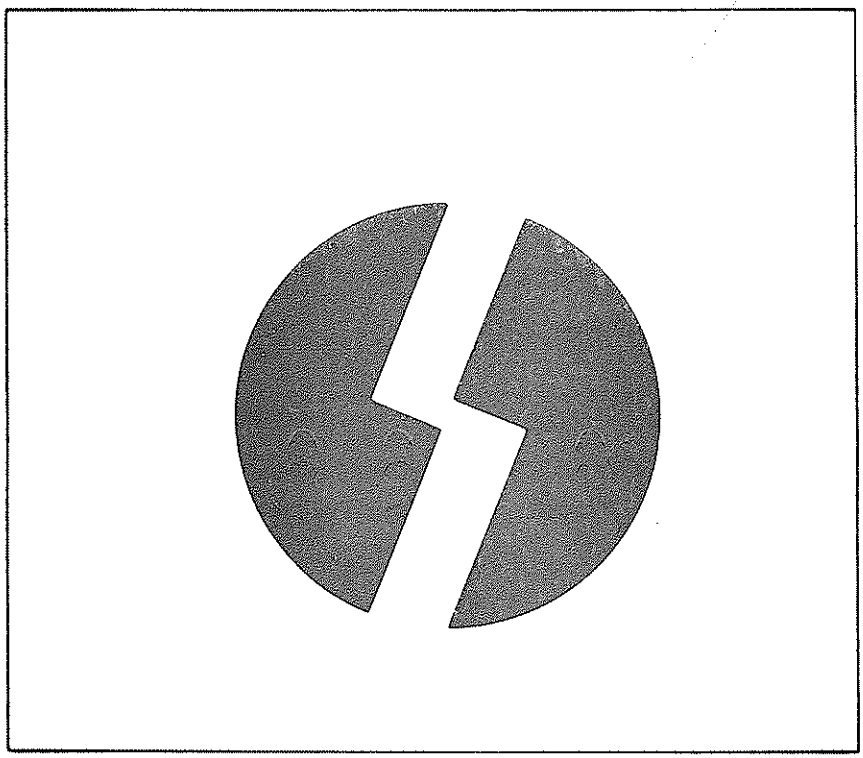
PUNCH ON #1 -

sunair



OPERATION AND MAINTENANCE MANUAL

1000 WATT ANTENNA COUPLER

GCU-1100

SUNAIR ELECTRONICS INC., 3101 Southwest Third Avenue, Ft. Lauderdale, **Florida, U.S.A.**

WARRANTY POLICY

MARINE AND GROUND PRODUCTS

Sunair Electronics warrants equipment manufactured by it to be free from defects in material or workmanship, under normal use for which intended, for the lesser of one (1) year from the date of purchase or 18 months from date of shipment by Sunair.

Sunair will repair or replace, at its option, any defective component of the equipment (excluding tubes, crystals, fuses-pilot lights and solid state devices on which the warranty is limited to 90 days and on the conditions herein stated) returned to it at its factory, transportation prepaid, within such warranty period.

For a period of 90 days from date of purchase Sunair will repair any defective equipment returned to it at its factory, transportation charges prepaid. No reimbursement will be made for non-factory repair charges.

This warranty is void if equipment is modified or repaired without authorization, subjected to misuse, abuse, accident, water damage or other neglect, or has its serial number defaced or removed, or if warranty registration card is not returned to Sunair within 10 days of date of purchase.

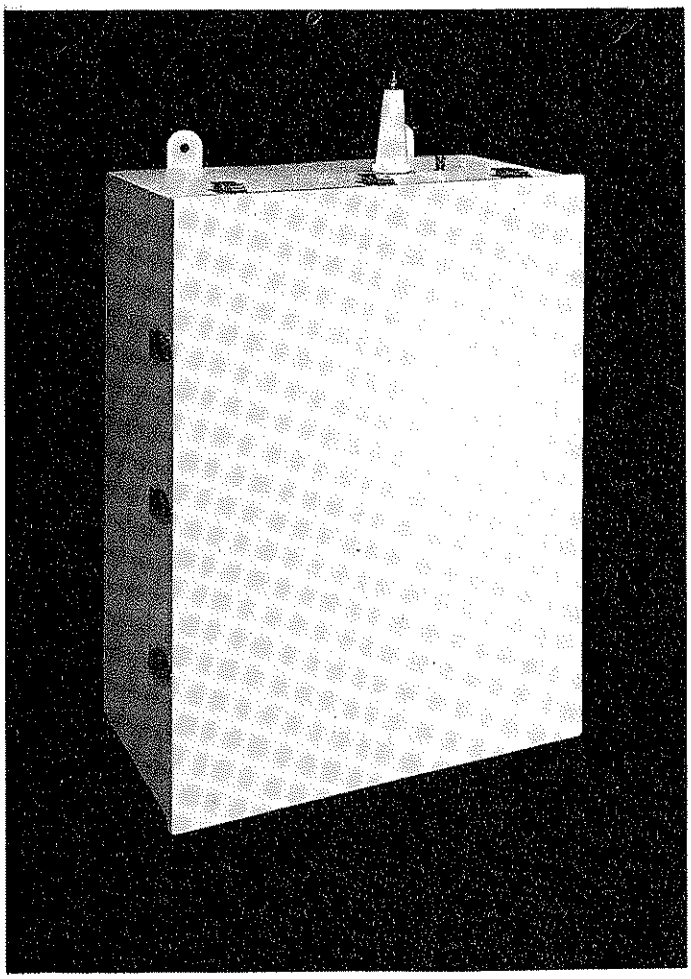
THIS WARRANTY IS ESPECIALLY IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The obligation and responsibility of Sunair shall be limited to that expressly provided herein and Sunair shall not be liable for consequential or other damage or expense whatsoever therefore or by reason thereof.

Sunair reserves the right to make changes in design or additions to or improvements in its equipment without obligation to install such additions or improvements in equipment theretofore manufactured.

GD-7074

sunair electronics, inc.

sunair electronics, inc.
3101 S. W. 3rd Avenue, Fort Lauderdale, Florida 33315 USA



OPERATION AND MAINTENANCE MANUAL

1000 WATT
ANTENNA COUPLER

GCU-1100

1st EDITION, 1 MAY, 1974
MANUAL PART NUMBER 5026-0009

GCU-1100
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SECTION 1

GENERAL INFORMATION

1.1 Purpose of Instruction Book:

This instruction book describes the GCU-1100 Kilowatt Antenna Coupler and includes installation details, tuning instructions, operating instructions, and maintenance procedures. Information in this instruction manual applies to all equipment configurations unless otherwise stated in the text or illustrations.

1.1.1 Purpose of Equipment:

The purpose of the GCU-1100 Antenna Coupler is to match the 50 ohm nominal output impedance of an associated power amplifier to the input impedances of a 35 foot vertical or 75 & 150 foot long wire antennas over the frequency range of 1.6 to 30 Mhz. Power capability is 1000 watts PEP or Average. The GCU-1100 has ten pre-set channels. The channel selector switching function is normally controlled by a master switch wafer in the power amplifier. The antenna coupler is intended for continuous duty, unattended operation in fixed station ground radio communications systems.

1.2 Equipment Description:

Outline and mounting dimensions for the GCU-1100 are shown on the Outline drawing, Figure 2-1.

The antenna coupler consists of a basic "Pi" network with RF switching circuits used to select input and output capacitors as needed. The RF network inductor is a motor driven variable type and is controlled by a resistor bridge position servo system. The entire RF network and control circuits are contained in an enclosure constructed entirely of aluminum to provide the best possible conduction of heat generated in the RF network, from the unit. An access cover with gasket material and compression-type fasteners is used to provide splash-proof construction.

1.3 Electrical Specifications:

Power Capability	1000 watts PEP or Ave.
Antenna Matching Capability	35 foot vertical, 75 foot or 150 foot long wire.
Frequency Range	1.6 to 30 Mhz.
Duty Cycle	Continuous
Number of Channels	Ten (pre-set)
Channel Switching Time	Ten seconds maximum
Input Impedance	50 ohms nominal
Environmental:	
Ambient Temperature	-30°C. to+50°C.
Humidity	To 95% R. H.
Altitude	To 5000 feet above sea level
Shock & Vibration	As encountered in normal handling and shipping
Dimensions	30" high x 22" wide x 12" deep (76 x 56 x 31 cm)
Weight	73 lbs (33 kilograms)

1.4 Equipment Supplied:

	Part Number
Kilowatt Antenna Coupler, Type GCU-1100 with control connector (plug)	5026-0000

1.5 Equipment Required, Not Supplied:

1. Transceiver, GSB-300, 115/230 VAC	97892
2. Coaxial Cable,	58864

		Part Number
3.	GSL-1000 Linear Power Amp	6026-0000
4.	Coaxial Connectors, (2 reqd)	74219
5.	GSB-300/GSL-1000 Interface Cables	98023
6.	GCU-1100 Control Cable	58878
7.	Antenna, Fixed:	
	35 foot vertical	71585
	or	
	75 foot long wire kit	99920
	or	
	150 foot long wire kit	99921

1.6 Optional Equipment:

Caster Set (4), for GSL-1000	98014
GSL-1000 Running Spare Parts Kit	98015
GSL-1000 Depot Spare Parts Kit	98016
GCU-1100 Depot Spare Parts Kit	98017
GCU-1100 Running Spare Parts Kit	99414
R-20 Reflectometer	97847

SECTION 2

INSTALLATION

2.1 Unpacking and Inspection of Equipment:

The GCU-1100 antenna coupler is packed in a crate using sturdy construction. The crating and packing material should be removed carefully and the contents inspected for physical damage. Any resulting claims for shipping damage should be filed promptly with the transportation company. If it is found necessary to file such a claim, retain all packing material.

Do not accept a shipment where there are visible signs of damage to the shipping container until a complete inspection is made. If there is a shortage, or evidence of damage is noted, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier.

A full report should also be forwarded to Sunair.

Include the following:

1. Order Number
2. Model and Serial Number
3. Name of Transportation Agency

When this information is received by Sunair, arrangements will be made for repair or replacement.

2.2 Return of Equipment to Sunair:

The shipping crate for the GCU-1100 has been carefully designed to protect the equipment during shipment. The container and its associated packing materials should be used to reship the unit.

When returning sub-assemblies or components for repair or replacement, be sure to pack each unit separately, using suitable cushioning material where necessary.

Shipment should be AIR PARCEL POST consigned to:

SUNAIR ELECTRONICS, INC.
3101 SW THIRD AVENUE
FORT LAUDERDALE, FLORIDA 33315
U.S.A.

Plainly mark all mailing documents with indelible ink as follows:

U.S. GOODS RETURNED FOR REPAIR
VALUE FOR CUSTOMS - $100.00

Mark all sides of the package:

FRAGILE - ELECTRONIC EQUIPMENT

2.3 Installation Procedure:

The satisfactory operation of the equipment will depend on the care and thoroughness taken during the installation phase.

2.3.1 General Installation Requirements:

1. Carefully plan transmitter/coupler/antenna locations, observing the following requirements before starting installation work.

2. Provide the best possible RF ground for the system. Use flat copper strap at least 1" wide or #6 or larger copper wire and make connections to the ground terminal of all system components. Keep all ground leads direct and as short as possible. After the system grounds have been installed, connect the station ground system to the antenna coupler ground terminal. Bear in mind that the antenna ground lead is actually part of the antenna itself, and therefore will have a marked effect on the antenna input impedance. If a 35 foot vertical antenna is to be used, at least 12 separate 35 foot radials connected to a common ground stake, are recommended.

3. Provide the maximum possible separation between the coupler/antenna and the associated radio transmitter. 100 feet is the recommended minimum distance and up to 250 feet separation may be used.

4. The antenna lead from the antenna coupler RF output insulator must be insulated for at least 15kv potential. As an alternative, copper tubing with an outside diameter of at least 1/4" may be used, provided that it is routed to the antenna terminal

so that it is spaced at least six inches from any metal objects in its vicinity. It is important to keep the length of this lead to an absolute minimum since it forms a part of the radiating portion of the antenna. Three (3) feet would be the maximum distance if antenna efficiency is not to be compromised.

5. Linear amplifiers with low level modulation such as is used in the GSB-300 will sometimes oscillate if the high level RF output is radiated or conducted into the low level stages. Evidence of this situation is erratic or excessive power output. This is caused by too close proximity of the antenna to the transceiver and/or a poor RF ground system. Carefully following the above procedures will prevent this problem.

2.3.2 Mounting Considerations:

Refer to Figure 2-1 for coupler outline configuration.

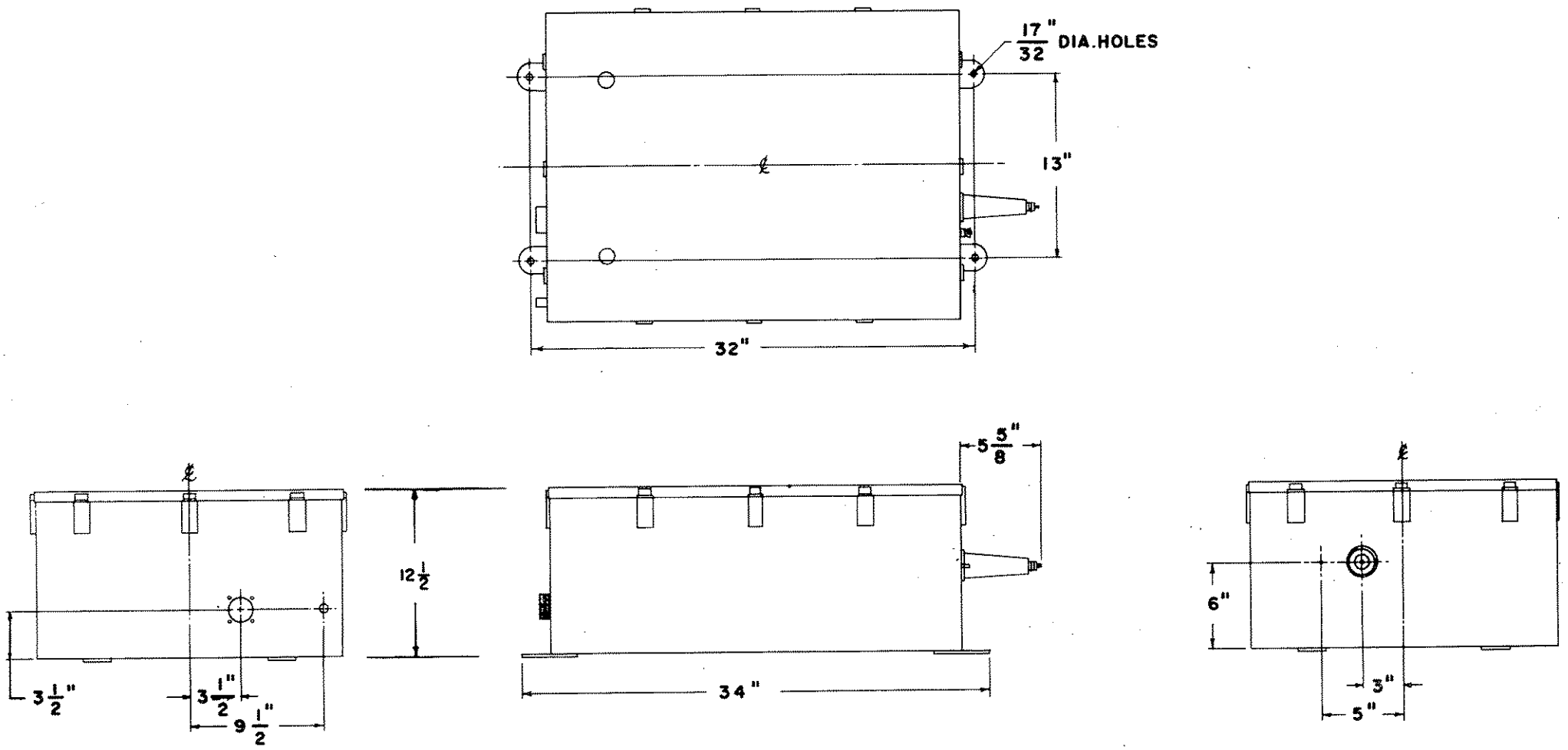
The intended mounting position for the GCU-1100 is in the vertical plane with the high voltage antenna insulator at the top. The enclosure may also be mounted in the horizontal position, but will require that the control and coaxial connectors be sealed with a suitable compound such as Dow-Corning DC-5, to prevent water entrance.

Four mounting feet with 1/2 inch diameter holes are provided on the back of the enclosure. If it is necessary to mount the coupler on a wooden pole, simple angle-iron adapter brackets may easily be fabricated. Since the total weight of the unit is only 73 pounds, two wooden 4x4's set in cement would provide dependable support.

2.3.3 Installation of Remote Control & RF Cables:

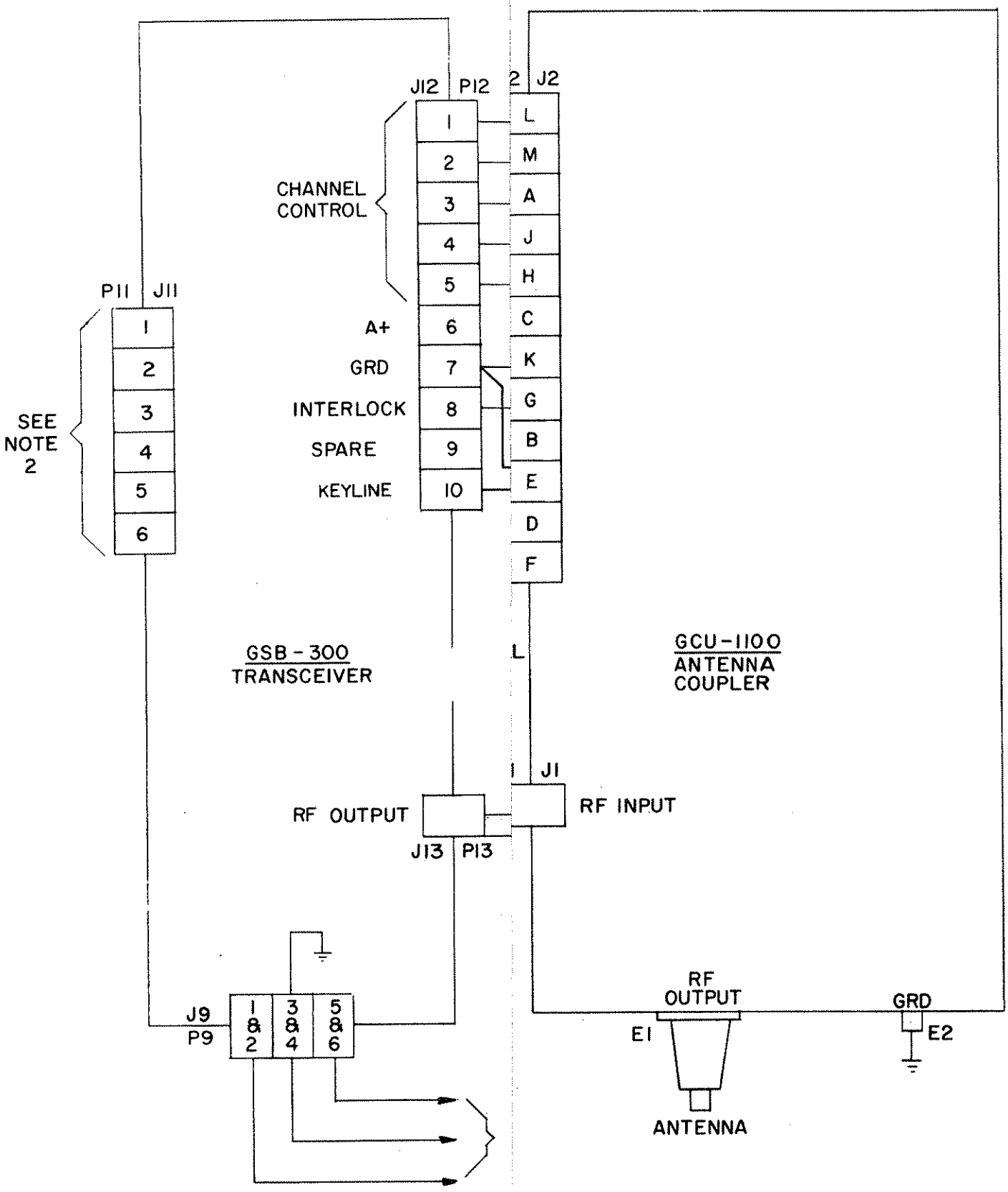
It is recommended that the remote control cable be procured from Sunair. However, if necessary, the cable may be made from individual No. 16 AWG stranded wire with an overall braided shield and PVC jacket.

Inter-connection cable details are given on Figure 2-2.



OUTLINE CONFIGURATION
ANTENNA COUPLER

FIGURE 2 – 1



NOTES:

1. 115 VAC - JUMPER 2TB1-1 TO 2TB1-2 & 2TB1-3
   230 VAC - JUMPER 2TB1-2 TO 2TB1-3.
2. AUDIO CONNECTIONS, SEE GSB-300 INST. BOO
3. TEN FEET OF 3 COND. NO. 10 AWG FURNISHED W
   USE NO. 8 AWG FOR RUNS LONGER THAN 10 FE
4. ALL CONNECTORS EXCEPT COAXIAL TYPES F
   WITH EQUIPMENT.

SYSTEM INTERCONNECT DIAGRAM
FIGURE 2-2

1100

2.4 Preliminary Electrical Checks:

When the system installation has been completed, perform the following checks:

1. Temporarily remove the top cover and inner RF shield plate from the coupler.

2. Connect a 50 ohm, 100 watt dummy load to the RF output connector of the associated exciter.

3. Turn on the filament voltage supply on the GSL-1000. The coupler cooling fan should be energized.

4. Manually turn the variable inductor two turns. Press the servo activate switch on the potentiometer bracket in the coupler, hold the switch button down until the servo motor has returned the inductor to its original position and stopped.

5. Turn the exciter channel selector switch to a different channel. Note that the servo system is energized and the motor runs to a new position. Check for proper operation on all assigned channels.

6. Switch the coupler safety keyline interlock toggle switch to the "off" position. Turn on the GSB-300 exciter and insure that it cannot be keyed with the coupler interlock switch in the "off" position.

7. Turn off all equipment and replace all covers.

8. Proceed to Section III and follow the tuning procedure given therein to complete the system check out.

NOTE

It is not possible to tune the antenna coupler at the factory as each antenna installation is different. Therefore it is mandatory that each active channel in the coupler be tuned after installation by following the procedure contained in Section III.

SECTION 3

OPERATION

3.1 Test Equipment Required:

1. RF Wattmeter, Bird Thruline, Model 43 with 100 and 1000 watt, 2-30 mhz, 50 ohm, elements.

2. Audio Frequency Generator, Hewlett-Packard Model 206A or equivalent.

3. VOM, Triplett Model 630 or equivalent.

4. Short length of RG-8A/U coaxial cable with UHF Plug (PL-259) on one end and plug to mate with Bird wattmeter "QC" connector on the other. 2 required.

5. Adapter, UHF, Type PL-258

3.2 RF Network Final Adjustment, Preliminary:

It is assumed that the GCU-1100 has been installed according to the instructions given in Section II.

The RF network component values for the 35 ft. vertical, and 75 & 150 ft. long wire antennas are given in Tables 3-1, 3-2, & 3-3. Capacitor ratings are listed on Table 3-4.

Insure that the correct input & output padder capacitors have been installed for each channel frequency as listed in the tables. The actual antenna impedance may vary considerably from these values because of differences in ground paths and the height of the support structures.

Temporarily connect the audio generator to the GSB-300 audio jack, J11-1&2. Do not ground either lead. In addition, connect a SPST switch to J11-5 & 6 to serve as a temporary key.

Connect the wattmeter at the coupler RF input so that it may easily be observed while making adjustments. Install the interior RF shield cover over the RF network.

3.3 RF Network, Tuning Procedure:

1. Locate the adjustment potentiometer for the channel in use by counting from the righthand side of the control board. The potentiometer on the extreme right is channel one. (The wire to the terminal board, TB-1, is also color

coded according to its channel number. The terminal may be followed to the potentiometer as a check).

2. The variable inductor provides approximately 0.8 micro-henries per coil turn. Using the data provided in the tables, set the inductor to its approximate inductance. Press the servo activate switch button and adjust the command potentiometer until the inductor is near its tabulated setting.

3. Place the GCU-1100 keyline interlock switch in the "On" position.

4. Turn on the GSB-300 and the GSL-1000 filament and plate voltage.

5. Place the GSB-300 Mode switch in the USB or LSB position. Insure that the audio generator gain control is set at minimum. Select the channel to be adjusted.

6. Close the key and advance the audio input level until 10 or 15 watts reflected power is indicated on the GSL-1000 test meter. Switch to forward power and note the RF output level. If the forward power is 100 watts or more, the coupler network will require very little adjustment.

7. Move to the coupler location and open the coupler keyline interlock switch. Loosen the channel tuning capacitor locknut, (7/16"). Key the system and adjust the variable capacitor and inductor for minimum reflected power on the wattmeter. Tune each variable element in turn and repeat the process several times. It should be possible to obtain zero or nearly zero reflected power for all antennas and channel frequencies.

8. If the procedure in step 7 does not produce a null, more output padder capacity is required if the variable inductor is attempting to tune at maximum, and/or more input capacity is required if the input variable capacitor is at maximum, or less if at minimum. In general, use the lowest value of output capacity possible for best tuning efficiency.

9. Adjust the input audio to produce an output level of approximately 500 watts if voice operation is intended or 1000 watts for CW and AFSK. Allow the system to run for ten or fifteen minutes, then recheck reflected power. Touch up the coupler tuning, if necessary. Usually this minor adjustment can be made with the variable input capacitor. Tighten the lock nut and recheck.

10. Repeat the above procedure for each active transmit channel.

NOTE

When tuning the coupler network to channel frequencies that require small values of inductance, allow at least one full turn for overshoot travel. The minimum inductance requirement can be adjusted by changing the output capacity value.

CAUTION

The data which follows for the three major antenna types, is intended FOR USE AS A GUIDE IN SELECTING APPROXIMATE NETWORK VALUES. The data reflects exact values for matching the tabulated antenna impedances to 50 ohms. Circuit strays and the actual antenna configuration could have a marked effect on the final values needed. Since the output capacitor is a fixed value, USE THE NEAREST AVAILABLE STANDARD CAPACITY with the necessary current rating as listed in the tables.

35 FOOT WHIP ANTENNA

SHAKESPEARE STYLE 222 3¼" BASE DIA.
12 EA – 35' RADIALS & 8' GRD ROD, SANDY SOIL

FREQ (KHZ)	IMPEDANCE	$C1_{(PF)}$	$L_{(UH)}$	$C2_{(PF)}$	$Ic1_{(A)}$	$IL_{(A)}$	$Ic2_{(A)}$	$L^{*}_{LOSS(W)}$	$E_{ANT(V)}$	$I_{ANT(A)}$
1600										
2000	5 – j600	9211	20.0	194	25.8	26.2	15.6	432.4	6603	10.6
3000	7 – j365	3338	15.1	50	14.0	14.7	3.8	154.5	3979	10.9
4000	10 – j245	2086	8.1	50	11.7	12.5	3.0	79.7	2329	9.5
5000	20 – j145	1041	4.4	50	7.3	8.5	1.6	25.4	1010	6.9
6000	30 – j55	536	2.0	50	4.5	6.3	0.7	7.5	357	5.7
7000	50 + j25	16	0.6	365	0.1	4.4	4.0	1.3	246	4.4
8000	80 + j100	21	1.7	293	0.2	4.4	6.7	4.3	448	3.5
9000	135 + j180	28	2.3	184	0.3	4.4	6.4	6.3	607	2.7
10MHZ	225 + j270	21	2.5	127	0.2	4.4	5.9	7.7	738	2.1
11.0	410 + j370	36	2.7	91	0.5	4.5	5.3	9.6	828	1.5
12.0	775 + j250	30	2.7	68	0.5	4.5	4.6	10.3	896	1.1
13.0	900 – j260	25	2.6	51	0.4	4.4	4.0	10.5	937	1.0
14.0	465 – j470	151	2.2	50	2.9	5.3	4.1	13.9	926	1.4
15.0	250 – j400	203	1.8	50	4.2	6.1	4.3	16.1	896	1.9
16.0	125 – j255	219	1.4	50	4.9	6.6	4.0	15.5	795	2.8
17.0	85 – j175	213	1.1	50	5.0	6.7	3.6	13.5	661	3.4
18.0	65 – j105	180	0.8	50	4.5	6.3	2.8	9.5	482	3.9
19.0	60 – j62	136	0.6	50	3.6	5.7	2.1	6.2	345	4.0
20.0	65 + j25	14	0.3	117	0.4	4.4	4.0	1.9	271	3.9
22.0	110 + j14	14	0.4	81	0.4	4.4	3.8	2.9	333	3.0
24.0	250 + j250	25	1.0	54	0.8	4.5	5.5	7.9	672	1.9
26.0	545 + j140	109	0.9	50	3.9	5.9	6.0	12.8	732	1.3
28.0	450 + j240	151	0.7	50	5.9	7.4	6.0	16.9	714	1.4
30.0	135 – j165	149	0.5	50	6.2	7.7	5.5	14.2	576	2.7

*INDUCTOR LOSS
(BASED ON QU = 400)

TABLE 3-1

75 FOOT LONG WIRE ANTENNA

FREQ (KHZ)	IMPEDANCE	$C1_{(PF)}$	$L_{(UH)}$	$C2_{(PF)}$	$I_{C1(A)}$	$I_{L(A)}$	$I_{C2(A)}$	$I_{ANT(A)}$	$E_{ANT(V)}$
1600	100 – j515	3012	22.5	299	6.8	14	4.9	3.1	1626
2000	75 – j352	715	22.5	77	2.1	5.3	1.3	3.6	1295
2500	78 – j181	87	9.7	84	.4	4.4	1.0	3.5	690
3000	82 – j53	40	3.1	234	.2	4.4	1.5	3.4	331
3175	74 + j0	31	1.8	470	.2	4.4	2.5	3.6	266
3500	84 + j93	24	3.8	672	.2	4.4	6.3	3.4	426
4000	108 + j203	35	5.9	394	.2	4.4	6.9	3	689
5000	352 + j823	92	10.7	127	.7	4.5	5.8	1.6	1432
5700	2900 + j0	51	10.6	73	.5	4.5	3.8	.5	1450
6000	2300 – j1030	67	9.8	67	.6	4.5	3.9	.6	1512
7000	222 – j685	311	6.8	50	3.1	6.5	3.4	2.1	1512
8000	160 – j300	44	3.7	50	.5	4.5	2.2	2.5	850
9000	110 – j77	27	1.3	88	.4	4.4	2.1	3	402
9380	110 + j0	5	.9	169	.1	4.4	3.3	3	330
10MHZ	130 + j145	17	1.7	181	.3	4.4	6	2.7	525
11.00	250 + j490	53	3.5	82	.9	4.6	6.3	2	1100
12.00	1210 + j700	30	3.7	51	.6	4.5	4.9	.9	1258
12.38	1700 + j0	144	3.5	50	2.6	5.8	4.7	.7	1190
13.00	675 – j565	150	2.7	50	2.8	6	4.4	1.2	1056
14.00	482 – j465	149	2.2	50	3	6.3	4.2	1.4	937
15.00	163 – j209	133	1.5	50	2.8	6.1	3	2.4	636
15.85	170 + j0	18	.8	92	.4	4.5	3.8	2.4	407
16.00	152 + j50	21	.8	111	.5	4.5	4.5	2.5	400
17.00	259 + j278	24	1.5	72	.6	4.5	5.6	1.9	721
18.00	717 + j668	146	1.9	50	3.7	7.4	6.1	1.1	1077
18.60	1600 + j0	227	1.6	50	6	11.9	6.6	.7	1119
19.00	1030 – j74.7	253	1.4	50	6.8	13.9	6.9	.9	1145
20.00	265 – j424	228	1.1	50	6.5	13.1	6	1.9	950

TABLE 3-2

75 FOOT LONG WIRE ANTENNA

FREQ (MHZ)	IMPEDANCE	$C1_{(PF)}$	$L_{(UH)}$	$C2_{(PF)}$	$I_{C1(A)}$	$I_{L(A)}$	$I_{C2(A)}$	$I_{ANT(A)}$	$E_{ANT(V)}$
21.0	180 – j187	134	0.9	50	4.0	7.8	4.0	2.3	596
22.0	170 – j42	8	.6	55	.3	4.4	3.2	2.4	480
22.2	165 + j0	7	.5	66	.3	4.4	3.7	2.4	395
23.0	204 + j127	1	.7	68	2.2	4.4	5.2	2.2	528
24.0	348 + j373	90	1.1	50	3.1	6.4	6.2	1.6	816
25.0	1080 + j153	195	.9	50	6.9	14.1	7.8	.9	981
25.1	1100 + j0	199	.9	50	7.1	14.7	7.9	.9	989
26.0	522 – j352	181	.8	50	6.7	13.5	6.7	1.3	818
27.0	315 – j175	124	.7	50	4.8	9.2	5.2	1.7	612
28.0	275 + j0	56	.6	50	2.3	5.5	4.6	1.9	522
29.0	286 + j103	48	.6	50	2	5.2	5	1.8	547
30.0	378 + j295	111	.7	50	4.7	9.1	7.3	1.6	767
28.0	275 + j0	0	.6	44	0		4.0		

150 FOOT SLOPING LONG WIRE ANTENNA

FREQ (KHZ)	IMPEDANCE	C_1 (PF)	L (UH)	C_2(PF)	$I_{C_1(A)}$	$I_{L(A)}$	$I_{C_2(A)}$	$I_{ANT(A)}$	$E_{ANT(V)}$
1600	108 – j73	9	7.3	499	0.1	4.4	2	3	391
1640	115 + j0	61	5.6	963	.2	4.4	3.4	2.9	333
2000	132 + j175	50	10	838	.2	4.4	6.3	2.7	591
2500	229 + j630	40	19.7	290	.2	4.4	6.2	2	1340
3000	4000 + j0	469	22.5	129	2	4.8	4.9	.5	2000
3500	310 – j950	110	18.2	70	.6	4.5	2.7	1.7	1698
4000	136 – j418	61	10.5	224	.4	4.4	1.9	2.7	1186
4900	125 + j0	35	2	224	.3	4.4	3.5	2.8	350
5000	128 + j57	18	2.3	391	.2	4.4	4.7	2.7	378
6000	416 + j68	29	3.7	181	.3	4.4	4.4	1.5	632
6400	2000 + j0	47	7.8	78	.5	4.4	4.4	.7	1399
7000	251 – j653	224	6.7	50	2.3	4.9	3	1.9	1329
8000	126 – j72	32	1.5	115	.4	4.4	2.4	2.8	406
8200	135 + j0	24	1.3	188	.3	4.4	3.6	2.7	364
9000	262 + j390	24	3.5	115	.3	4.4	5.9	1.9	892
9700	1600 + j0	58	4.6	58	.7	4.5	4	.7	1119
10(MHZ)	785 – j842	154	4.4	50	2.2	4.9	4	1.1	1266
11.0	161 – j150	11	1.6	63	.2	4.4	2.3	2.4	528
11.5	135 + j0	16	.9	134	.3	4.4	3.6	2.7	364
12.0	199 + j191	19	1.7	123	.4	4.4	5.7	2.8	606
13.0	1300 + j0	86	3	50	1.6	4.7	4.3	.8	1039
14.0	185 – j297	179	1.8	50	3.6	5.6	3.6	2.3	804
14.7	150 + j0	24	.8	103	.5	4.4	3.6	2.5	375
15.0	156 + j109	26	1.0	120	.6	4.5	5.4	2.5	475
16.0	952 + j550	120	2.3	50	2.8	5.2	5.6	1.0	1099
16.2	1200 + j0	152	2.1	50	3.5	5.6	5.5	.9	1079
17.0	272 – j470	241	1.5	50	5.8	7.2	5.6	1.9	1031
18.0	175 + j0	8	.7	80	.3	4.4	3.7	2.3	402
19.0	498 – j418	177	1.3	50	4.8	6.5	5.5	1.4	910
19.5	1100 + j0	172	1.5	50	.9	6.4	6.1	.9	990

TABLE 3-3

150 FOOT SLOPING LONG WIRE ANTENNA

SHEET 2 OF 2

FREQ (MHZ)	IMPEDANCE	C1 (PF)	$L_{(UH)}$	$C2_{(PF)}$	$Ic1_{(A)}$	$IL_{(A)}$	$Ic2_{(A)}$	$I_{ANT(A)}$	$E_{ANT(V)}$
20.0	482 – j535	221	1.2	50	6.3	7.6	6.4	1.4	1008
21.0	174 – j126	89	.8	50	2.7	5.1	3.3	2.3	494
21.3	190 + j0	10	.6	66	.3	4.4	3.7	2.2	418
22.0	328 + j230	27	1.1	55	.9	4.5	5.2	1.7	681
22.6	900 + j0	162	1.1	50	5.2	6.8	6.4	1.0	900
23.0	693 – j400	190	1.0	50	6.2	7.6	7	1.2	960
24.0	150 – j150	129	.7	50	4.4	6.2	4	2.5	530
24.5	185 + j0	11	.5	58	.4	4.4	3.8	2.3	425
25.0	234 + j135	17	.7	59	.7	4.5	5.1	2	540
26.0	800 + j0	161	.8	50	1.1	7.3	7.2	1.1	879
27.0	206 – j245	169	.6	50	2.2	7.7	6	2.2	704
27.7	130 + j0	5	.3	56	2.7	4.4	3.5	2.7	351
28.0	193 + j82	12	.5	58	2.2	4.4	4.8	2.2	461
29.0	555 + j272	135	.7	50	5.5	7.0	7.4	1.3	803
29.3	800 + j0	170	.7	50	7.1	8.3	8.1	1.1	880
30.0	290 – j290	174	.5	50	7.4	8.5	7	1.8	738

TABLE 3-4

RF Capacitor Current Ratings

Sunair P/N	Capacitor Type/value	Voltage Rating	Current Rating
27545	Ceramic,NPO,25pf (type 857)	15kv	6.2 amps
27546	Ceramic,NPO,50pf (type 857)	15kv	7.4 amps
29032	Ceramic,NPO,25pf (type 850)	5kv	3.1 amps
29020	Ceramic,NPO,50pf (type 850)	5kv	4.2 amps
27550	Mica, 220pf	2.5kv	1.8 amps
28204	Mica, 470pf	2.5kv	3.1 amps
27548	Mica, 1000pf	2.5kv	4.0 amps

The current ratings listed above should not be exceeded when these capacitors are connected in parallel. Refer to the data given in Tables 3-1, 3-2 & 3-3 for typical values.

SECTION 4

THEORY OF OPERATION

4.1 Antenna Tuning Network:

4.1.1 General:

The antenna tuning network consists of a conventional "Pi" network to permit matching antennas with a wide range of impedances to the required 50 ohms. The tuning network consists of three elements, 1. input shunt capacitance, 2. series inductance, 3. output shunt capacitance.

4.1.2 Input Shunt Capacitance:

The input branch of the "Pi" network consists of a two section air variable capacitor, one capacitor for each channel (total ten). Each section is 380 pf or 760 pf total. If the antenna impedance at the channel frequency is found to require more capacity, high voltage mica padders are connected by a ceramic switch wafer, S2C. A second wafer, S2D is used to connect the air variables.

4.1.3 Series Inductance:

The variable inductor, L1, forms the series leg of the "Pi" network. The range of this inductor is nominally 0.2 to 22.5 microhenries. The high unloaded Q of this inductor (typically 200), and its high current handling capacity contributes to the high efficiency of the antenna coupler. The inductor is positioned by a servo system. A switch wafer, S2B, is controlled by the channel selector solenoid, B2. The switch section is used to connect a ten turn potentiometer across the motor follow potentiometer, R21. A floating reference supply voltage is connected across the potentiometers, and their wipers are connected to the servo amplifier signal input terminals. The resistor bridge circuits are used to position the inductor as required. A separate potentiometer is used for each of the ten available channels. A mechanical back turns shorting device is actuated by the contact assembly as it travels down the inductor coil turns. The shorting device is necessary to remove the back turn (shorted turns) resonance from the operating

frequency when only a few inductor turns are active.

4.1.4 Output Shunt Capacitance:

The output shunt branch of the network is composed of banks of high voltage ceramic capacitors connected as needed and selected according to channel requirements by the high voltage switch section, S2E.

4.2 RF Circuit Efficiency:

The efficiency, (the ratio of power output to power input) of the antenna coupler is strongly dependent on the reactive circulating current through the series inductor, L1, and on the quality factor (Q), of this element. The circulating current, in turn, is dependent on the value of the output capacity in the circuit. The output capacity, in this application of a "Pi" network is used to transform the antenna impedance to a value that is within the range of the tuning network. The network can therefore be considered to be a basic "L" network preceded by an impedance matching capacitor. In the GCU-1100, therefore as with all wide range antenna couplers, a good impedance match may always be obtained with high values of output capacitance, however it is important that the operator follow the recommended tuning procedure and search for an impedance match at the lowest possible value of output capacity, in order to transfer maximum power to the antenna.

4.3 Control Circuits:

The rotary solenoid channeling pulse is used to initiate a tune sequence. When the solenoid is channeled, a sample of its ground pulse is applied to the unijunction timer circuit Q1/Q3 through the gating diode, CR4. The purpose of this timer is to allow the rotary solenoid to complete its channeling sequence before the servo system is activated. The timer is set for approximately 3 seconds. The 3 second timer relay contacts are used to charge a capacitor, C31, during the hold-in period. When the timer releases, the capacitor discharges into the emmiter of Q2 which starts the second timer, Q2/Q4 and its relay, K2. This timer is used to activate the servo amplifier so that the variable inductor can move to a new position. In addition, a set of contacts on K2 are used to open the system keyline to insure that RF drive is not applied while the servo system is operating. A

second function is served by this timer, it insures that the servo motor is not left energized for long periods of time, in the event of a failure in the potentiometer bridge circuit, which would cause the motor to run to a mechanical limit stop and stall. The timing period is approximately ten seconds.

4.4 Series Inductor Position Servo System:

Refer to the simplified schematic, Figure 4-1.

The servo system used in the GCU-1100 antenna coupler is a conventional resistor-bridge position servo with D.C. components throughout. Ten channel adjustment potentiometers are used in the bridge circuit, one for each channel. The channel selector switch section, S2B, connects the wiper of the operational potentiometer to the servo amplifier signal input. When the servo amplifier is enabled, the bridge circuit will supply a positive or negative error signal depending on the relative settings of the command pot. R13, (channel 3 is shown as the active position on Figure 4-1), and the servo motor follow pot., R21. The servo motor polarity and direction of rotation is connected so that when the follow pot. has been positioned to the same relative setting as the command pot. the D.C. bridge will be balanced, and the input signal to the servo amplifier is zero. The command pot. is a ten-turn screwdriver adjust type. The follow pot. is also a ten-turn device, but it is geared to the motor output shaft so that when the command pot. is adjusted over its complete range, the inductor will travel from its maximum to minimum inductance limits. The bridge circuit uses a "floating" reference voltage, (33 VDC).

4.5 Servo Amplifier:

Refer to the simplified schematic, Figure 4-2.

The servo amplifier in the GCU-1100 is a solid-state, direct-coupled circuit with a bridge connected power output stage. Over-all feedback is used to reduce off-set drift and improve operation at low levels.

Refer to the D.C. Servo Amplifier schematic diagram, S5026-0011.

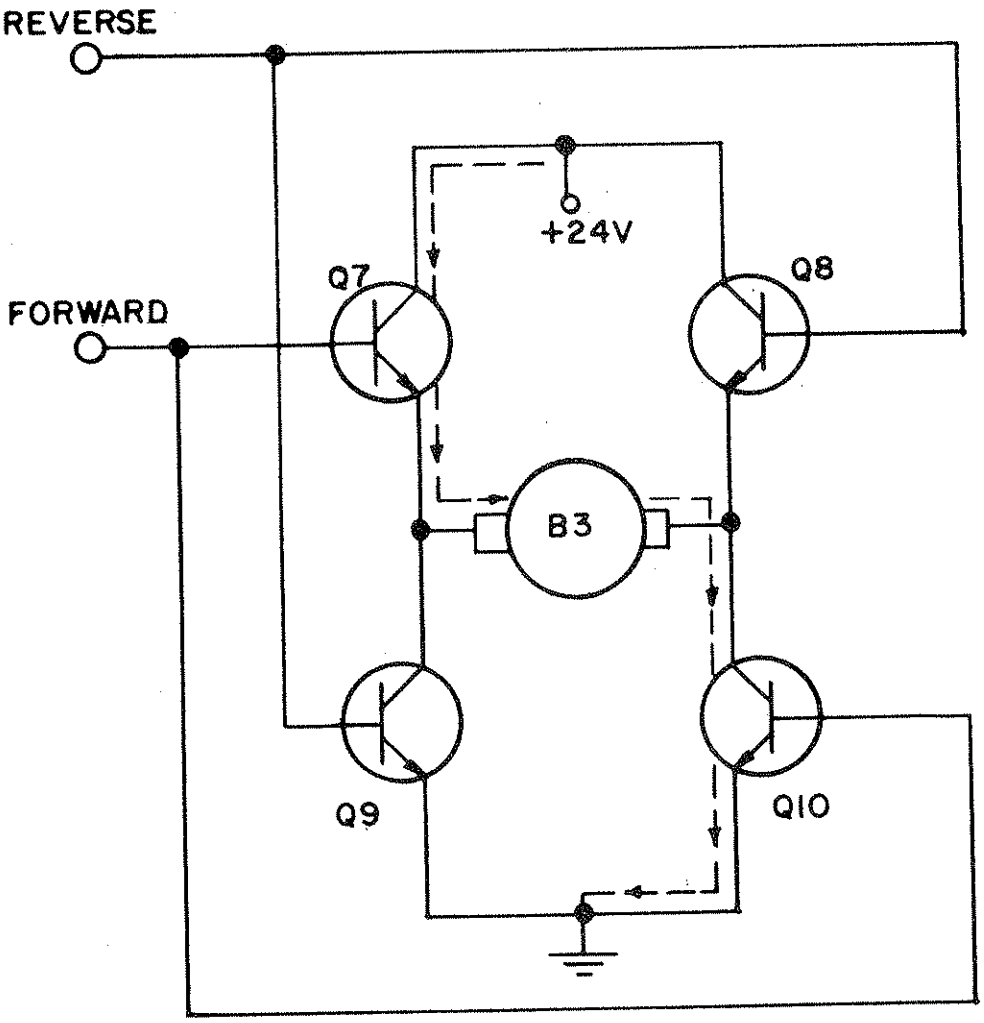


FIGURE 4-2

GSU-1100

SERVO AMPLIFIER
OUTPUT BRIDGE
SIMPLIFIED

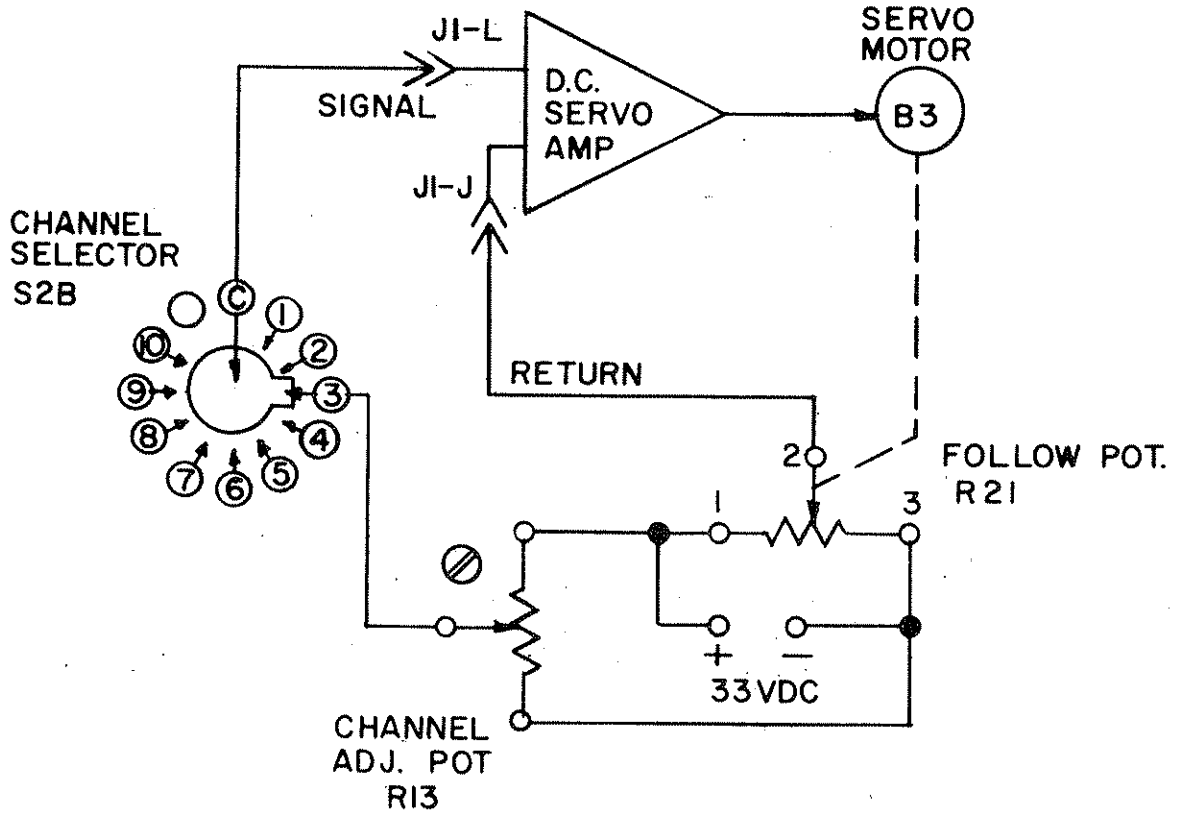


FIGURE 4-1
GCU-1100
INDUCTOR POSITION
SERVO SYSTEM
SIMPLIFIED

The amplifier is a combination printed circuit and hard wired assembly with integral heat-sink. The input stage is an operational amplifier, AR1, to provide a high input impedance to the error signal. Diodes, CR1 & CR2 are connected back-to-back across the input to avoid saturating and possible latch-up at large input signal levels. The output of the op-amp is coupled directly to positive and negative level sensors, Q2 & Q3. The servo enable transistor, Q1 is also connected to the same point. Q1 is normally in the conducting state because of the positive base bias supplied by the zener diode, VR1. When the enable input is grounded, (J1-F), Q1 is shut off, resulting in a high impedance at the op-amp output junction. Either Q2 or Q3 will then conduct, depending on the polarity of the output signal. The positive error sensor, Q2 is coupled directly to the positive driver amplifier, Q5, while the negative error sensor is coupled to its driver, Q6 through an inverter stage Q4. The purpose of the inverter is to obtain symetrical operation in the bridge power amplifier stage.

The output amplifier connections are shown in a simplified form on Figure 4-2. Assume that a positive error signal is being amplified. Driver transistor, Q5 conducts, turning on the bridge pair, Q7/Q10. The dashed lines on the simplified schematic show the current path through the servo motor which results. A negative input will turn on the amplifier pair, Q8/Q9, reversing the current path through the motor. The servo motor is a D.C. permanent magnet type, which provides bi-directional rotation when the applied voltage across it is reversed in polarity.

In the GCU-1100 antenna coupler servo system, the two inputs labeled "+Forcing" & "-Forcing", (J1-E & N) are not used.

SECTION 5
MAINTENANCE AND REPAIR

5.1 Periodic Maintenance:

WARNING

OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES (15kv peak under some conditions) WHICH ARE DANGEROUS TO LIFE. OBSERVE SAFETY REGULATIONS AT ALL TIMES. DO NOT MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH HIGH POWER ON. DO NOT DEPEND ON THE KEYLINE INTERLOCK FOR PROTECTION. TO AVOID INJURY ALWAYS GROUND CIRCUITS BEFORE TOUCHING THEM. DO NOT SERVICE ALONE.

In the normal service life of any piece of equipment, faults and breakdowns will develop. In order that necessary repairs may be carried out in a reasonably short time, a logical test routine must be followed. The maintenance technician should familiarize himself with the circuitry and the physical layout of the equipment prior to the occurrence of trouble.

When repairs are necessary, it is recommended that this servicing be done whenever possible by competent radio technicians, supplied with suitable tools and test equipment.

In order to assure continued trouble-free operation from the GCU-1100 antenna coupler, the following periodic maintenance should be performed every 3 months (monthly, if operated in a salt atmosphere such as a coastal base station).

1. Remove the cover from the coupler enclosure.

2. Inspect the synthetic rubber gasket material for signs of deterioration and stickiness. Lubricate if necessary with Dow Corning 4X silicone lubricant. (Sunair P/N 85854).

3. Check all hardware and retorque, if necessary.

4. Apply a small amount of the Dow Corning 4X lubricant to the mechanical limit stop washers, use the PVC tubing extension for the spray nozzle (furnished with the spray can).

5. Check the servo drive timing belt tension and adjust if necessary. (Press belt at center of its span with one finger, it should not be possible to deflect the belt more than 1/16 of an inch when exerting moderate pressure). Finally, manually move the inductor 5 or 6 turns off its normal position and activate servo. Insure that no slippage occurs when motor starts and/or reverses.

6. Apply a small amount of molybdenum grease to the variable inductor slide support bar. (Dow Corning "Molykote" Type G, Sunair P/N 84095). Wipe off all excess grease after running the inductor over its normal range several times. Note: Do not apply the grease to the insulating material, clean these surfaces, if necessary with a non-toxic solvent such as Trichloroethane.

5.2 Troubleshooting & Repair:

5.2.1 Required Test Equipment:

1. VOM Triplett Model 630 or equivalent

2. RF Wattmeter, Bird Thruline Model 43 with 100 and 1000 watt, 2-30 Mhz elements. (50 ohms).

3. Audio Frequency Generator, Hewlett-Packard Model 206A or equivalent.

4. Coaxial cables, misc. short lengths to permit connection of wattmeter ahead of GCU-1100 RF input jack. Coaxial fittings for cable to mate with wattmeter & UHF type coupler connector.

5.2.2 Timing Period Adjustments:

Connect an ohmmeter to the tune control board, PC1-TB1, terminals 18 & 19. The ohmmeter will indicate the status of relay K2, continuity will indicate that the relay is unenergized. Connect a short jumper (clip lead type) to PC1-TB1-14 (dc common). Now touch the other end of the clip lead to CR4 (anode) momentarily. The time span from the instant the terminal is touched until the ohmmeter indicates an open circuit, (K2 energized) should be approximately 3 seconds. If it is not, adjust PC1-R4 until the correct timing period is found.

The second timer controls K2, which in turn, enables the servo amplifier, and opens the keyline interlock circuit. The timing period should be on the order of 6 seconds (to permit the inductor to be positioned as needed). The adjustment is made with R8.

NOTE: The DC ground for all power supplies is kept isolated throughout the coupler. Do not attempt to measure the servo amplifier output voltage, (motor voltage) with a grounded type instrument such as an oscilloscope. This will short circuit the output bridge network.

5.2.3 Voltage Measurements, Tune Control Board, PC1:

All measurements made to DC common, PC1-TB1-14, with VOM (20,000 ohms/volt).

PC1-TB-1		Terminals 1-10
2		0 to 33 volts, depending on control
3		pot. settings. Channel selected will
4		read 0 volts at null.
5		
6		
7		
8		
9		
10		
11	28 volts	
12	-5 volts	
13	24 volts	N.C. indicates no
14	0	connection (external)
15	2.65 volts	
16	18 volts	
17	18 volts	
18	N.C.	
19	N.C.	
20	-12 volts	
21	0	

5.2.4 Voltage Measurements, Servo Amplifier Board:

All measurements made to DC common, J1-R with VOM.

J1-A	42 volts
B	42 volts
C	0
D	0
E	N.C.
F	2.65 volts
H	11.5 volts
J	0
K	0
L	0
M	-11.8 volts
N	N.C.
P	0
R	0
S	0
T	0
U	0
V	0

5.2.5 Servo Amplifier Check:

If the servo system is operational, select a channel which places the inductor slider near the middle of its normal travel. If the amplifier is defective, (motor will not run when channel is changed), connect a voltmeter on a low voltage range from J1-J to J1-L, switch polarity as necessary. Now turn the inductor manually until the voltmeter indicates 0 volts.

Connect the voltmeter positive lead to J1-U or V, negative lead to J1-C or D. Manually turn the inductor 3 full turns toward the output end of the coil. Hold the inductor firmly with one hand and press the servo activate switch with the other. The meter should indicate approximately 12 volts.

Return the inductor to its original position, reverse the voltmeter leads and repeat the measurement while the coil is 3 turns in the other direction. As before, the meter should indicate 12 volts.

5.2.6 Spark Gap Adjustment:

The spark gap at the output of the coupler should be set for a nominal spacing of 1.0 inches. If the insulator has been removed, adjustment may be required. Loosen the 1/4-20 jam nut at the spark gap bracket and rotate the adjusting screw for the indicated spacing between the crown nut and the coupler case wall. Re-torque the jam nut.

5.2.7 High Voltage Output Capacitor Selector Switch:

Location of channel 1 with respect to the switch common. Face the switch wafer from the RF output end of the coupler. Channel 1 is located adjacent to the switch common terminal in a counter-clockwise direction. Switch rotation is also counter-clockwise, therefore channel 2 is two terminals CCW from common, etc.

5.3 RF Network Adjustments:

The initial tuning of the antenna coupler is described in Section 3 OPERATION. Refer to the data given in that section for retuning to a new frequency.

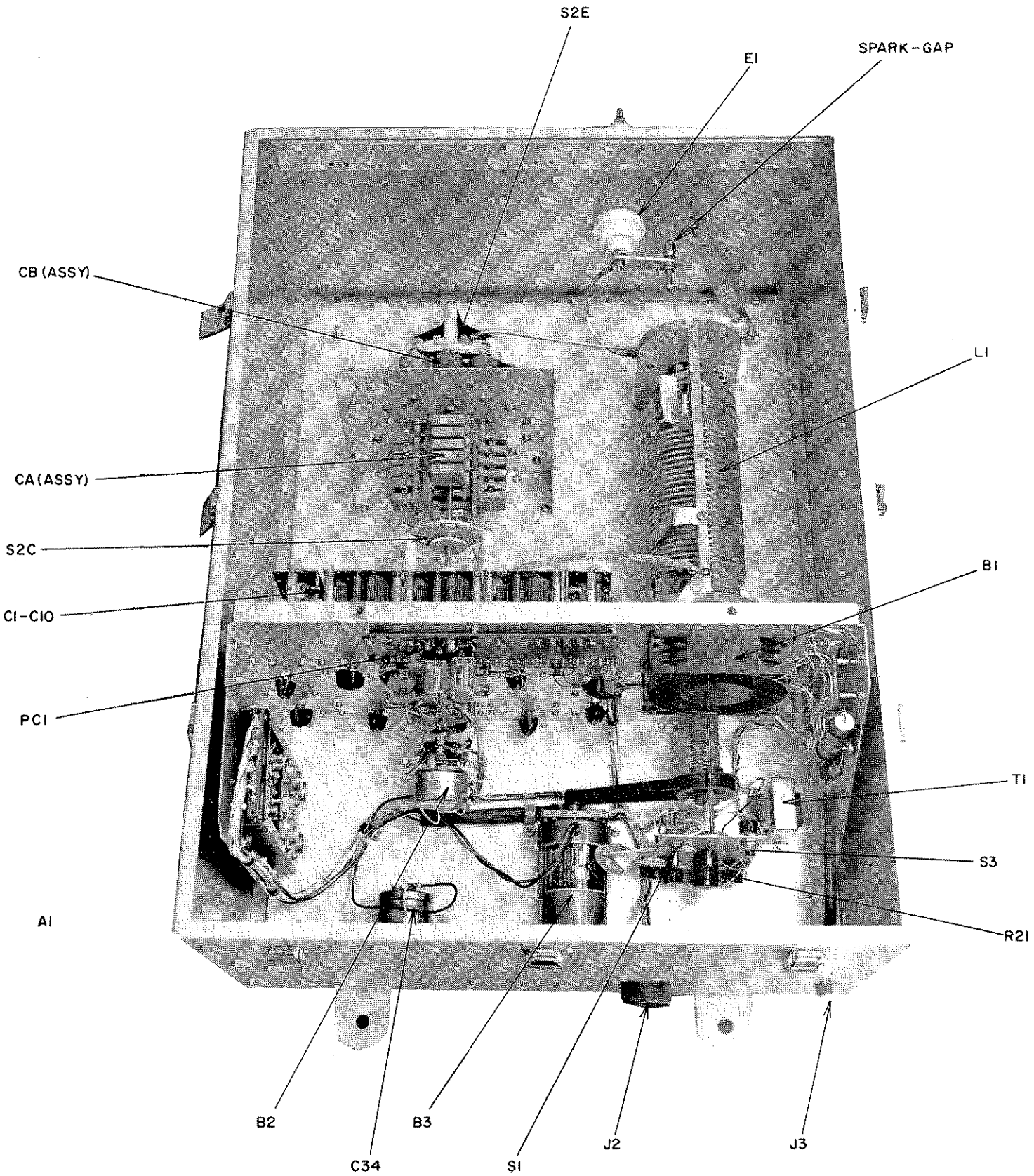


FIGURE 5-1
GCU-1100 TOP VIEW

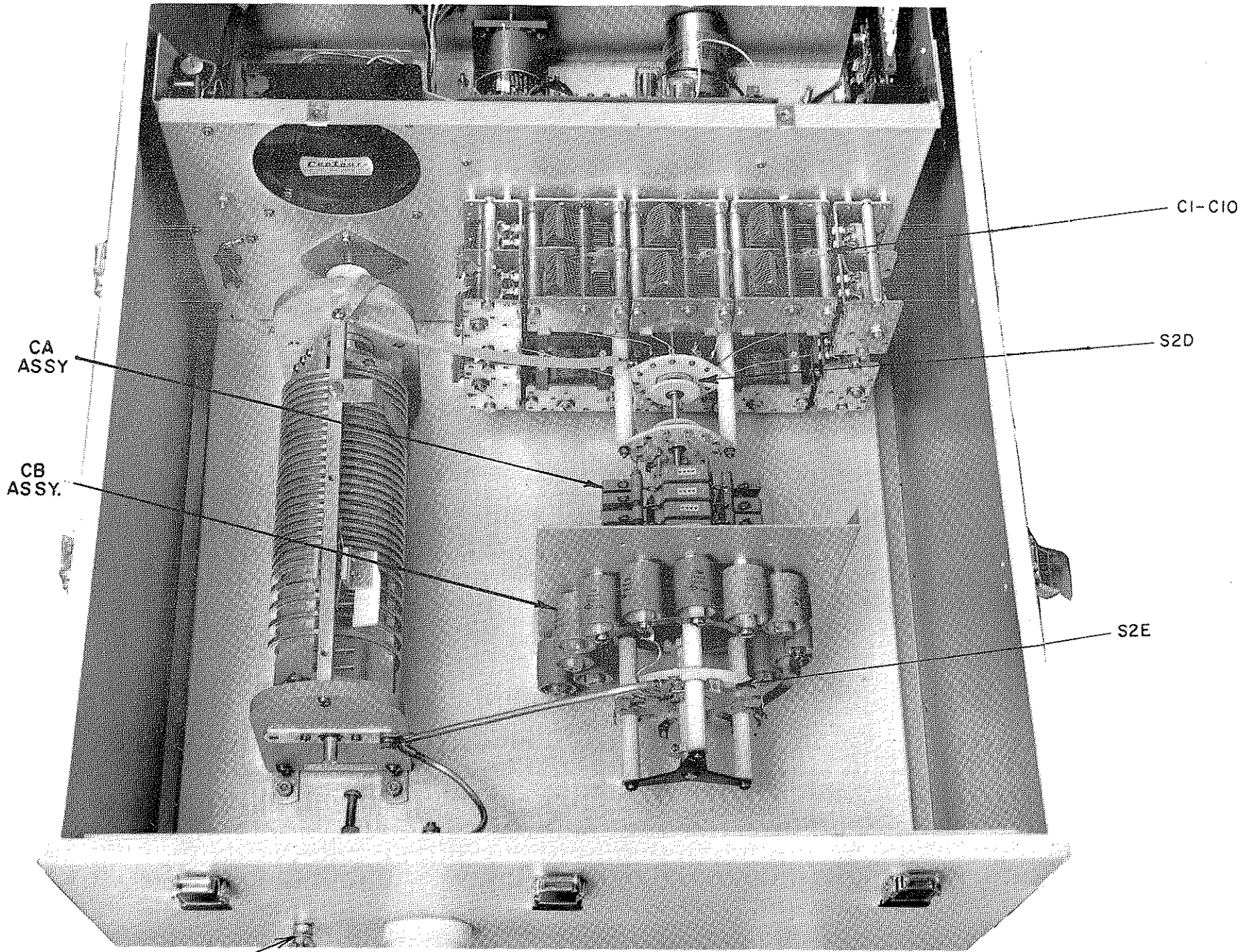
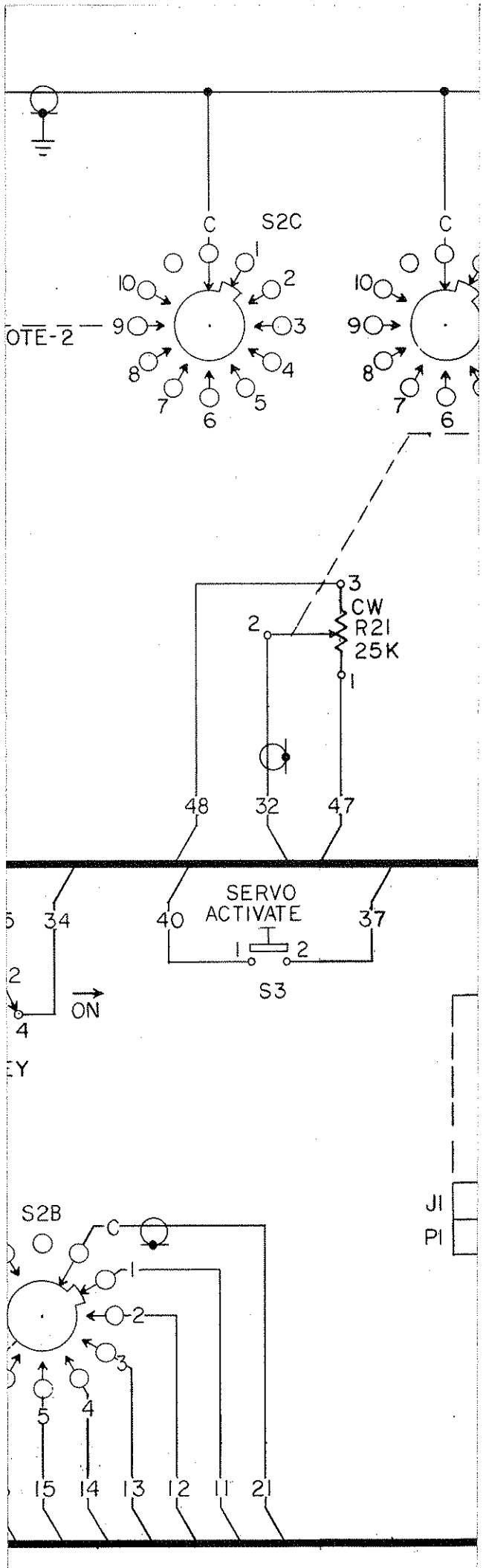


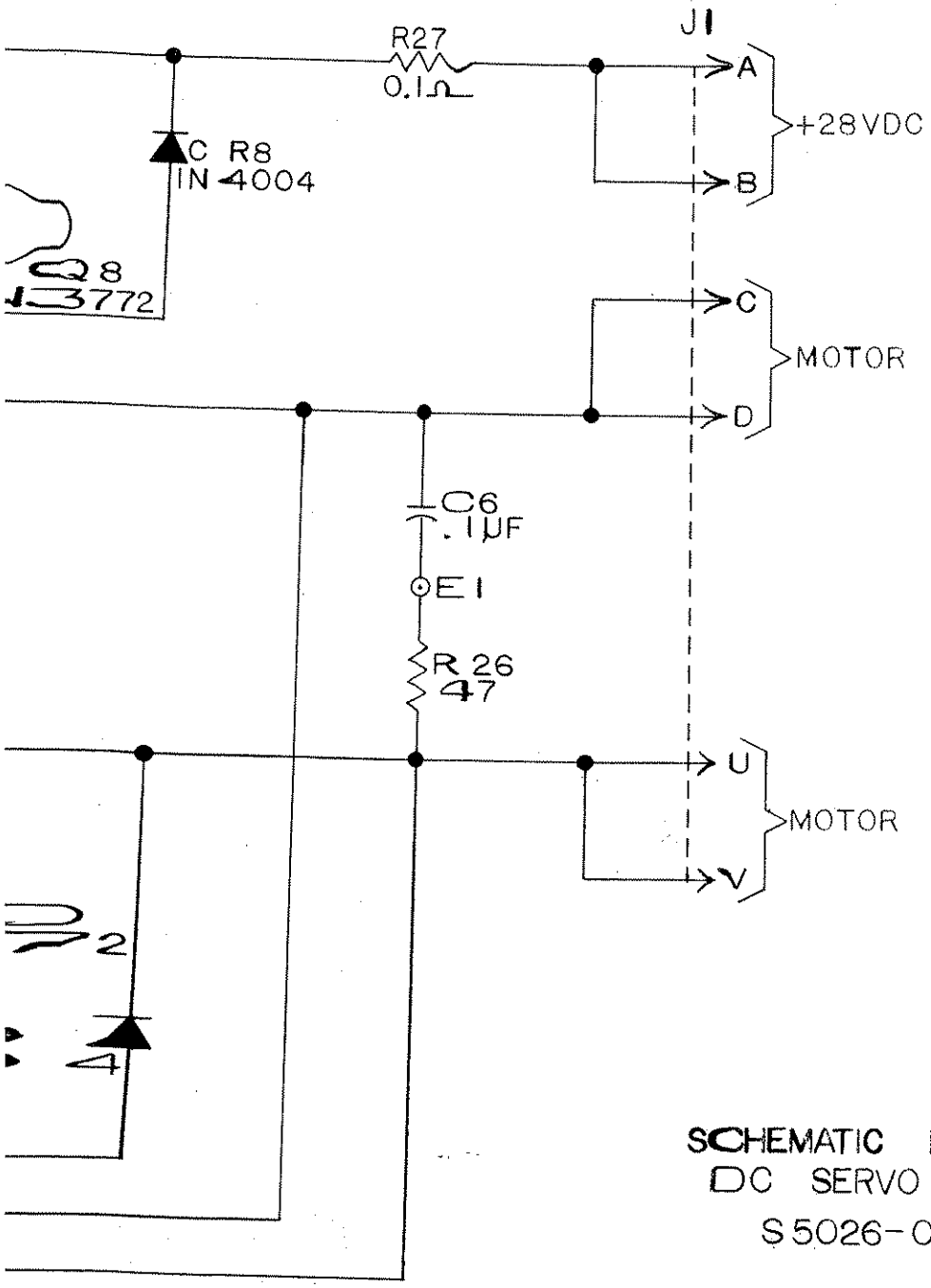
FIGURE 5-2
GCU-1100 TOP VIEW REAR SECTION



NOTES

1. UNLESS OTHERWISE. INDICATED ALL RESISTOR VALUES ARE IN OHMS ALL CAPACITOR VALUES IN PICO FARADS & ALL INDUCTANCE VALUES IN MICROHENRIES
2. CUSTOMIZED COMPONENT. SEE INSTRUCTION BOOK FOR VALUES AND CONNECTION DETAILS.

GCU-1100
KILOWATT ANTENNA COUPLER
SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM
DC SERVO AMP.
S5026-0011

TABLE 5-1

WIRE LIST

WIRE NO.	FROM	TO	LENGTH	SIZE & COLOR	DESC
1	J2-F	P1-P		20 WHT	Grd
2	J2-G	XF1-1		16 Yel	115
3	J2-B	T1-2		16 Orange	115
4	J2-H	S2A-A		20 Brown	
5	J2-J	S2A-B		20 Red	
6	J2-A	S2A-C		20 Orange	Cha Con
7	J2-M	S2A-D		20 Yel	
8	J2-L	S2A-E		20 Green	
9	J2-E	XF2-1		16 Bl/Wh	+28V
10	J2-D	XF2-1		16 Red	"
11	TB1-1	S2B-1		24 Brn	
12	TB1-2	S2B-2		24 Red	
13	TB1-3	S2B-3		24 Orange	
14	TB1-4	S2B-4		24 Yel	Pot
15	TB1-5	S2B-5		24 Green	Cha Se
16	TB1-6	S2B-6		24 Blue	Cor
17	TB1-7	S2B-7		24 Violet	
18	TB1-8	S2B-8		24 Grey	
19	TB1-9	S2B-9		24 White	
20	TB1-10	S2B-10		24 Black	
21	P1-L	S2B-Com		Shielded 20 Audio Type	Co Po
22	XF2-2	P1-A		18 Brn/Wh	+2
23	B2-1	TB1-21		20 Brn/Bl/Wh	
24	TB1-20	VR2 (Anode)		20 Red/Wh	-1
25	P1-S	TB1-14		20 Green	Se
26	P1-F	TB1-15		20 Vio/Wh	En
27	P1-M	VR2-(Anode)		20 Red/Wh	-1
28	P1-U	Motor		16 Red	Mo

TABLE 5-1 Con't

WIRE LIST

	TO	LENGTH	SIZE & COLOR	DESCRIPTION
	Motor		16 Blk	
	VR1-(Cath)		20 Yel/Wh	+24V Reg
d				
	R21-2		20 Shielded Audio	Follow Pot Wiper
	C34 (-)		20 Yel	
	S1-4		20 Blue	Key In
	S1-2		20 Gray/Wh	
	TB1-17		20 Violet	Key Out
	S1-3		20 Green/Wh	
	VR3 (Cath)		20 Bl/Wh	
	VR3/VR1		20 Black	
	P1-F		20 Org/Bl/Wh	Enable
	C34 (+)		18 Yel/Wh	+28V Unreg
	R22		16 Org	+28V Unreg
	C35/R2		18 Red/Wh	" "
	VR4 (Anode)		20 Brn/Wh	-33V
	VR4 (Cath)		20 Blue/Wh	+33V
	VR4 (Cath)		20 Shld Blk	"
	VR4 (Anode)		20 Pair Wh	-33V

SECTION 6
PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
B1	71594	Fan, 115 VAC, 50/60 Hz
B2	34271	Solenoid, Rotary, 28V
B3	5026-0123	Motor, D.C. Servo 24V
C1-C10	27551	Capacitor, Air Var, 760PF
C11-C29		Not Used
C30	27400	Capacitor, 15UF, 35V
C31	27544	Capacitor, 10UF, 50V
C32	27400	Capacitor, 15UF, 35V
C33	28923	Capacitor, 500UF, 50V
C34	28147	Capacitor, 9,500UF, 50V
C35	27230	Capacitor, 1UF, 100V
C36	28923	Capacitor, 500UF, 50V
C37	24355	Capacitor, .01UF
CA & CB		(Quantity as Required by Ant Type & Freq)
---	27545	Capacitor, Ceramic, 25PF 15KV
	27546	Capacitor, Ceramic, 50PF, 15KV
	29032	Capacitor, Ceramic, 25PF, 5KV
	29020	Capacitor, Ceramic, 50PF 5KV
	27550	Capacitor, Mica 220PF 2.5KV
	28204	Capacitor, Mica 470PF 2.5KV
	27548	Capacitor, Mica 1000PF 2.5KV
CR1	40542	Rect. Assy FWB, 2 Amps
CR2	40541	Diode, 1N645
CR3	40541	Diode, 1N645
CR4	40541	Diode, 1N645
CR5	40165	Diode, 1N2071
CR6	40542	Rect. Assy FWB, 2 Amps
F1	84110	Fuse, MDL-1
F2	89666	Fuse, MDL-3
J1	---	P/O A1 (P.C. Board)
J2	75403	Conn. MS-3102A-28-9P
J3A	75336	Conn. SO-239
J3B	75406	Hood, UG-177/U
K1	66743	Relay DPDT, 24VDC
K2	66755	Relay 4PDT, 24VDC
L1	55926	Inductor, Var. 22.5UH
P1	75361	P/O A1 (P.C. Board)
P2	75402	Conn. MS-3106B-28-9S
P3	74219	Conn. PL-259
Q1	44833	Transistor, 2N697
Q2	44833	Transistor, 2N697
Q3	44834	UJT 2N2646
Q4	44834	UJT 2N2646

CKT. SYM.	PART NO.	DESCRIPTION
R1	18538	Resistor, 10 ohm, 10% 1/2W
R2	19477	Resistor, 1.0 ohm, 10% 1/2W
R3	16607	Resistor, 15K 10% 1/2W
R4	31841	Potentiometer, 50K, 10 Turn
R5	16671	Resistor, 100K ohm 10% 1/2W
R6	17390	Resistor, 470 ohm 10% 1/2W
R7	16607	Resistor, 15K ohm 10% 1/2W
R8	31853	Potentiometer, 1 Meg 10 Turn
R9	16671	Resistor, 100K ohm 10% 1/2W
R10	17390	Resistor, 470 ohm 10% 1/2W
R11-R20	31839	Potentiometer, 25K 10 Turn
R21	31865	Potentiometer, 25K 10 Turn
R22	16190	Resistor, 100 ohm 12W
R23	16114	Resistor, 300 ohm 5W
R24	16530	Resistor, 330 ohm 10% 1W
R25	18538	Resistor, 10 ohm 10% 1/2W
R26	16499	Resistor, 47 ohm 10% 1W
S1	34626	Switch, DPDT
S2A	5026-0302	Switch, Wafer, Special
S2B	5026-0314	Switch, Wafer, Special
S2C	34569	Switch, Wafer, Ceramic
S2D	34569	Switch, Wafer, Ceramic
S2E	34634	Switch, Wafer, Hi-Volt
S3	34622	Switch, Push Button
T1	49162	Xfmr 115/230V
VR1	40189	Diode Zener 1N2986B
VR2	40538	Diode Zener 1N5349A
VR3	40538	Diode Zener 1N5349A
VR4	40523	Diode Zener 1N5364B
TB1	---	(P/O P.C. Board)

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
		D.C. SERVO AMPLIFIER
A1		ASSEMBLY A1
C1	28272	Capacitor, 5600PF, 5%
C2	28715	Capacitor, 200PF, 5%
C3	29707	Capacitor, 1.022UF
C4	27187	Capacitor, .01UF
C5	27187	Capacitor, .01UF
C6	24408	Capacitor, .1UF, 75V
CR1	44290	Diode, 1N914
CR2	44290	Diode, 1N914
CR3	44290	Diode, 1N914
CR4	44290	Diode, 1N914
CR5	44290	Diode, 1N914
CR6	40518	Diode, 1N4004
CR7	40518	Diode, 1N4004
CR8	40518	Diode, 1N4004
CR9	40518	Diode, 1N4004
P1	74972	Connector, P.C.
Q1	44838	Transistor, 2N1711
Q2	44838	Transistor, 2N1711
Q3	44839	Transistor, 2N2907A
Q4	44835	Transistor, 2N1893
Q5	44836	Transistor, 2N3741
Q6	44836	Transistor, 2N3741
Q7	44837	Transistor, 2N3772
Q8	44837	Transistor, 2N3772
Q9	44837	Transistor, 2N3772
Q10	44837	Transistor, 2N3772
R1	19348	Resistor, 2150 ohms 1%
R2	19348	Resistor, 2150 ohms 1%
R3	18306	Resistor, 5.6K, 10% 1/4W
R4	17247	Resistor, 1.5K 10% 1/4W
R5	17481	Resistor, 6.8K 10% 1/4W
R6	18057	Resistor, 470K 10% 1/4W
R7	18057	Resistor, 470K 10% 1/4W
R8	18057	Resistor, 470K 10% 1/4W
R9	17807	Resistor, 2.2K 10% 1/4W
R10	17352	Resistor, 68K 10% 1/4W
R11	17807	Resistor, 2.2K 10% 1/4W
R12	17807	Resistor, 2.2K 10% 1/4W
R13	17522	Resistor, 180 10% 1/4W
R14	17522	Resistor, 180 10% 1/4W
R15	17077	Resistor, 4.7K 10% 1/4W
R16	18186	Resistor, 1.2K 10% 1/4W
R17	17156	Resistor, 1.0K 10% 1/4W
R18	18667	Resistor, 2.7K 10% 1/4W
R19	18667	Resistor, 2.7K 10% 1/4W
R20	17091	Resistor, 330 10% 1/2W
R21	17091	Resistor, 330 10% 1/2W
R22	16554	Resistor, 100 10% 1W
R23		Resistor, 100 10% 1W
R24		Resistor, 100 10% 1W
R25		Resistor, 100 10% 1W
R26	16499	Resistor, 47 10% 1W
R27	19336	Resistor, 0.1 10% 15W
AR1	44733	Int. Ckt UA709
VR1	40232	Diode, Zener 1N746

CKT. SYM.	PART NO.	DESCRIPTION

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RECOMMENDED SPARE PARTS LIST

Quantity Required To Support 3 to 5 Units For 2 To 4 Years				MODEL GCU-1100	Voltage		
				SunAir P/N	Description	Unit Price	Total Price
			20	84110	Fuse 1 amp Slo-Blo		
			20	89666	Fuse 3 amp Slo-Blo		
			1	71594	Fan,115 VAC 50/60 Hz 115CFM		
			1	34271	Solenoid,Rotary, 28VDC		
			1	5026-0123	Motor,D.C. Servo 24V		
			2	27551	Capacitor,Air Var 2x380pf		
			2	28923	Capacitor,Elect 500UF		
			1	28147	Capacitor,Elect 85°C,9500UF		
			1	40542	Rect Assy,FWB 2 amp		
			1	40518	Diode 1N4004		
			1	66743	Relay DPDT 24 VDC		
			1	66755	Relay 4 PDT "		
			1	55926	Inductor Var. 22.5UH		
			1	44833	Transistor 2N697		
			1	44834	UJT 2N2646		
			1	31865	Potentiometer,Prec.25K 10 Turn		
			1	5026-0302	Switch,Wafer 30° Slave		
			1	5026-0314	Switch,Wafer 1 Pole 10 Pos Glass		
			1	34569	Switch,Wafer, 1 Pole 12 Pos Ceramic		
			1	34634	Switch,Wafer, 1 Pole 12 Pos 12KV 30 amp		
			1	49162	Xfmr,PRl 115/230V Sec 2 ea.24V @¼A		
			1	40189	Diode,Zener, 24V 5% 10W		
			1	40538	Diode,Zener,12V 10% 5W		
			1	40523	Diode,Zener 33V 5%		

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RECOMMENDED SPARE PARTS LIST

Quantity Required To Support 3 to 5 Units For 2 To 4 Years				MODEL GCU-1100	Voltage		
				SunAir P/N	Description	Unit Price	Total Price
			1	5026-0400-01	D.C. Servo Amp Assy		

ADDENDUMS

Information contained in this section supplements the information contained in the manual. References to this section may be indicated where necessary in the manual.

SUNAIR ELECTRONICS, INC.
Manual: GCU-1100

ADDENDUM 01
DATE: 2-19-75

REFERENCE: GCU-1100 Kilowatt Antenna Coupler

ECN: 5026-008

EFFECTIVITY: Serial Number 174

PURPOSE: Correct wiring error

MANUAL REFERENCE: Schematic Diagram, GCU-1100

TEXT: The arc suppressor circuit across solenoid stepping motor, B2, is incorrectly shown. The correct connections are shown below.