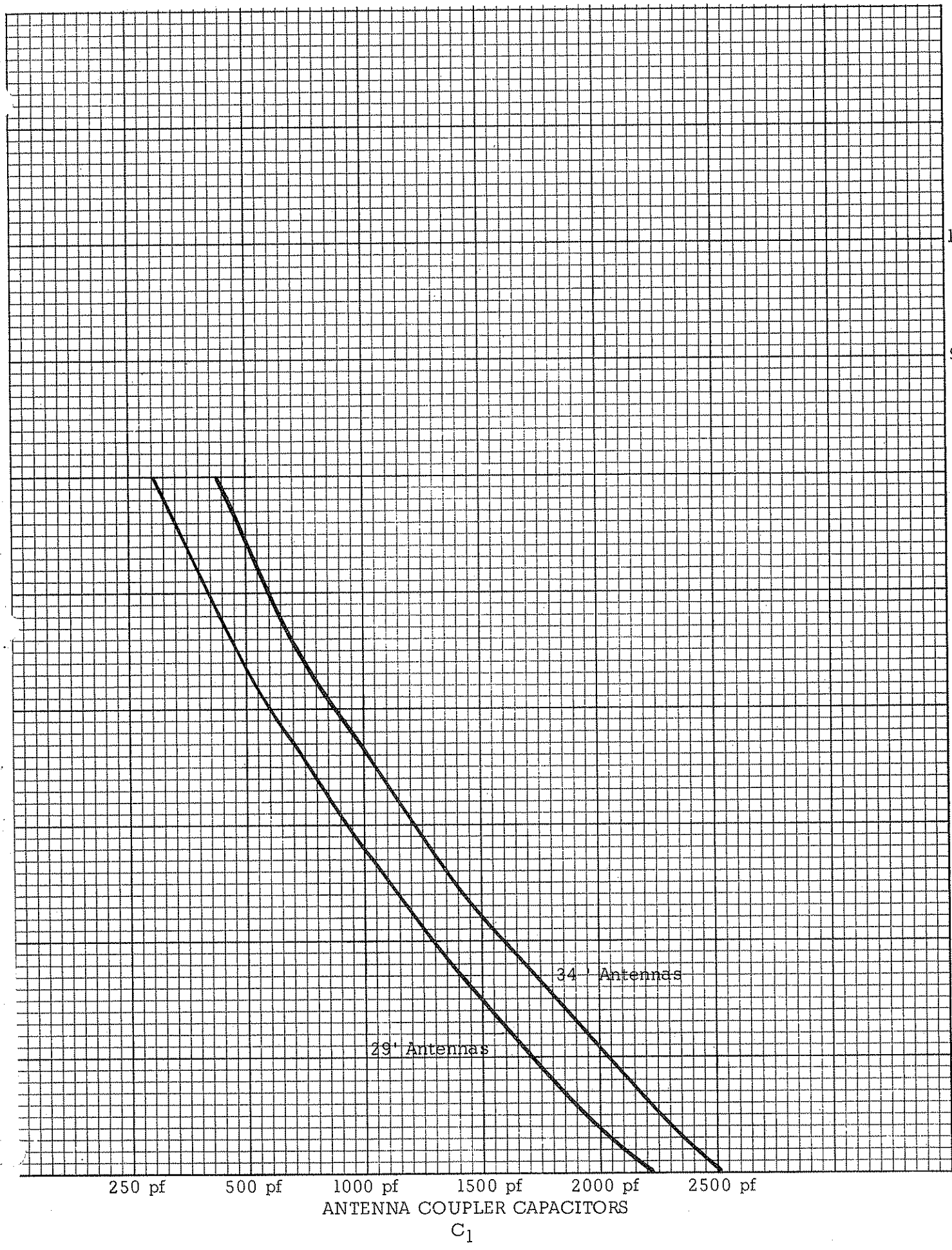
The following pages show a typical schematic and average values of C_s and C_1, over the frequency range of 2 mc to 18 mc.

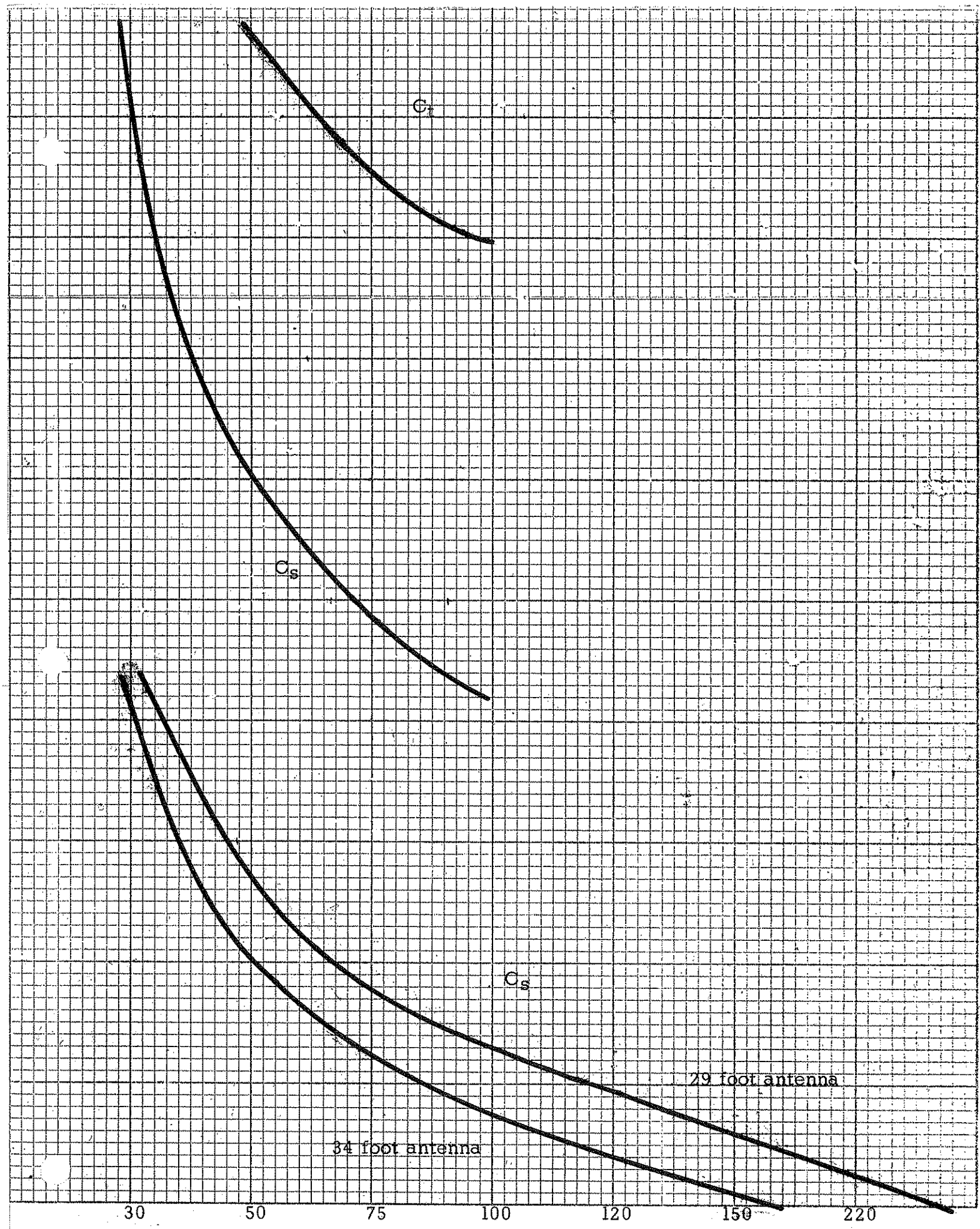


This Antenna Coupler has been customized at the factory for the assigned frequencies of the transmitter and the specified antenna configuration. This information is contained in the above schematic diagram. Refer to the instruction manual for the FINAL tuning procedure which MUST be accomplished to avoid damage to the transmitter and provide optimum operation.

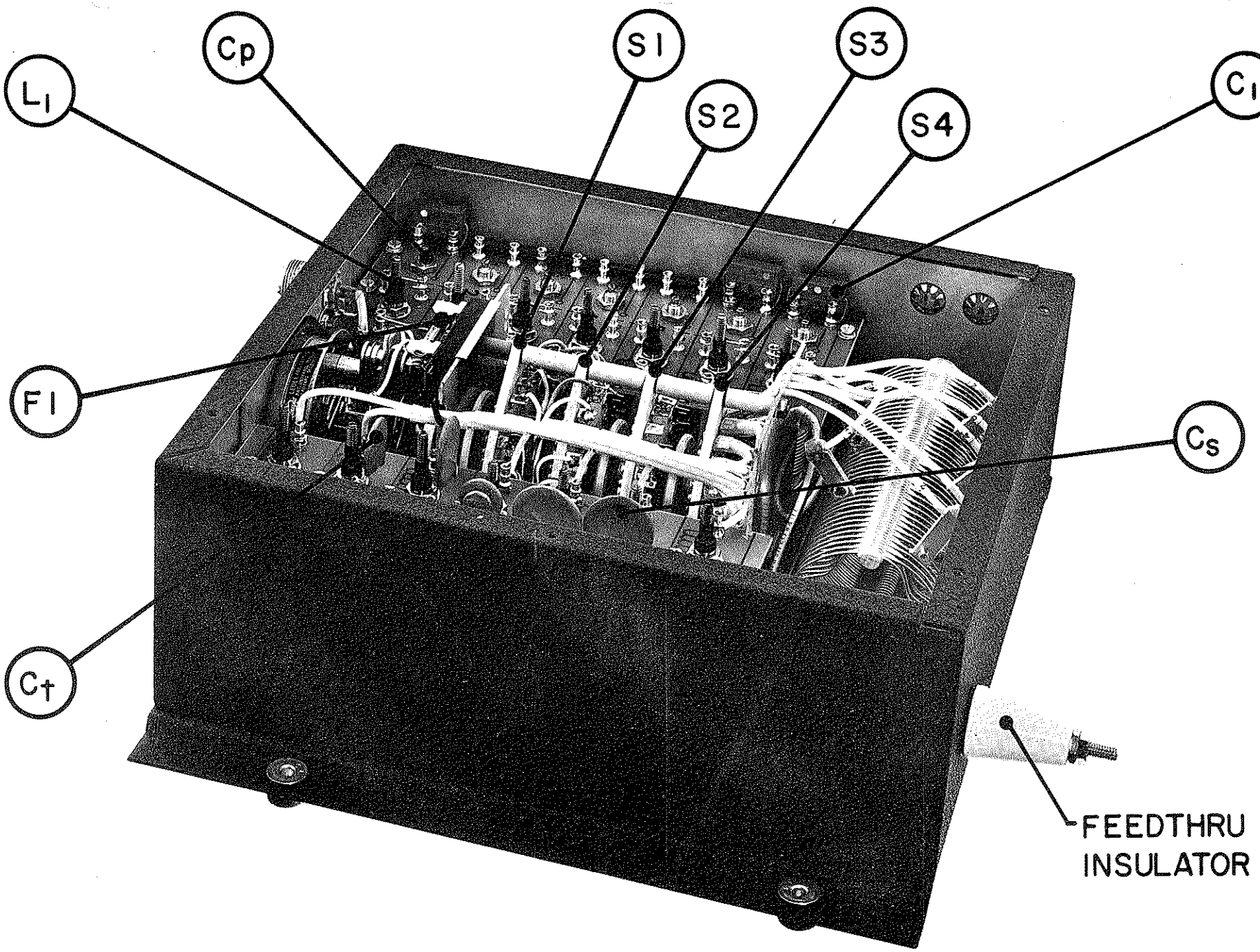
NATURAL FREQUENCY VS. ANTENNA LENGTH FOR TYPICAL ANTENNAS



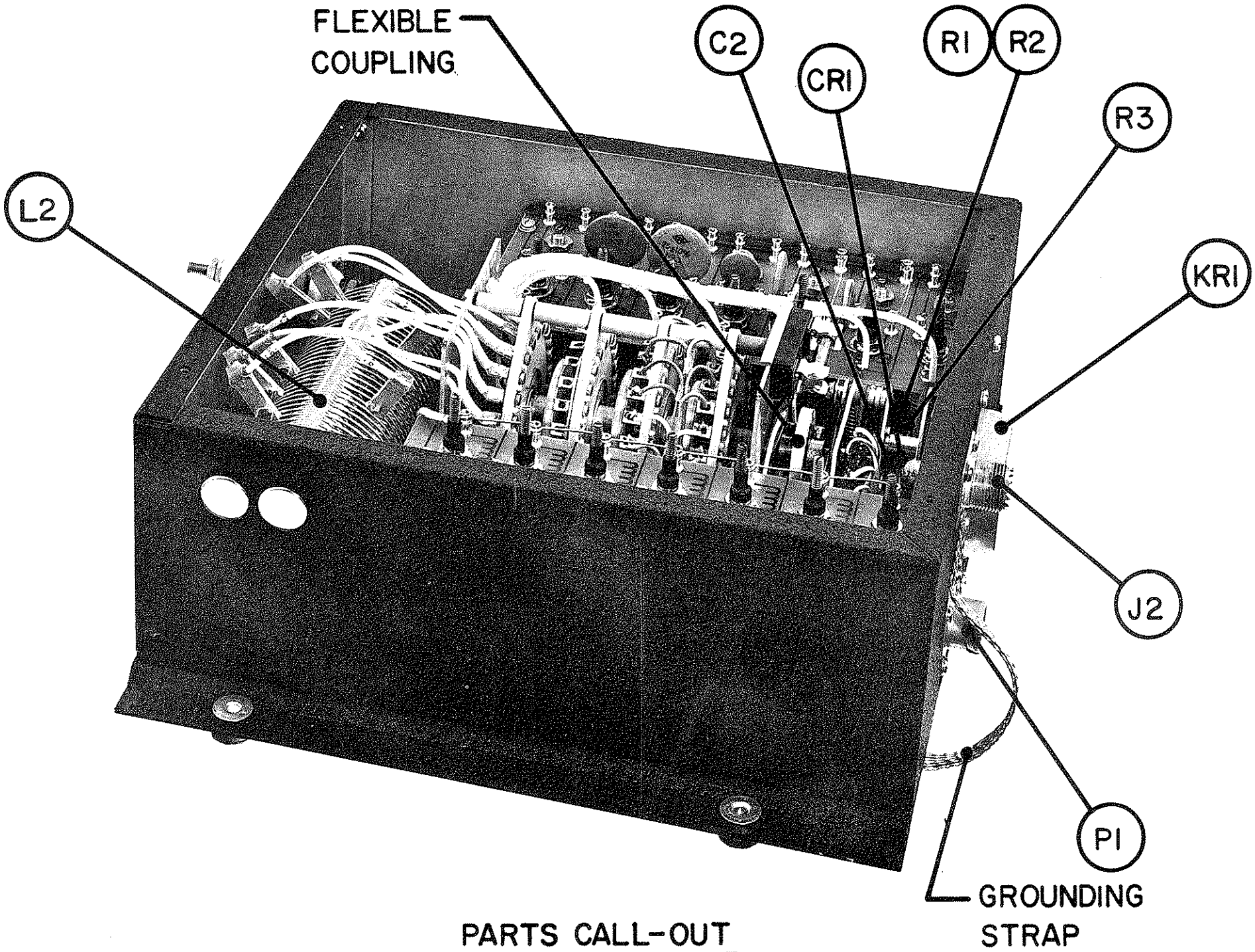

10 mc
9 mc
8 mc
7 mc
6 mc
5 mc
4 mc
3 mc
2 mc
34' Antennas
29' Antennas
250 pf
500 pf
1000 pf
1500 pf
2000 pf
2500 pf
ANTENNA COUPLER CAPACITORS
C_1



ANTENNA COUPLER CAPACITORS
C_s and C_t



PARTS CALL-OUT



PARTS CALL-OUT

REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NUMBER
C_p	Capacitor, Padder	27058
C_1	Capacitor, Mica, 500 V, Capacity dependent upon frequency.	
C-2	Capacitor, 1 uf 200 V.	24525
C_t, C_s	Capacitor, Disc, 3 KV - Capacity dependent upon frequency.	
R1, R2	Resistor, 1 ohm, 10 watt	16968
R3	Resistor, 1 ohm, 1 watt	17027
L_1	Coil, Variable, 2.0 uh to 3.85 uh	63868
L-2	Coil, Air Duct	97821
CR1	Diode, IN 534	40165
F1	Fuseholder	84862
	Fuse, 5 amp. Slo-Blow	85866
KR1	Motor, Ledex, Complete with channeling wafer	32285
S1, S2, S3, S4	Wafer, 24 Position, Ceramic	33162
P1	Plug, Channeling	74350
J2	Plug, RF. Input	74192
	Insulator, Feed Through	71035
	Coupling, Flexible	32223
	Strap, Grounding	11803
	Connector, Cable, Channeling	74362
	Connector, Cable, R. F.	90873
	Shaft, Phenolic 4-1/2 Inch	33459
	Clip, Air Duct	50665
	Shock Isolator Kit, All Attitude (Kit consists of 4 shock isolators No. 15330 and mounting hardware)	98928