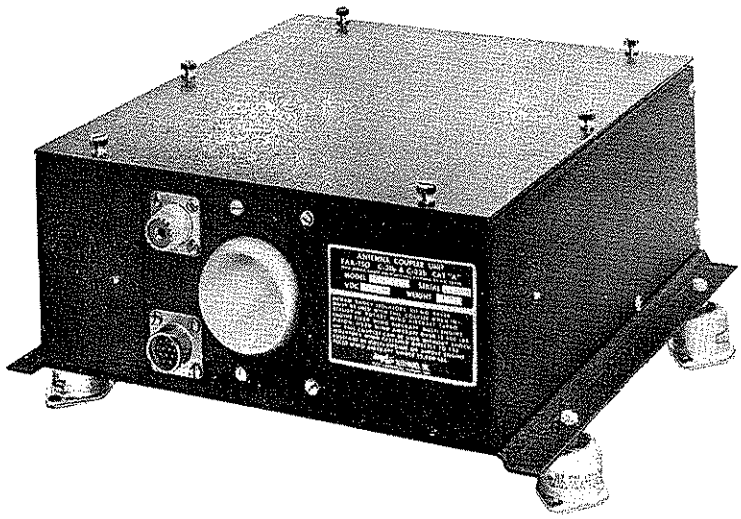
sunair electronics, inc.

3101 S.W. Third Avenue, Fort Lauderdale, Florida 33315 U.S.A.



Instruction Manual

ANTENNA COUPLER
CU MODELS

3 RD EDITION 10 APRIL 196
MANUAL PART NUMBER 99374

IN CASE OF DIFFICULTY

If your Sunair Electronics, Inc. equipment, develops a malfunction, please follow the steps outlined below to expedite your equipment repair.

1. Note all of the symtoms of the problem, i.e, when does it occur; how often; which modes of operation work, which do not; and anything else which might assist in problem solving.
2. Note model number and serial number.
3. When and from whom (dealer, representative or factory) equipment was acquired.
4. Note peripheral equipment being used in conjunction with the Sunair equipment. Is the peripheral equipment working properly?

After determining the answers to the above, contact your dealer or representative and discuss the problem with him, he may be able to fix the problem locally, avoiding shipping delays. If it becomes necessary to return the equipment to the factory, please follow the procedures outlined in Section II of this manual.

TABLE OF CONTENTS

ANTENNA COUPLER
CU MODELS

1. SPECIFICATIONS

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

Fuse: 1 1/2 amp S.B.

TSO: Category A when used with Sunair all-attitude Shock Insolator Kit No. 98928.

SUNAIR SHOCK INSOLATOR KIT 98916 MUST BE USED WITH CU-2200 INSOLATOR KIT, 98928 MUST BE USED WITH ALL OTHER COUPLERS 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 INSOLATORS 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-500 A	98411	13.75 or 27.5	S-5-DTR, S-5-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, ASB-100	6.50 lb
CU-1400	93986	13.75 or 27.5	SA-14, SA-14-R SA-14-DA, SA-14-RA	7.00 lb
CU-2200	95249	27.5	T-22-RA, ASB-320	8.75 lb

*NOTE: Units are replaced by CU-100 Series Couplers.

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 unit.

3. ANTENNA

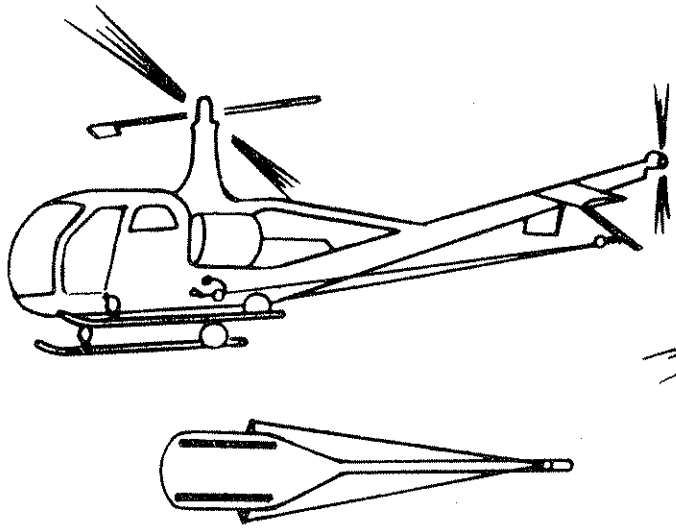
One fixed antenna of exact electrical characteristics is impossible to recommend due to the variation in aircraft configurations.

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. Some installations may require other antenna lengths or configurations and the SunAir antenna coupler will provide good performance on antennas from 25 to 45 feet in length. In the event special antenna requirements are indicated, SunAir will furnish recommendations when requested.

CAUTION

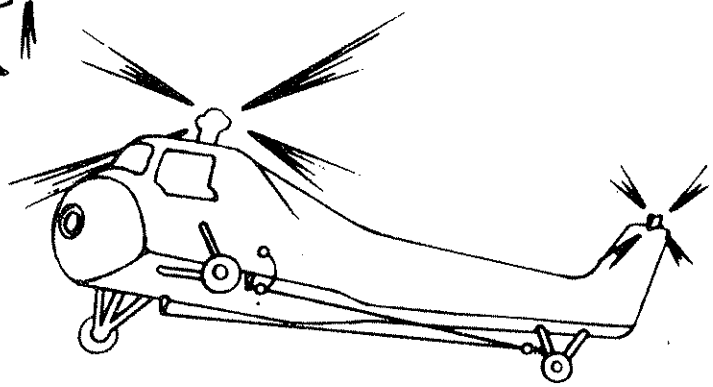
It is important to have a good antenna installation. Be sure the antenna has adequate tension and secure mountings, as slack in the antenna will cause detuning in flight.

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.



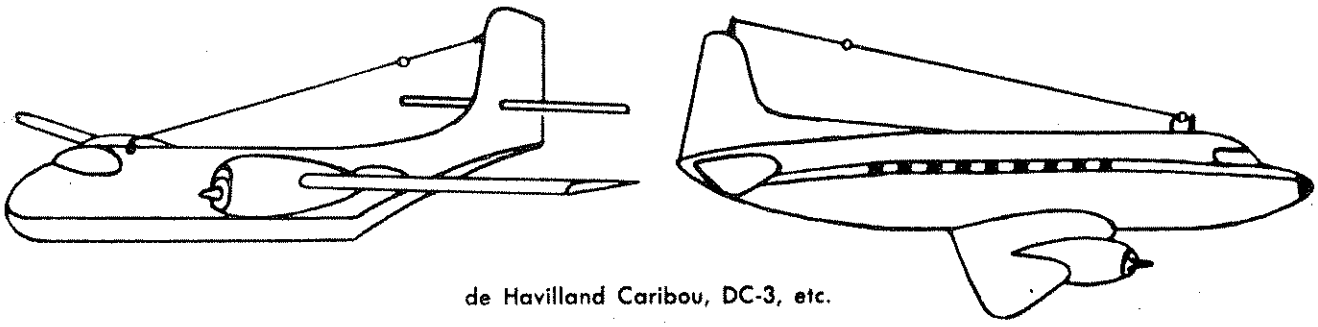
Hiller E 4

29 Foot "V" Antenna



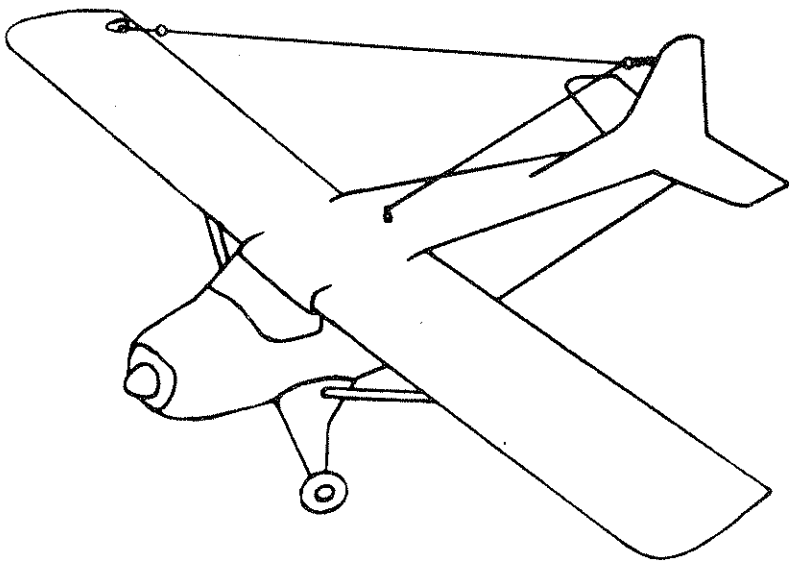
Sikorsky S-58

34 Foot "V" Antenna



de Havilland Caribou, DC-3, etc.

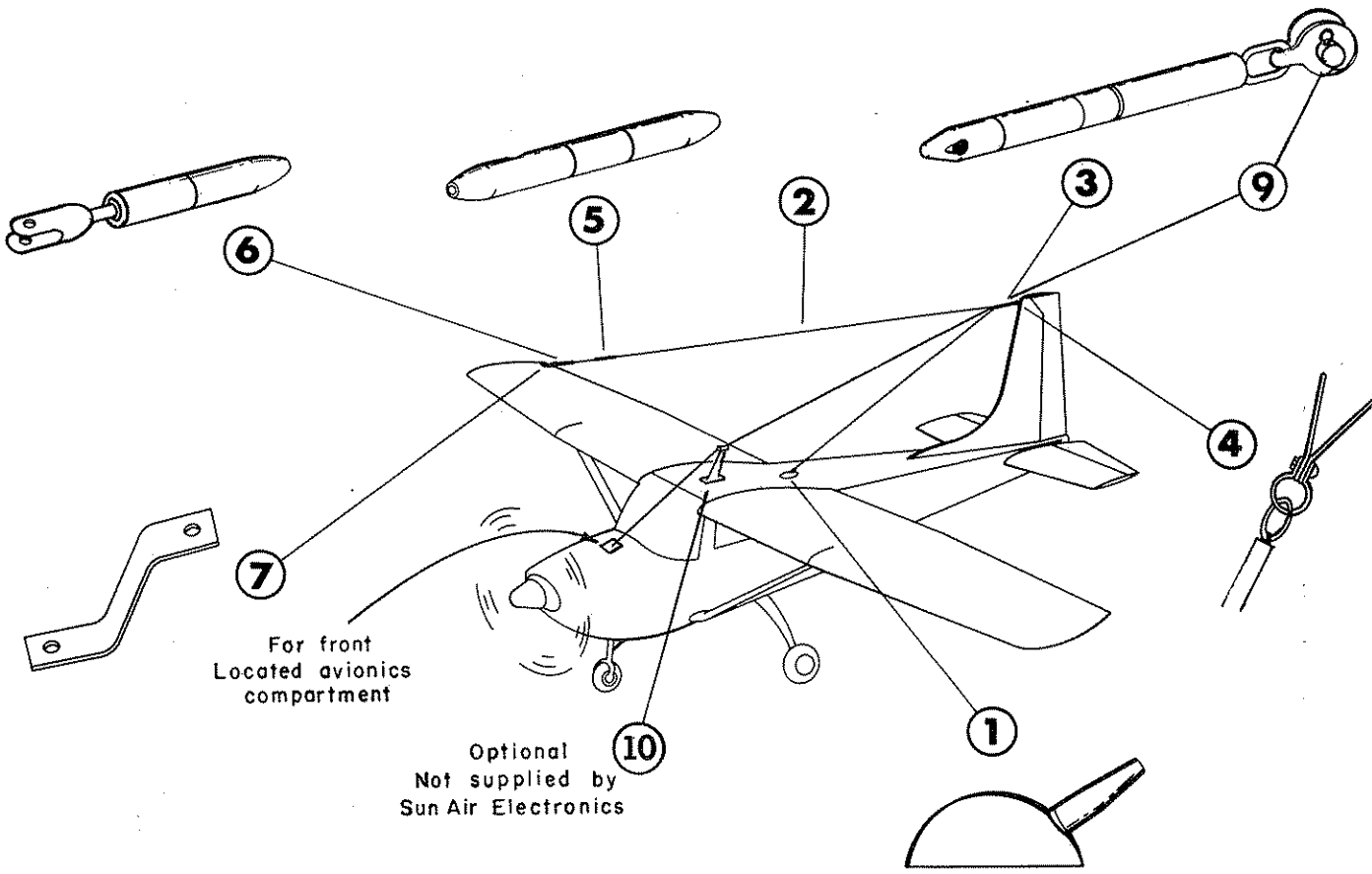
34 Foot "Straight" Antenna



de Havilland
Beaver, etc.

34 Foot "V" Antenna

SUNAIR 95158 HF ANTI-PRECIPITATION STATIC ANTENNA KIT



INSTALLATION

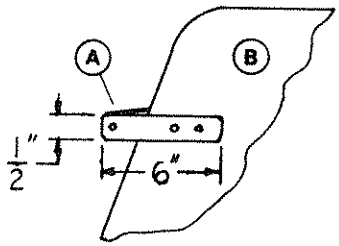
ITEM	DESCRIPTION	PART NO.
1	Feed Through Insulator	71308
2	60 Feet Insulated Antenna Wire	71310
3	Insulated Tension Unit	71322
4	Vertical Fin Anchor (see fig. 4, page 9)	71283
5	Strain Insulator	71267
6	Insulated Tension Anchor	71334
7	Wing Tip Bracket	71009
8	Wire Retraction Tool	71346
9	Shackle AN 115-8	71542
10	Stand-off Mask (LAPA #50 ARM 300-79)	———
11	Installation Instructions	71285

FIGURE No. 10

VERTICAL FIN ANCHOR 71283

(ITEM 4)

Suggested method of mounting only: The anchor will 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

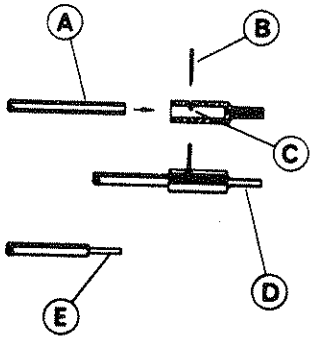
(ITEM 7)

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

4. ANTENNA COUPLER INSTALLATION

Mounting dimensions, weight and space requirements are shown on Page 12.

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

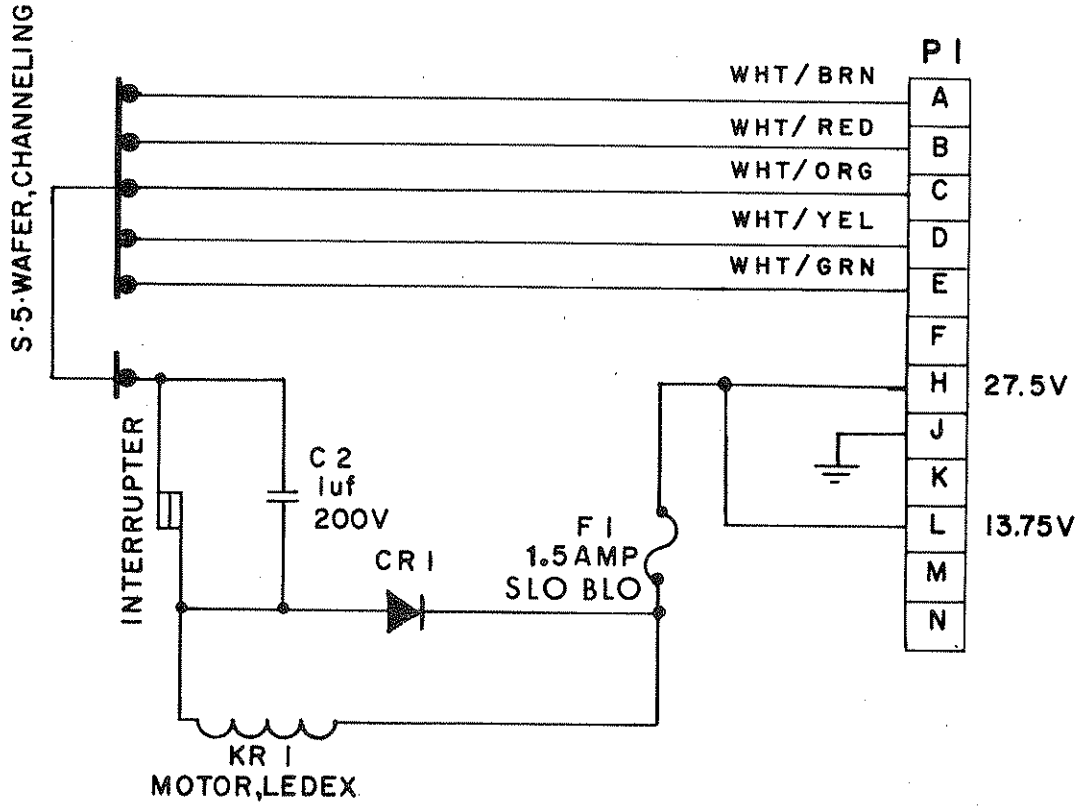


Fig. No. 8

IMPORTANT NOTICE

TO THE INSTALLER

The SunAir Antenna Coupler has been designed to provide a proper match when used with a fixed antenna and thus ensure maximum transmitter and receiver performance. To obtain top performance, the antenna coupler must be correctly installed and carefully tuned to the antenna.

However extensive or limited your knowledge of electronic theory or your experience in tuning radio circuits, it is necessary that the procedures contained in this manual be carefully followed step by step. In this way you can be assured of obtaining optimum performance with a minimum of time and effort on your part.

Reactance is the opposition to the flow of alternating current at a particular frequency by inductance or capacitance. Where both inductive reactance and capacitive reactance are present, resultant reactance is equal to the difference between them.

Inductive reactance varies directly with inductance. That is, an increase in inductance causes an increase in inductive reactance. This has the same effect as increasing the length of the antenna.

Capacitive reactance varies inversely with capacitance. That is, an increase in capacitance causes a decrease in capacitive reactance. Since capacitive reactance is the opposite of inductive reactance, it follows that the presence of capacitance has the same effect as shortening the antenna. However large values of capacitance will have less shortening effect than small values.

In summary, then it is necessary to remember only the following:

- Increase inductance to lengthen the antenna.
- Decrease inductance to shorten the antenna.
- Insert large values of capacitance to shorten the antenna a little.
- Insert small values of capacitance to shorten the antenna a lot.

This applies to components that are placed in series with the antenna. If a component is placed in shunt (or parallel), the effect is just the opposite. That is, if inductance is used as a shunt for the antenna, it will act to shorten the antenna rather than lengthen it.

Group B. For frequencies of 6 mc to 7.0 mc for a 29 foot antenna, 5 mc to 6.0 mc for a 34 foot antenna.

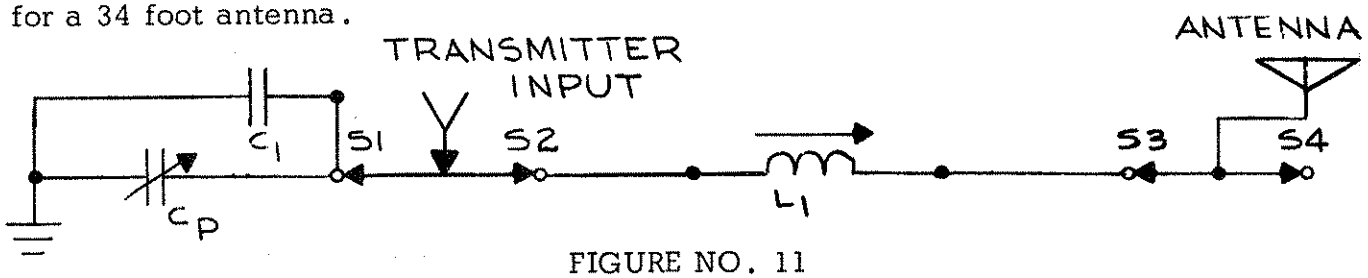


FIGURE NO. 11

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_1. Only a small amount of inductance is required since the antenna is nearly as long as required for these frequencies. Therefore the air duct is not required and is switched out.

Group C. For frequencies of 7.0 mc to 10 mc for a 29 foot antenna, 6.0 mc to 9 mc for a 34 foot antenna.

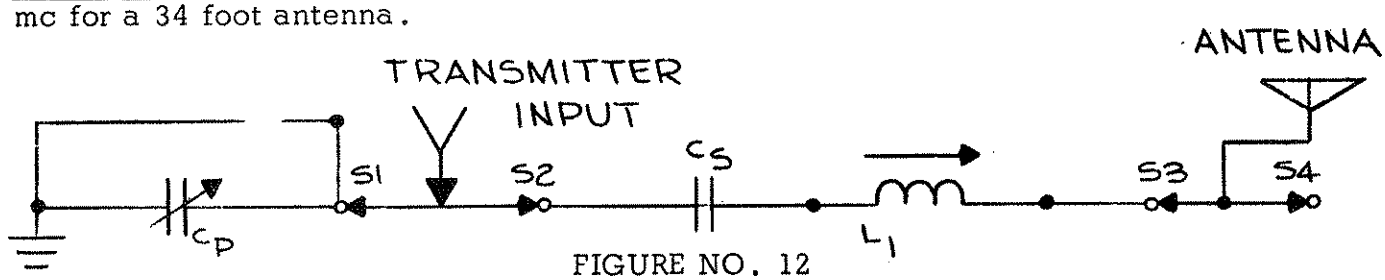


FIGURE NO. 12

In this configuration, series capacitance is required rather than series inductance in order to effectively shorten the antenna to a point that permits small adjustments to be made with the tunable inductor L_1. Therefore Capacitor C_S is used in place of the air duct. The total input capacitance required is usually between 500 pf and 200 pf, so the padder C_P requires no parallel capacitor.

Group D. For frequencies of 10 mc to 18 mc for a 29 foot antenna, 9 mc to 18 mc for a 34 foot antenna.

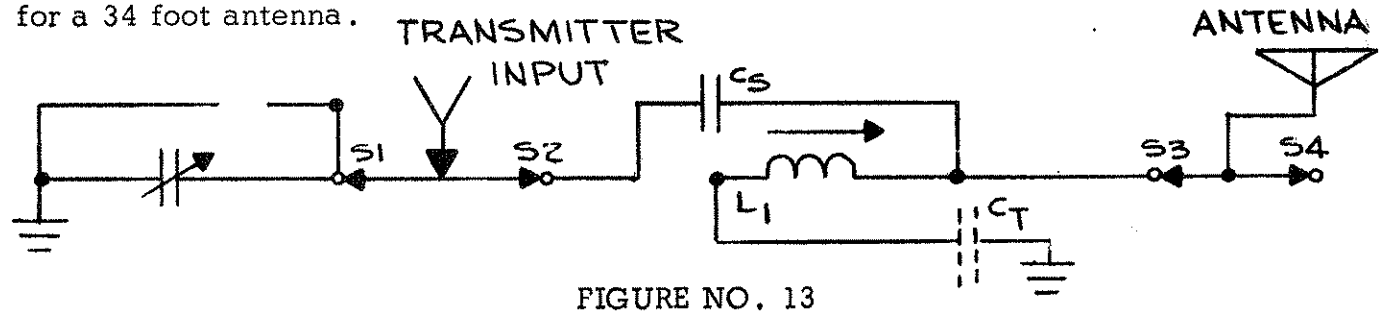


FIGURE NO. 13

In this configuration the fixed capacitor C_S is the only series element. Since this does not effectively shorten the antenna sufficiently (values smaller than 30 pf for C_S are not practical) the tunable inductor L_1 is used as a shunt to accomplish this, and small adjustments are made with L_1. Since L_1 is tunable only within the inductance range of 2 uh to 3.85 uh, a capacitor C_t is inserted in series with L_1 on frequencies requiring less than 2 uh shunt inductance (from 13 or 14 mc to 18 mc). Approximate values for C_S and C_t may be determined from the graphs on pages 28 and 29.

CAUTION

Coil tuning screws should not be turned in more than 1/8 inch from full in as the locking device will become ineffective and the tuning slug will bottom on the chassis. The proper alignment tool must be used to avoid damage to the coil tuning screws.

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 feed-thru insulator should be as short as possible. The suggested length is 6 inches. It should not exceed 12 inches, because performance drops off rapidly over this length due to dissipation of power inside the aircraft. This dissipation is not measured by the Wattmeter and is therefore not readily detected.

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

High RF voltage is present on the air duct and the air duct clips, so all contact while the transmitter is keyed should be with insulated tools. A wooden clothespin is useful in holding the air duct clips while they are being repositioned.

Care must be taken to be sure that the insulated wires from the air duct clips do not touch the air duct. This is necessary because the high RF voltage will burn through the insulation and may cause damage.

The transmitter should not be continuously keyed for over 30 seconds while operating into an untuned antenna. If the transmitter has a low power switch all tuning should be done with the switch in this position. Using only the aircraft battery during tuning will also lessen possibility of excessive Power Amplifier dissipation during tuning. Do not needlessly key the transmitter while tuning the antenna coupler.

In the following tuning procedure:

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

Minimum inductance is obtained when the screw reaches 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.

GROUP A, B, C, AND D TUNING PROCEDURE

If optimum tuning is not obtained with steps 8, 9, and 10, the following steps will help determine the cause of the difficulty and the appropriate action to take.

WARNING: If any replacement of parts is required, parts replacements must be made with components of equal rating regarding voltage, stability and Q. Installing components of lesser rating may result in system failure. A fixed Capacitor Kit (SunAir Part No. 99130) may be ordered from the factory to meet this requirement. It is important that the wire leads on any replacement parts be as short as possible and that the resin core solder joint be of good quality. Excess resin must be cleaned from the joint.

A. FOR GROUP A FREQUENCIES, REFER TO ANTENNA COUPLER CONFIGURATION FIGURE 10, PAGE 16.

12. If L_1 reaches maximum inductance (screw extended full out) when approaching the dip:

    12.1 Move the air duct clip on the air duct one turn away from the porcelain antenna feed thru insulator (to increase inductance).

    12.2 Repeat Steps 8, 9, and 10.

13. If L_1 reaches minimum inductance (screw turned 1/8 inch from full in) when approaching the dip:

    13.1 Move the air duct clip on the air duct one turn toward the porcelain antenna feed thru insulator (to decrease inductance).

    13.2 Repeat Steps 8, 9 and 10.

14. If no indication of tuning is observed, the air duct clip on the air duct will have to be repositioned.

    14.1 Return the positions of the screws on L_1 and C_p to some mid-position.

    14.2 Loosen the screw on the air duct clip for that channel and using an insulated holder, touch the air duct clip to successive turns of the air duct in each direction from the original turn until the meter shows a noticeable dip.

    14.3 Fasten the air duct clip to this turn.

    14.4 Repeat Steps 8, 9 and 10.

C. FOR GROUP C FREQUENCIES, REFER TO ANTENNA CONFIGURATION FIGURE 12, PAGE 17.

19. If L1 reaches maximum inductance (screw extended full out) when approaching the dip, more capacitance is required.

    19.1 Remove the disc capacitor C_S and solder a new disc capacitor with a larger value in its place.

    19.2 Repeat steps 8, 9, and 10.

20. If L_1 reaches minimum inductance (screw extended 1/8 inch from full in) when approaching the dip, less capacitance is required.

    20.1 Remove the disc capacitor C_S and solder a new disc capacitor with a lesser value in its place.

    20.2 Repeat Steps 8, 9, and 10

21. If no indication of tuning is observed, follow the procedure described in step 19 first. If this does not give the desired result, follow the procedure described in step 20.

22. If a change in transmitting frequency or antenna length is made, the value of C_S may have to be changed.

    22.1 Refer to graph on Page 28 to determine the approximate for C_S that will be required.

    22.2 Remove the disc capacitor C_S and solder the new value C_S in its place.

    22.3 Repeat Steps 8,9, and 10.

D. FOR GROUP D FREQUENCIES, REFER TO ANTENNA CONFIGURATION FIGURE 13, PAGE 17.

23. If L reaches maximum inductance (screw extended full out) when approaching the dip, C_S should be decreased in value.. Only C_S should be changed; in this case it is not necessary for C_S and C_t to have the same value.

    23.1 Remove the disc capacitor C_S and solder a new disc capacitor with a smaller value in its place.

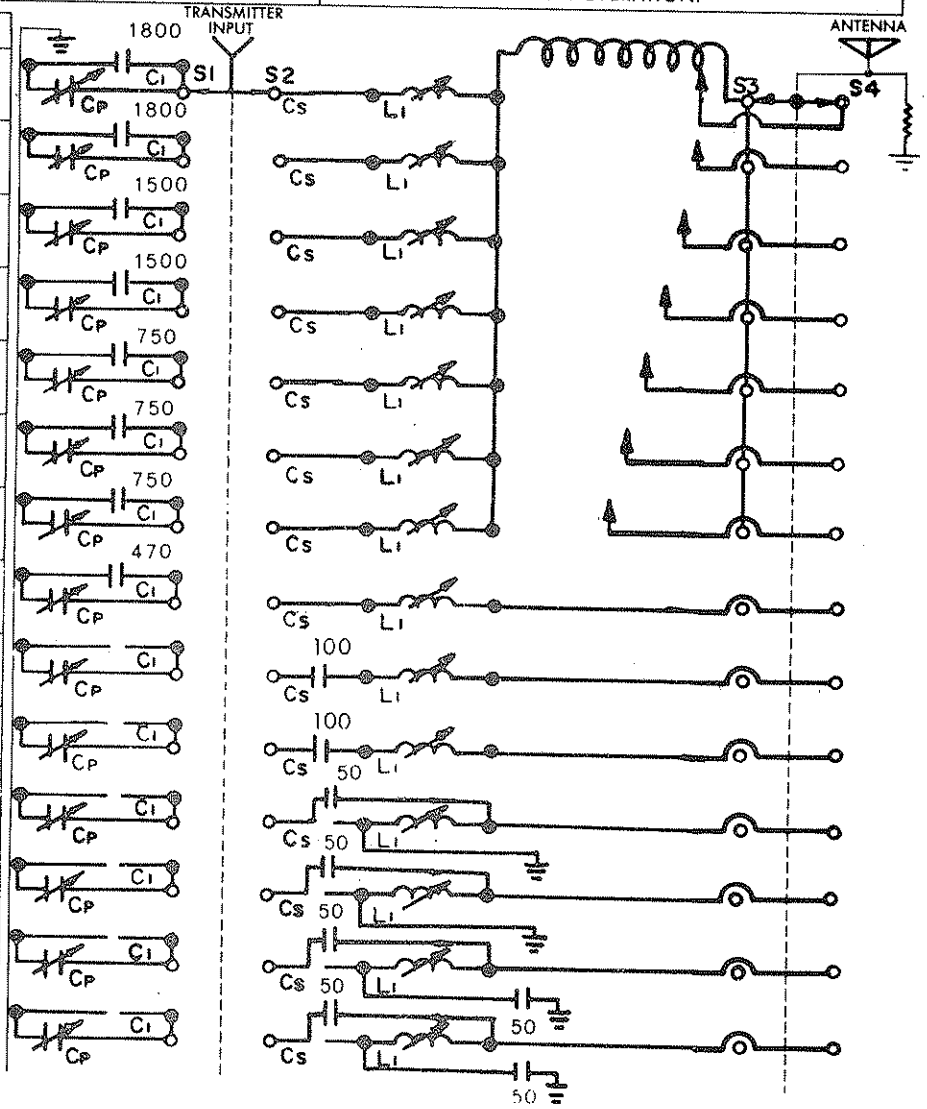
    23.2 Repeat Steps 8,9, and 10.

RADIO MODEL	14V	28V	PART NUMBER	SunAir® ELECTRONICS, INC

C U MODEL	ANTENNA	PART NO.	SERIAL NO.
1400	29 FEET	93986	XXXX

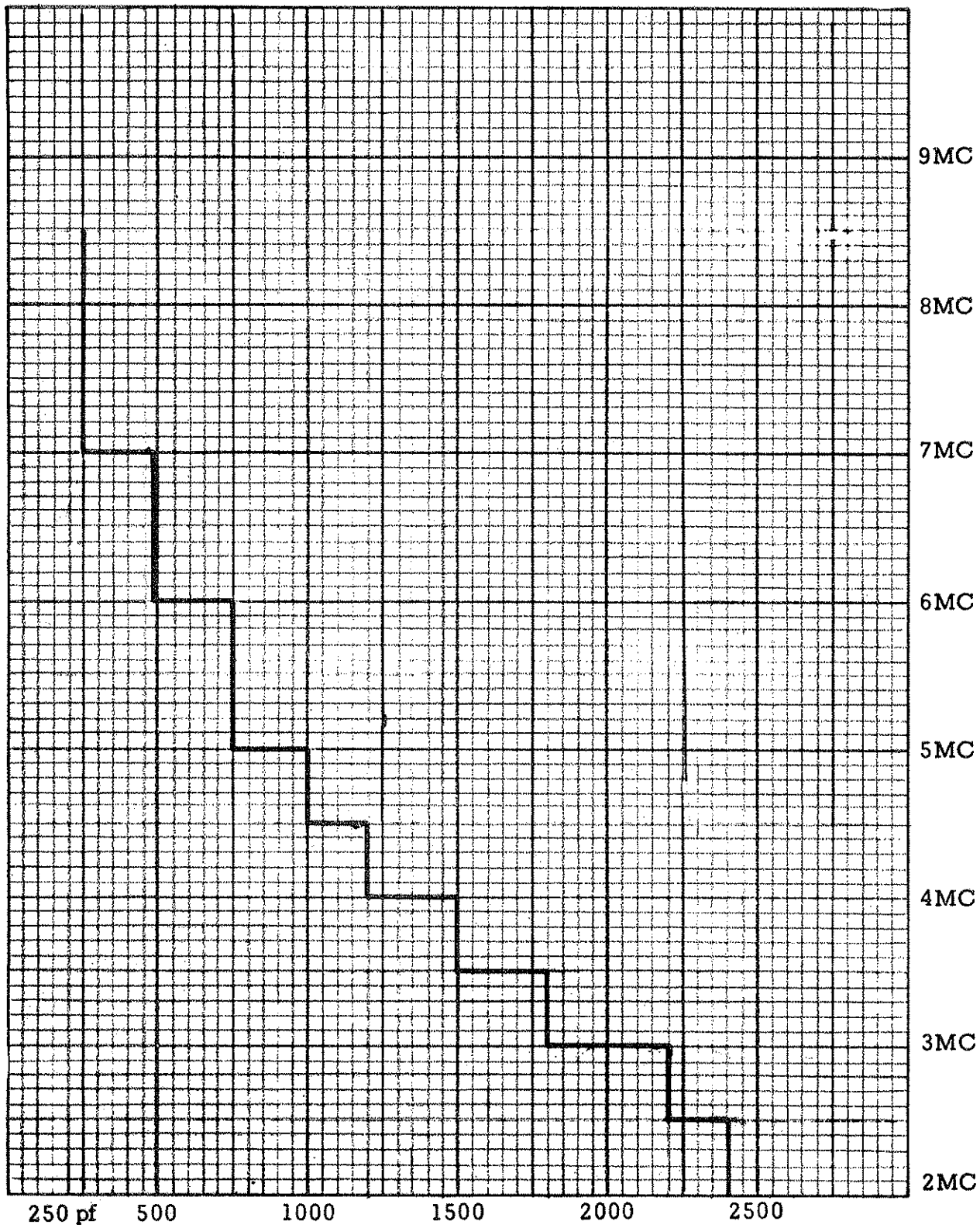
THIS ANTENNA COUPLER HAS BEEN CUSTOMIZED AT THE FACTORY FOR THE ASSIGNED FREQUENCIES OF THE TRANSMITTER AND THE SPECIFIED ANTENNA CONFIGURATION. THIS INFORMATION IS CONTAINED IN THE SCHEMATIC DIAGRAM BELOW. REFER TO THE INSTRUCTION MANUAL FOR THE FINAL TUNING PROCEDURE WHICH MUST BE ACCOMPLISHED TO AVOID DAMAGE TO THE TRANSMITTER AND PROVIDE OPTIMUM OPERATION.

CH	FREQUENCY
1	2868
2	2931
3	3411.5
4	3432.5
5	5506.5
6	5521.5
7	5559
8	6612
9	8820
10	8956
11	13304.5
12	13324.5
13	17926.5
14	17966.5

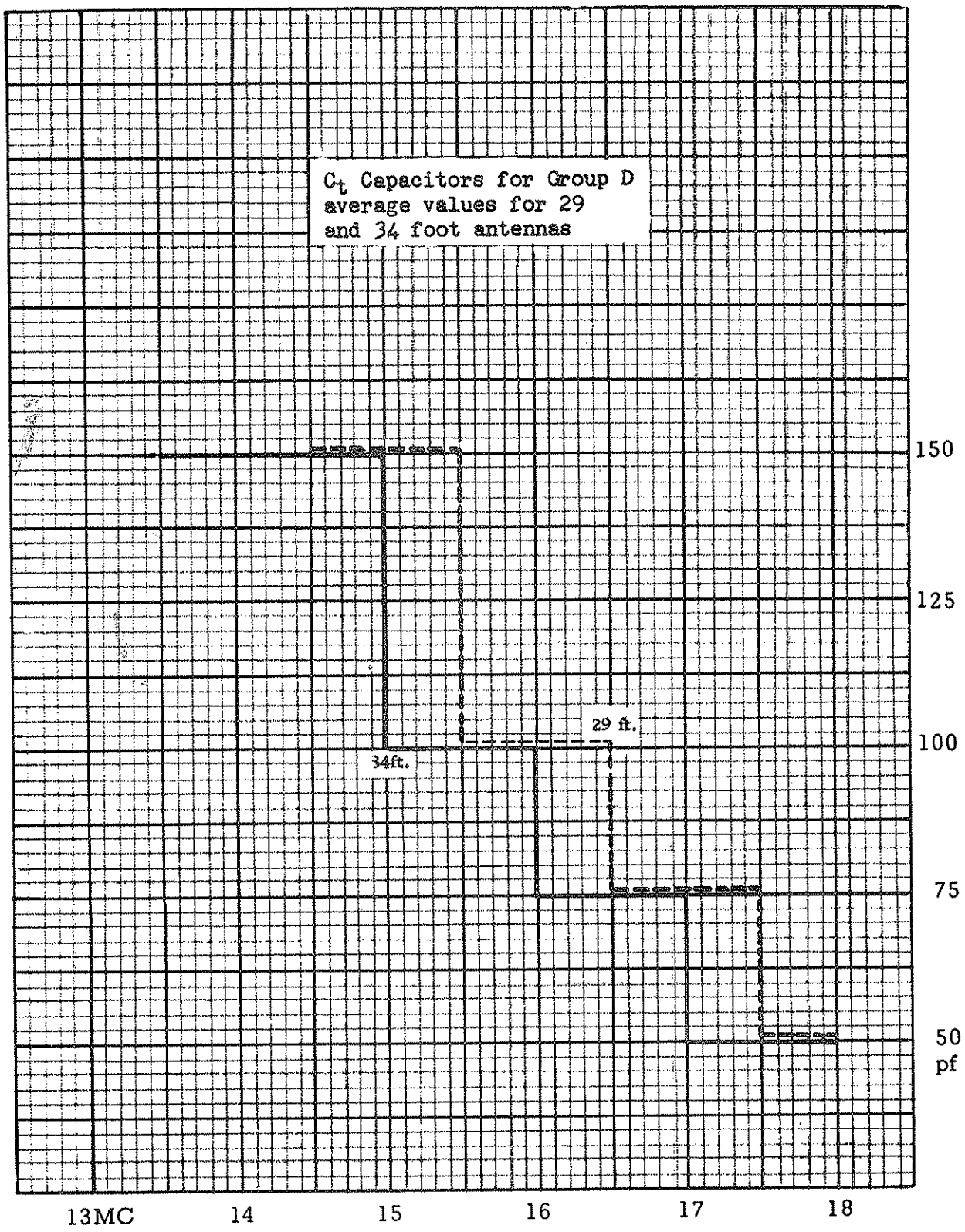


The above is a typical schematic of an antenna coupler and shows examples of circuit variations over the range of frequencies. The four circuit groups described in Section 6 of the manual are represented. A schematic similar to the above is affixed to the inside cover of each SunAir Antenna Coupler. This provides a record of the exact circuit configuration of the unit. It is recommended that the schematic be corrected when a circuit change is made to the antenna coupler.

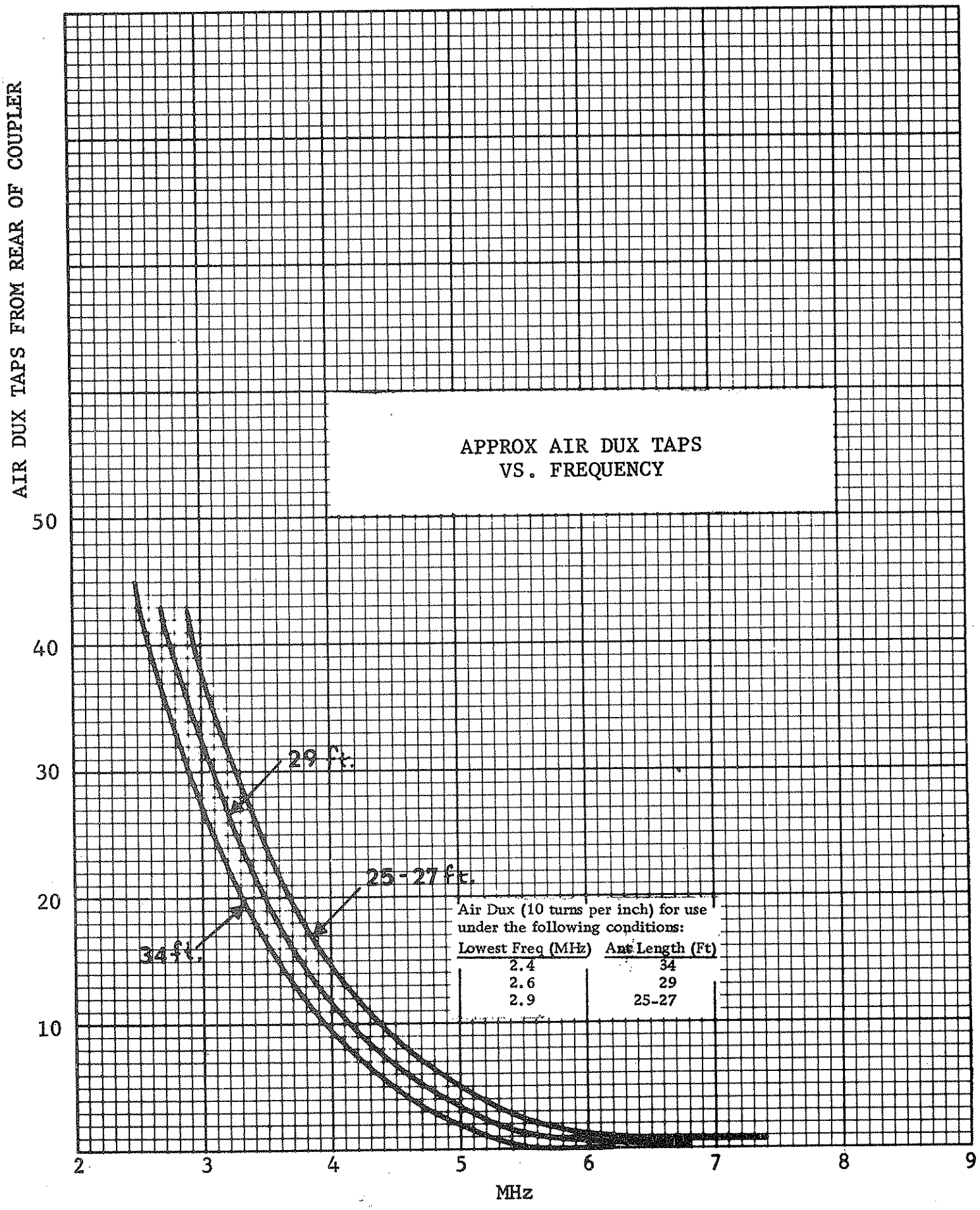
APPROXIMATE VALUES FOR ALL ANTENNAS



C_1 ANTENNA COUPLER CAPACITORS



C_t ANTENNA COUPLER CAPACITORS


AIR DUX TAPS FROM REAR OF COUPLER
APPROX AIR DUX TAPS
VS. FREQUENCY
50
40
30
20
10
29 ft.
25-27 ft.
34 ft.
Air Dux (10 turns per inch) for use under the following conditions:
Lowest Freq (MHz) | Ant Length (Ft)
2.4 | 34
2.6 | 29
2.9 | 25-27
2
3
4
5
6
7
8
9
MHz

PARTS LIST

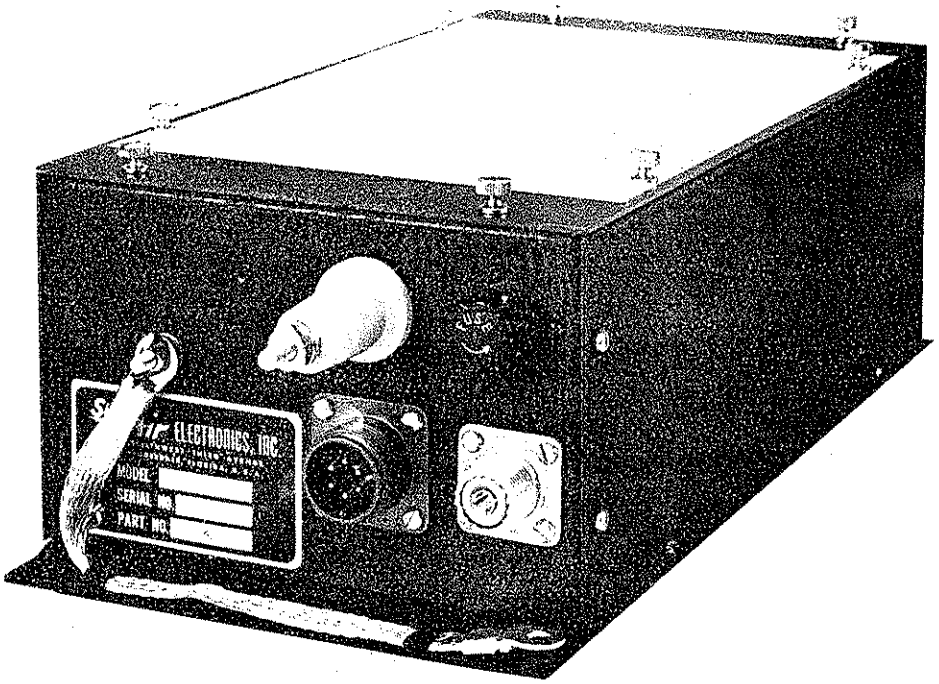
CKT. SYM.	PART NO.	DESCRIPTION
Cp	27058	Capacitor, Padder
C1		Capacitor, Mica, 500V, (Frequency dependent)
C2	24525	Capacitor, 1 uf, 200V
Ct Cs		Capacitor, Disc, 3 KV, (Frequency dependent)
R1	18722	Resistor, 6.8 megohms, 2 watt
L1	63868	Coil, Variable, 2.0 uh to 3.85 uh
L2	93617	Air Dux Coil Assembly (78 Turns)
L2	98887	Air Dux Coil Assembly (49 Turns)
CR1	40165	Diode, 1N534
F1	89654	Fuse, 1 1/2 amp S.B.
KR1	98629	Motor, Ledex, Complete with S5-14V
KR1	34271	Motor, Ledex, Complete with S5-28V
S1, S2, S3, S4	33162	Switch Wafer, 24 Position, Ceramic
S5	32417	Switch Wafer, Channeling
J1	74350	Connector, Channeling
J2	74192	Connector, RF Input
	84862	Fuseholder
	71035	Insulator, Feed Through
	51592	Spacer, Phenolic, 1/4 dia.x2-3/16 lg.
	32223	Coupling, Flexible
	98409	Strap, Grounding
	74362	Connector, Cable, Channeling
	90873	Connector, Cable, R.F.
	33253	Shaft, Phenolic 4-1/2 Inch
	50665	Clip, Air Duct
	98928	Shock Isolator Kit, All-Attitude (Except CU-2200)
	98916	Shock Isolator Kit, (CU-2200 only)

CKT. SYM.	PART NO.	DESCRIPTION *KIT
C1	25426	Capacitor, Mica, 200 pf, 500 VDC
C1	25438	Capacitor, Mica, 250 pf, 500 VDC(2)
C1	25505	Capacitor, Mica, 470 pf, 500 VDC(6)
C1	24915	Capacitor, Mica, 750 pf, 500 VDC(4)
C1	24927	Capacitor, Mica, 1000 pf, 500 VDC(4)
C1	24965	Capacitor, Mica, 1200 pf, 500 VDC(4)
C1	24939	Capacitor, Mica, 1500 pf, 500 VDC(4)
C1	26690	Capacitor, Mica, 1800 pf, 500 VDC(2)
C1	24903	Capacitor, Mica, 2000 pf, 500 VDC
C1	26705	Capacitor, Mica, 2200 pf, 500 VDC
C1	26717	Capacitor, Mica, 2400 pf, 500 VDC
C1	27319	Capacitor, Mica, 2500 pf, 500 VDC
Ct, Cs	25957	Capacitor, Ceramic, 20 pf, 3 KVDC
Ct, Cs	25945	Capacitor, Ceramic, 30 pf, 3 KVDC(4)
Ct, Cs	25933	Capacitor, Ceramic, 50 pf, 3 KVDC(6)
Ct, Cs	25921	Capacitor, Ceramic, 75 pf, 3 KVDC(6)
Ct, Cs	25919	Capacitor, Ceramic, 100 pf, 3 KVDC(6)
Ct, Cs	25907	Capacitor, Ceramic, 120 pf, 3 KVDC(4)
Ct, Cs	25892	Capacitor, Ceramic, 150 pf, 3 KVDC(6)
	*KIT	Sunair has available a kit of capacitors which is made up of those most commonly used in antenna couplers. This kit is identified by part number 99130 and consists of the quantities shown in the last column.

Field Service men are encouraged to use capacitors with proper voltage rating, dissipation factor and temperature stability in the frequency dependent circuits. Using inferior components may result in detuning and/or complete failure of the circuit.

sunair electronics, inc.

3101 S.W. Third Avenue, Fort Lauderdale, Florida 33315 U.S.A.



OPERATION AND MAINTENANCE MANUAL

ANTENNA COUPLER CU-105, 106, 110

SECOND EDITION 16 DECEMBER 1970
MANUAL PART NUMBER 99694

IN CASE OF DIFFICULTY

If your Sunair Electronics, Inc. equipment, develops a malfunction, please follow the steps outlined below to expedite your equipment repair.

1. Note all of the symtoms of the problem, i.e, when does it occur; how often; which modes of operation work, which do not; and anything else which might assist in problem solving.
2. Note model number and serial number.
3. When and from whom (dealer, representative or factory) equipment was acquired.
4. Note peripheral equipment being used in conjunction with the Sunair equipment. Is the peripheral equipment working properly?

After determining the answers to the above, contact your dealer or representative and discuss the problem with him, he may be able to fix the problem locally, avoiding shipping delays. If it becomes necessary to return the equipment to the factory, please follow the procedures outlined in Section II of this manual.

TABLE OF CONTENTS

ANTENNA COUPLER
CU MODELS

CAUTION

TO INSURE THAT CABLE HAS NOT BEEN DAMAGED DURING SHIPMENT, ALL CABLE ASSEMBLIES MUST BE CHECKED FOR CONTINUITY OR SHORTS, FROM PIN TO PIN, BETWEEN CONNECTORS BEFORE INITIAL RADIO OR SYSTEM POWER UP.

WARNING

CONNECTORS INSTALLED BY THE CUSTOMER MUST BE WIRED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS PROVIDED IN THE OPERATION AND MAINTENANCE MANUAL. THE CABLE MUST BE CONTINUITY CHECKED AFTER INSTALLATION AND PRIOR TO RADIO OR SYSTEM POWER UP.

1. SPECIFICATIONS

Power Requirements: 13.75 VDC or 27.5 VDC

Fuse: 1 1/2 Ampere S.B.

TSO: TSO-C31c and TSO-C32c. Environmental Category AAAAAX. For Category A vibration environment, SUNAIR Shock Isolator Kit 98928 (all attitude) must be used. Coupler may be used without shock isolators when fastened directly to fuselage in multi-engine or single engine fixed wing aircraft under 12,500 pounds.

COUPLER MODELS	PART NUMBER	TRANSCEIVER	WEIGHT
CU-105	99813	T-5RA	4.3 lbs.
CU-105-1	99814	T-5D, T-5R, T-5DA	4.3 lbs.
CU-106	99815	ASB-60	4.3 lbs.
CU-110	99816	ASB-100A, ASB-125, T-10D, T-10R	4.6 lbs.

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 unit.

3. ANTENNA

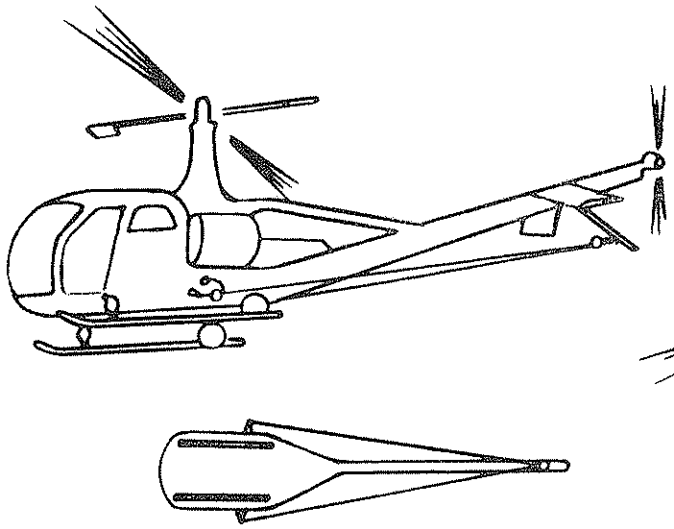
One fixed antenna of exact electrical characteristics is impossible to recommend due to the variation in aircraft configurations.

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. Some installations may require other antenna lengths or configurations and the Sunair antenna coupler will provide good performance on antennas from 25 to 45 feet in length. In the event special antenna requirements are indicated, Sunair will furnish recommendations when required.

CAUTION

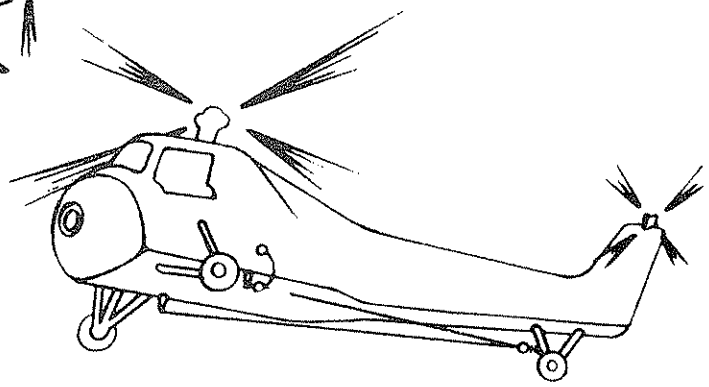
It is important to have a good antenna installation. Be sure the antenna has adequate tension and secure mountings, as slack in the antenna will cause detuning in flight.

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.



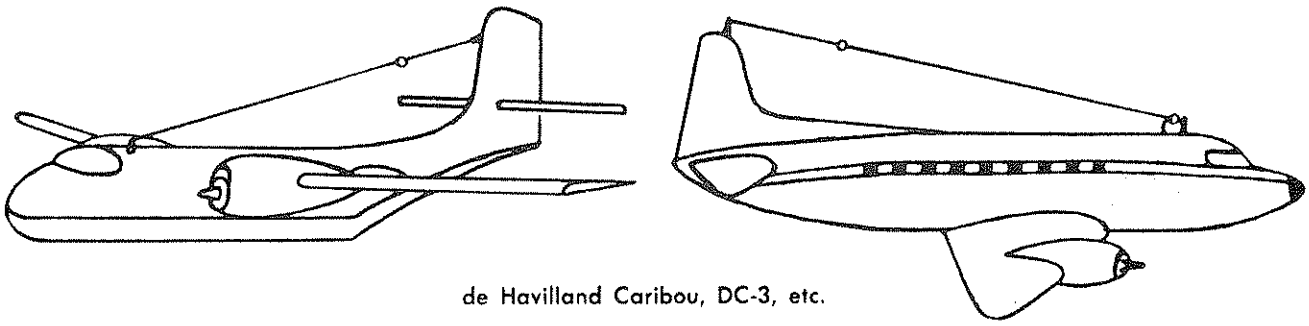
Hiller E 4

29 Foot "V" Antenna



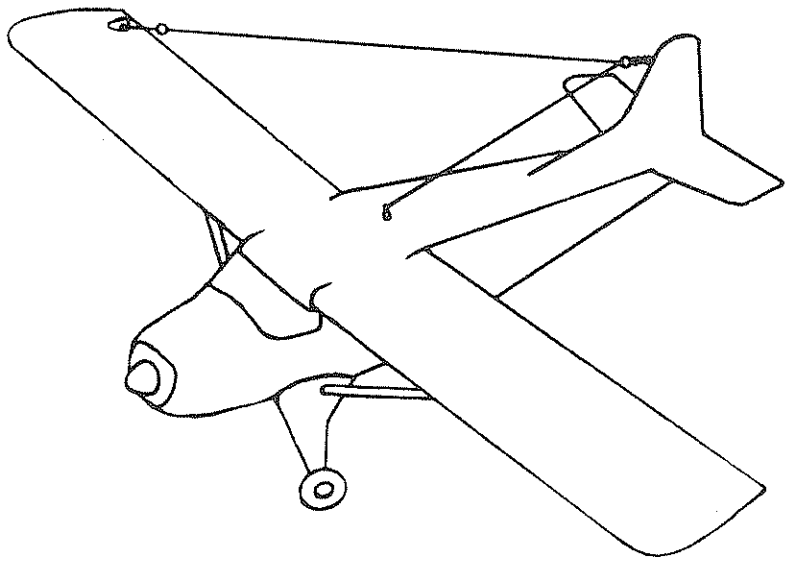
Sikorsky S-58

34 Foot "V" Antenna



de Havilland Caribou, DC-3, etc.

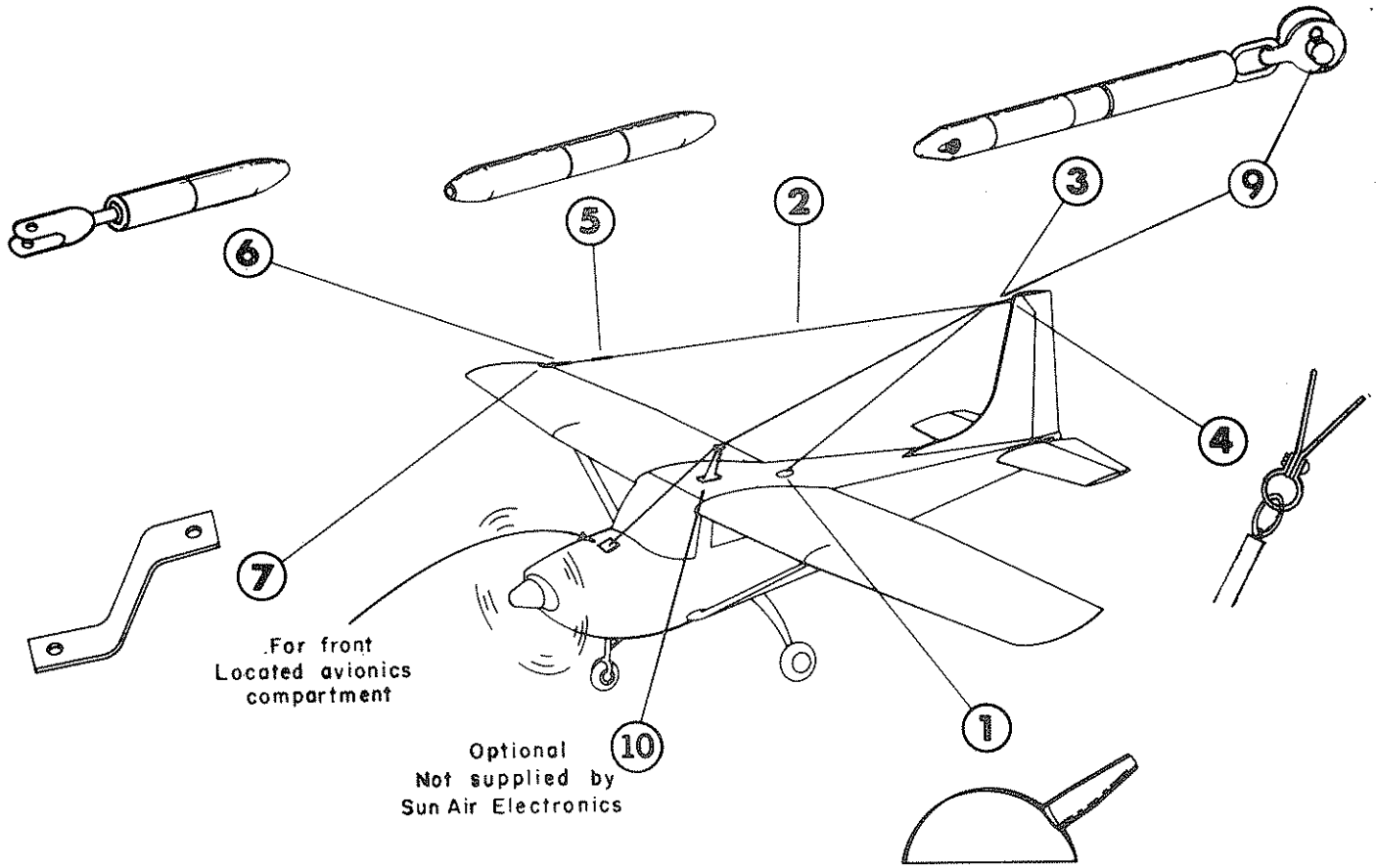
34 Foot "Straight" Antenna



de Havilland
Beaver, etc.

34 Foot "V" Antenna

SUNAIR 95158 HF ANTI-PRECIPITATION STATIC ANTENNA KIT



INSTALLATION

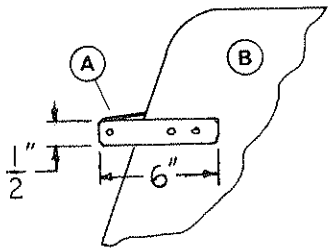
ITEM	DESCRIPTION	PART NO.
1	Feed Through Insulator	71308
2	60 Feet Insulated Antenna Wire	71310
3	Insulated Tension Unit	71322
4	Vertical Fin Anchor (see fig. 4, page 9)	71283
5	Strain Insulator	71267
6	Insulated Tension Anchor	71334
7	Wing Tip Bracket	71009
8	Wire Retraction Tool	71346
9	Shackle AN 115-8	71542
10	Stand-off Mask (LAPA #50 ARM 300-79)	———
11	Installation Instructions	71285

FIGURE No. 10

VERTICAL FIN ANCHOR 71283

(ITEM 4)

Suggested method of mounting only: The anchor will 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

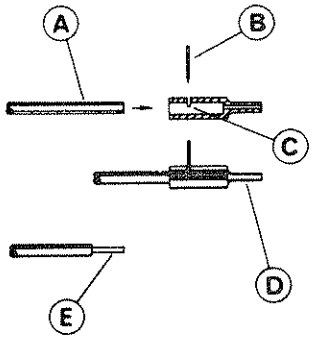
(ITEM 7)

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

4. ANTENNA COUPLER INSTALLATION

Mounting dimensions, weight and space requirements are shown on Page 12.

Particular emphasis is placed on the following:

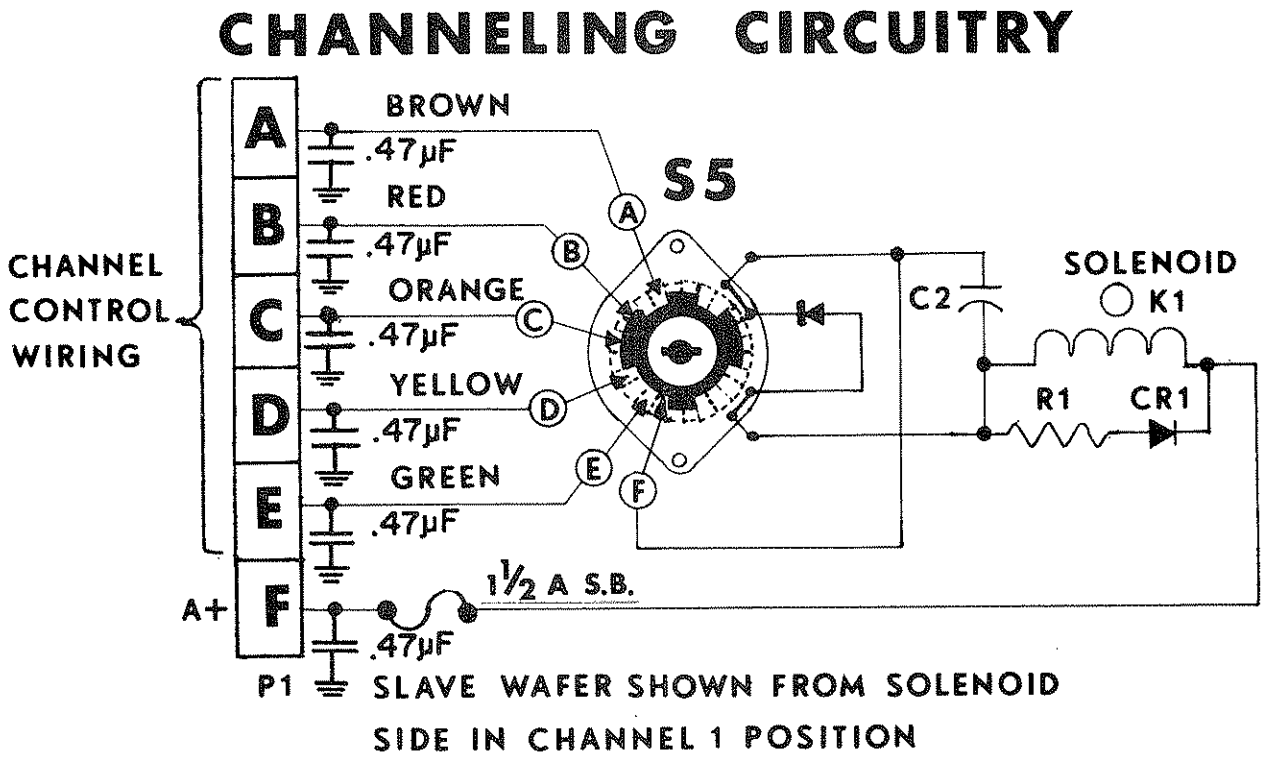
1. The coupling unit must be located as close to the antenna feed-thru insulator as possible. The antenna lead from the feed-thru to the coupling unit should not be in excess of 6 inches.

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'



IMPORTANT NOTICE

TO THE INSTALLER

The SunAir Antenna Coupler has been designed to provide a proper match when used with a fixed antenna and thus ensure maximum transmitter and receiver performance. To obtain top performance, the antenna coupler must be correctly installed and carefully tuned to the antenna.

However extensive or limited your knowledge of electronic theory or your experience in tuning radio circuits, it is necessary that the procedures contained in this manual be carefully followed step by step. In this way you can be assured of obtaining optimum performance with a minimum of time and effort on your part.

Impedance is the total opposition to the flow of alternating current at a particular frequency. It is a combination of resistance and reactance. Its significance is that the impedance of the antenna system must match that of the transmitter in order to obtain maximum efficiency.

Reactance is the opposition to the flow of alternating current at a particular frequency by inductance or capacitance. Where both inductive reactance and capacitive reactance are present, resultant reactance is equal to the difference between them.

Inductive reactance varies directly with inductance. That is, an increase in inductance causes an increase in inductive reactance. This has the same effect as increasing the length of the antenna.

Capacitive reactance varies inversely with capacitance. That is, an increase in capacitance causes a decrease in capacitive reactance. Since capacitive reactance is the opposite of inductive reactance, it follows that the presence of capacitance has the same effect as shortening the antenna. However large values of capacitance will have less shortening effect than small values.

In summary, then it is necessary to remember only the following:

- Increase inductance to lengthen the antenna.
- Decrease inductance to shorten the antenna.
- Insert large values of capacitance to shorten the antenna a little.
- Insert small values of capacitance to shorten the antenna a lot.

This applies to components that are placed in series with the antenna. If a component is placed in shunt (or parallel), the effect is just the opposite. That is, if inductance is used as a shunt for the antenna, it will act to shorten the antenna rather than lengthen it.

Group B. For frequencies of 6 mc to 7.0 mc for a 29 foot antenna, 5 mc to 6.0 mc for a 34 foot antenna.

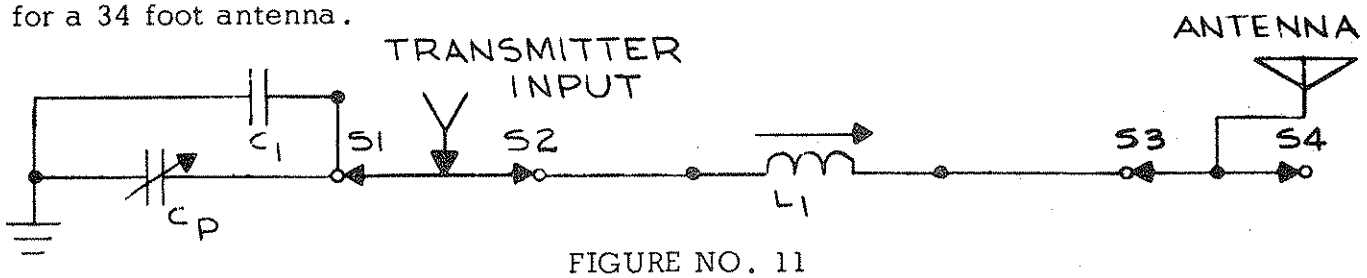


FIGURE NO. 11

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_1. Only a small amount of inductance is required since the antenna is nearly as long as required for these frequencies. Therefore the air duct is not required and is switched out.

Group C. For frequencies of 7.0 mc to 10 mc for a 29 foot antenna, 6.0 mc to 9 mc for a 34 foot antenna.

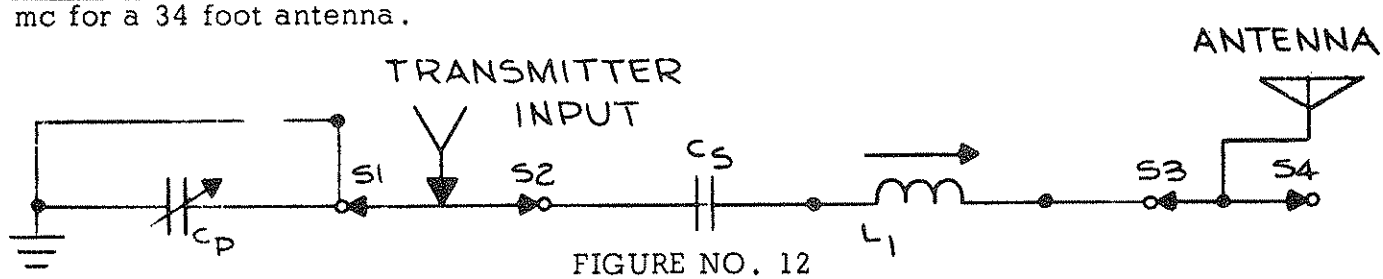


FIGURE NO. 12

In this configuration, series capacitance is required rather than series inductance in order to effectively shorten the antenna to a point that permits small adjustments to be made with the tunable inductor L_1. Therefore Capacitor C_S is used in place of the air duct. The total input capacitance required is usually between 500 pf and 200 pf, so the padder C_p requires no parallel capacitor.

Group D. For frequencies of 10 mc to 18 mc for a 29 foot antenna, 9 mc to 18 mc for a 34 foot antenna.

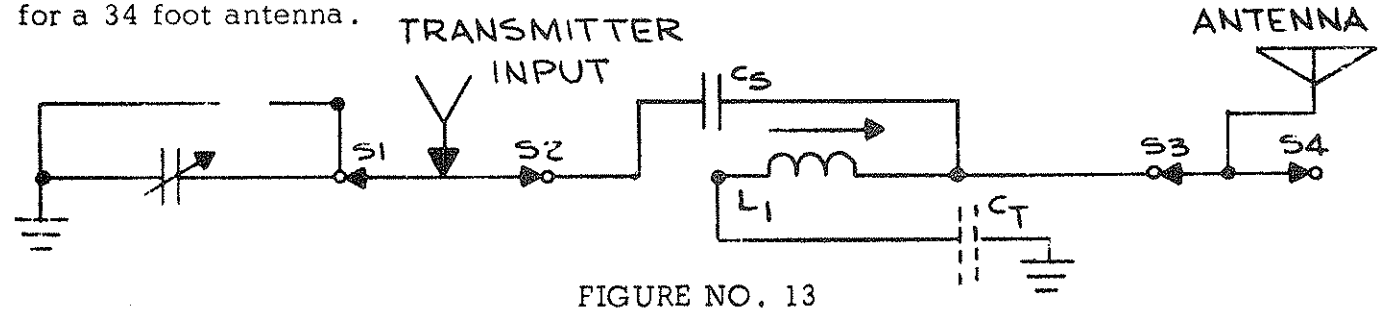


FIGURE NO. 13

In this configuration the fixed capacitor C_S is the only series element. Since this does not effectively shorten the antenna sufficiently (values smaller than 30 pf for C_S are not practical) the tunable inductor L_1 is used as a shunt to accomplish this, and small adjustments are made with L_1. Since L_1 is tunable only within the inductance range of 2 uh to 3.85 uh, a capacitor C_t is inserted in series with L_1 on frequencies requiring less than 2 uh shunt inductance (from 13 or 14 mc to 18 mc). Approximate values for C_S and C_t may be determined from the graphs on pages 28 and 29.

Coil tuning screws should not be turned in more than 1/8 inch from full in as the locking device will become ineffective and the tuning slug will bottom on the chassis. The proper alignment tool must be used to avoid damage to the coil tuning screws.

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 feed-thru insulator should be as short as possible. The suggested length is 6 inches. It should not exceed 12 inches, because perfomance drops off rapidly over this length due to dissipation of power inside the aircraft. This dissipation is not measured by the Wattmeter and is therefore not readily detected.

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

High RF voltage is present on the air duct and the air duct clips, so all contact while the transmitter is keyed should be with insulated tools. A wooden clothespin is useful in holding the air duct clips while they are being repositioned.

Care must be taken to be sure that the insulated wires from the air duct clips do not touch the air duct. This is necessary because the high RF voltage will burn through the insulation and may cause damage.

The transmitter should not be continuously keyed for over 30 seconds while operating into an untuned antenna. If the transmitter has a low power switch all tuning should be done with the switch in this position. Using only the aircraft battery during tuning will also lessen possibility of excessive Power Amplifier dissipation during tuning. Do not needlessly key the transmitter while tuning the antenna coupler.

The following tuning procedure:

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

Minimum inductance is obtained when the screw reaches 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.

GROUP A, B, C, AND D TUNING PROCEDURE

If optimum tuning is not obtained with steps 8, 9, and 10, the following steps will help determine the cause of the difficulty and the appropriate action to take.

WARNING: If any replacement of parts is required, parts replacements must be made with components of equal rating regarding voltage, stability and Q. Installing components of lesser rating may result in system failure. A fixed Capacitor Kit (SunAir Part No. 99130) may be ordered from the factory to meet this requirement. It is important that the wire leads on any replacement parts be as short as possible and that the resin core solder joint be of good quality. Excess resin must be cleaned from the joint.

A. FOR GROUP A FREQUENCIES, REFER TO ANTENNA COUPLER CONFIGURATION FIGURE 10, PAGE 16.

12. If L_1 reaches maximum inductance (screw extended full out) when approaching the dip:

    12.1 Move the air duct clip on the air duct one turn away from the porcelain antenna feed thru insulator (to increase inductance).

    12.2 Repeat Steps 8, 9, and 10.

13. If L_1 reaches minimum inductance (screw turned 1/8 inch from full in) when approaching the dip:

    13.1 Move the air duct clip on the air duct one turn toward the porcelain antenna feed thru insulator (to decrease inductance).

    13.2 Repeat Steps 8, 9 and 10.

14. If no indication of tuning is observed, the air duct clip on the air duct will have to be repositioned.

    14.1 Return the positions of the screws on L_1 and C_p to some mid-position.

    14.2 Loosen the screw on the air duct clip for that channel and using an insulated holder, touch the air duct clip to successive turns of the air duct in each direction from the original turn until the meter shows a noticeable dip.

    14.3 Fasten the air duct clip to this turn.

    14.4 Repeat Steps 8, 9 and 10.

C. FOR GROUP C FREQUENCIES, REFER TO ANTENNA CONFIGURATION FIGURE 12, PAGE 17.

19. If L1 reaches maximum inductance (screw extended full out) when approaching the dip, more capacitance is required.

    19.1 Remove the disc capacitor C_S and solder a new disc capacitor with a larger value in its place.

    19.2 Repeat steps 8, 9, and 10.

20. If L_1 reaches minimum inductance (screw extended 1/8 inch from full in) when approaching the dip, less capacitance is required.

    20.1 Remove the disc capacitor C_S and solder a new disc capacitor with a lesser value in its place.

    20.2 Repeat Steps 8, 9, and 10.

21. If no indication of tuning is observed, follow the procedure described in step 19 first. If this does not give the desired result, follow the procedure described in step 20.

22. If a change in transmitting frequency or antenna length is made, the value of C_S may have to be changed.

    22.1 Refer to graph on Page 28 to determine the approximate for C_S that will be required.

    22.2 Remove the disc capacitor C_S and solder the new value C_S in its place.

    22.3 Repeat Steps 8,9, and 10.

D. FOR GROUP D FREQUENCIES, REFER TO ANTENNA CONFIGURATION FIGURE 13, PAGE 17.

23. If L reaches maximum inductance (screw extended full out) when approaching the dip, C_S should be decreased in value.. Only C_S should be changed; in this case it is not necessary for C_S and C_t to have the same value.

    23.1 Remove the disc capacitor C_S and solder a new disc capacitor with a smaller value in its place.

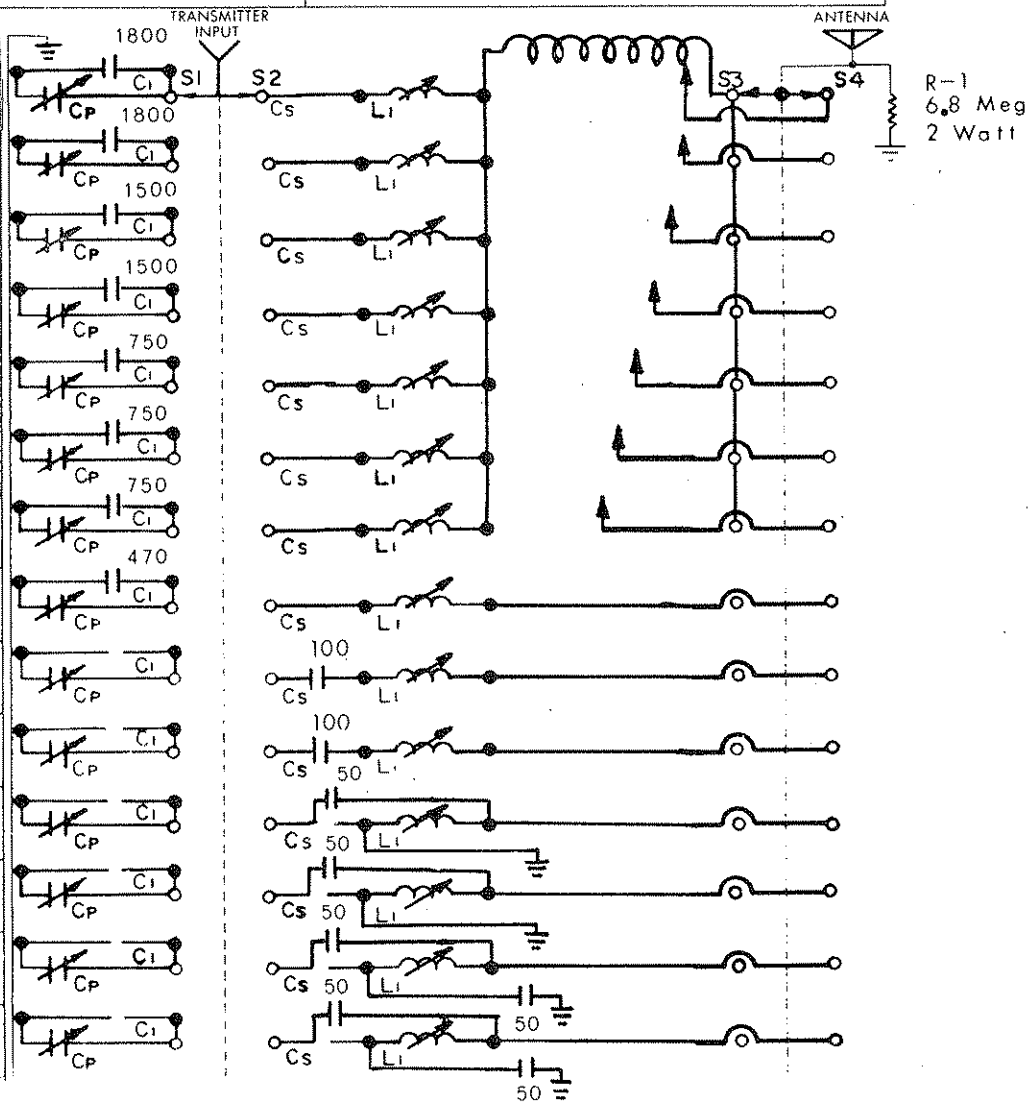
    23.2 Repeat Steps 8,9, and 10.

RADIO MODEL	14V	28V	PART NUMBER	SUNAIR® ELECTRONICS, INC

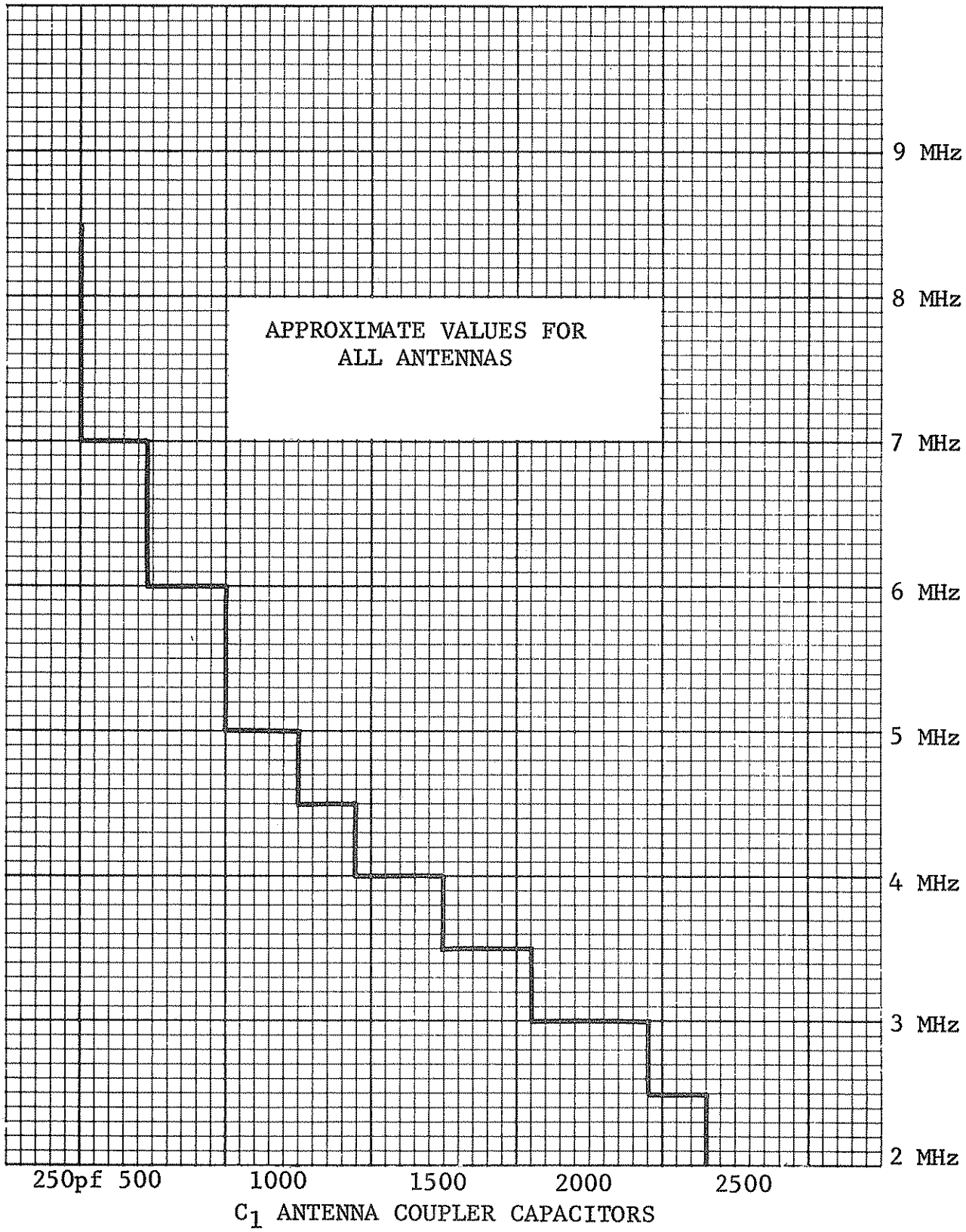
C U MODEL	ANTENNA	PART NO	SERIAL NO
1400	29 FEET	93986	XXXX

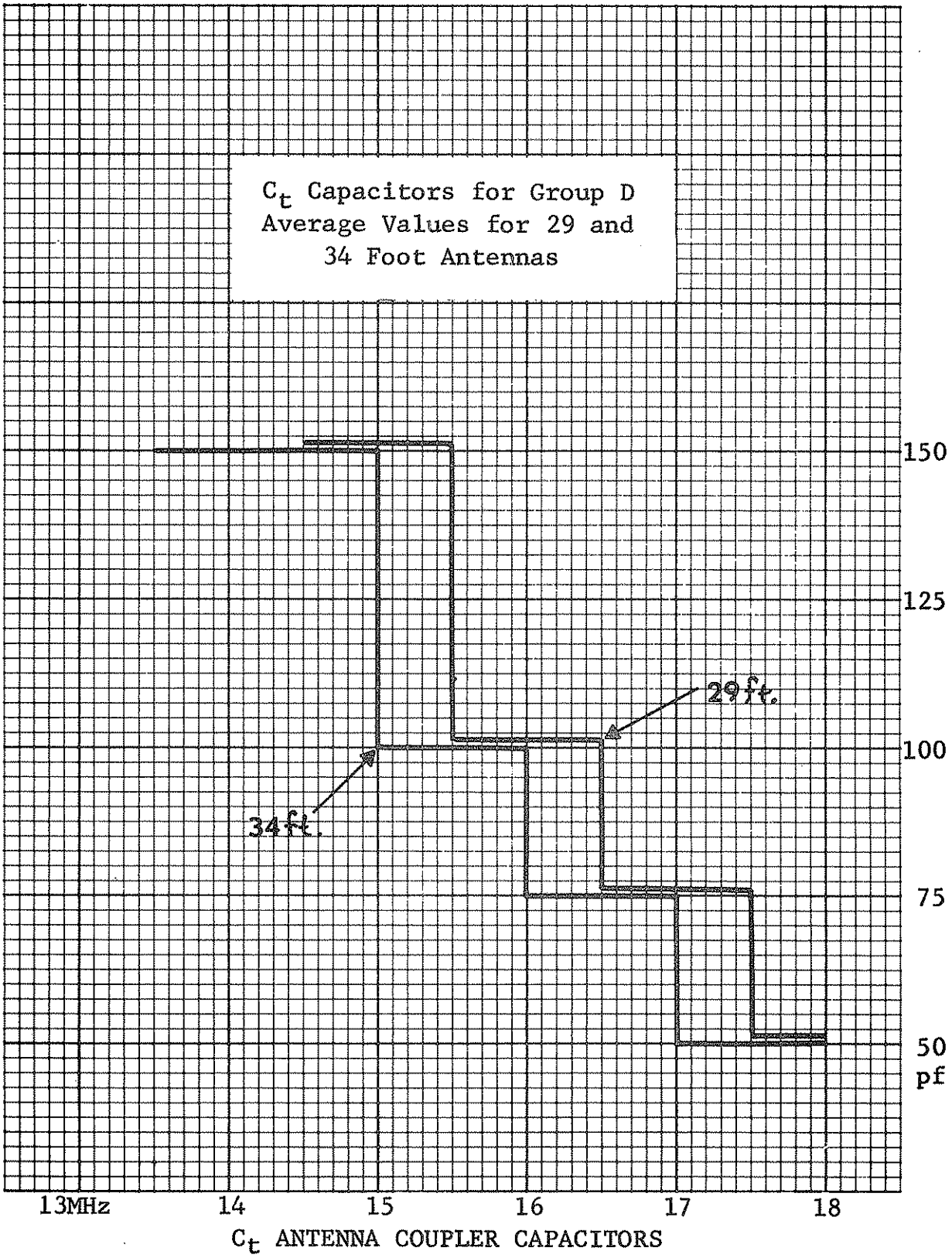
THIS ANTENNA COUPLER HAS BEEN CUSTOMIZED AT THE FACTORY FOR THE ASSIGNED FREQUENCIES OF THE TRANSMITTER AND THE SPECIFIED ANTENNA CONFIGURATION THIS INFORMATION IS CONTAINED IN THE SCHEMATIC DIAGRAM BELOW. REFER TO THE INSTRUCTION MANUAL FOR THE FINAL TUNING PROCEDURE WHICH MUST BE ACCOMPLISHED TO AVOID DAMAGE TO THE TRANSMITTER AND PROVIDE OPTIMUM OPERATION.

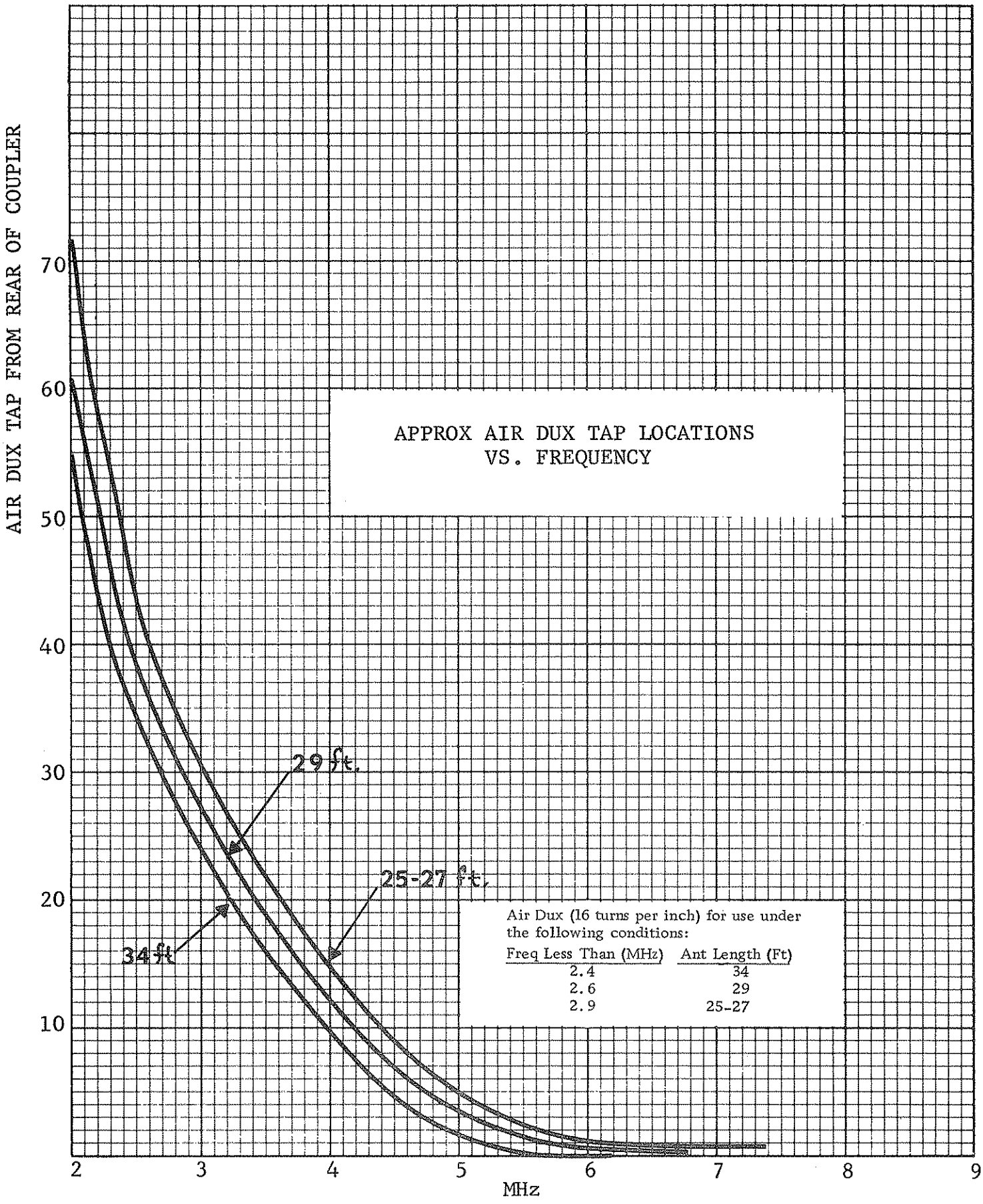
CH	FREQUENCY
1	2868
2	2931
3	3411.5
4	3432.5
5	5506.5
6	5521.5
7	5559
8	6612
9	8820
10	8956
11	13304.5
12	13324.5
13	17926.5
14	17966.5



The above is a typical schematic of an antenna coupler and shows examples of circuit variations over the range of frequencies. The four circuit groups described in Section 6 of the manual are represented. A schematic similar to the above is affixed to the inside cover of each SunAir Antenna Coupler. This provides a record of the exact circuit configuration of the unit. It is recommended that the schematic be corrected when a circuit change is made to the antenna coupler.


APPROXIMATE VALUES FOR
ALL ANTENNAS
9 MHz
8 MHz
7 MHz
6 MHz
5 MHz
4 MHz
3 MHz
2 MHz
250pf 500
1000
1500
2000
2500
C_1 ANTENNA COUPLER CAPACITORS


C_t Capacitors for Group D
Average Values for 29 and
34 Foot Antennas
150
125
100
75
50
pf
29ft.
34ft.
13MHz
14
15
16
17
18
C_t ANTENNA COUPLER CAPACITORS


AIR DUX TAP FROM REAR OF COUPLER
70
60
50
40
30
20
10
2
3
4
5
6
7
8
9
MHz
APPROX AIR DUX TAP LOCATIONS
VS. FREQUENCY
29 ft.
25-27 ft.
34 ft
Air Dux (16 turns per inch) for use under the following conditions:
Freq Less Than (MHz) Ant Length (Ft)
2.4 34
2.6 29
2.9 25-27

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
C_p	27058	Capacitor, Padder
C1		Capacitor, Mica, 500V (Frequency Dependent)
C2	27230	Capacitor, 1 uf, 100V
Ct C_s		Capacitor, Disc, 3 KV, (Frequency Dependent)
R1	18722	Resistor, 6.8 megohms, 2 watt
L1	63868	Coil, Variable, 2.0 uh to 3.85 uh
L2	99644	Air Dux Coil Assembly, 16 turns/inch
L2	99643	Air Dux Coil Assembly, 10 turns/inch
CR1	40165	Diode
F1	89654	1 1/2 Amp., S.B.
KR1	98629	Motor, Ledex, Complete with S5 (14V)
KR1	34271	Motor, Ledex, Complete with S5 (28V)
S1, S2, S3, S4	34386	Switch Wafer, 10 Position, Ceramic
S5	32417	Switch Wafer, Channeling
J1	75108	Connector, Channeling
J2	74192	Connector, RF Input
	84903	Fuseholder
	71035	Insulator, Feed Through, High Voltage
	51592-1	Spacer, Phenolic, 1/4 dia. x 2-3/16 lg.
	52388	Coupling, Shaft
	99739	Strap, Grounding
	75093	Connector, Cable, Channeling
	75110	Clamp, Cable, Channeling
	90873	Connector, Cable, R.F.
	34362	Shaft, Switch
	50665	Clip, Air Duct
	98928	Shock Isolator Kit, All Attitude (Option)
	10151	Board, Component, 10 Channel
	10288	Board, Component, 5 and 6 Channel
C3-C8	28337	Capacitor .47 uf

CKT. SYM.	PART NO.	DESCRIPTION *KIT
C1	25426	Capacitor, Mica, 200 pf, 500 VDC
C1	25438	Capacitor, Mica, 250 pf, 500 VDC (2)
C1	25505	Capacitor, Mica, 470 pf, 500 VDC (6)
C1	24915	Capacitor, Mica, 750 pf, 500 VDC (4)
C1	24927	Capacitor, Mica, 1000 pf, 500 VDC (4)
C1	24965	Capacitor, Mica, 1200 pf, 500 VDC (4)
C1	24939	Capacitor, Mica, 1500 pf, 500 VDC (4)
C1	26690	Capacitor, Mica, 1800 pf, 500 VDC (2)
C1	24903	Capacitor, Mica, 2000 pf, 500 VDC
C1	26705	Capacitor, Mica, 2200 pf, 500 VDC
C1	26717	Capacitor, Mica, 2400 pf, 500 VDC
C1	27319	Capacitor, Mica, 2500 pf, 500 VDC
Ct, Cs	25957	Capacitor, Ceramic, 20 pf, 3 KVDC
Ct, Cs	25945	Capacitor, Ceramic, 30 pf, 3 KVDC (4)
Ct, Cs	25933	Capacitor, Ceramic, 50 pf, 3 KVDC (6)
Ct, Cs	25921	Capacitor, Ceramic, 75 pf, 3 KVDC (6)
Ct, Cs	25919	Capacitor, Ceramic, 100 pf, 3 KVDC (6)
Ct, Cs	25907	Capacitor, Ceramic, 120 pf, 3 KVDC (4)
Ct, Cs	25892	Capacitor, Ceramic, 150 pf, 3 KVDC (6)

*KIT - SunAir has available a kit of capacitors which is made up of those most commonly used in antenna couplers. This kit is identified by part number 99130 and consists of the quantities shown in the last column.

Field Service men are encouraged to use capacitors with proper voltage rating, dissipation factor and temperature stability in the frequency dependent circuits. Using inferior components may result in detuning and/or complete failure of the circuit.