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- (6) (a) REGULATOR FIELD TERMINAL: Connect a 39 ohm resistor in series with a 0.01 mfd ceramic capacitor between the Field terminal and ground.
 - (b) ARMATURE TERMINAL: Insert 0.2 mfd coaxial capacitor (Sprague #48P18 or equivalent).
 - (c) BATTERY TERMINAL: Repeat (b).
- (7) GAUGES: Install 0.5 mfd, 200 volt capacitors from terminals to ground.
- (8) WHEELS AND TIRES: Inject special graphite powder (available at automotive parts suppliers) into the tires.

CAUTION: Do not connect any capacitor alone from the Field Terminal of the generator to ground. Read (6) (a) carefully.

C. ALTERNATORS

The prime cause of alternator whine is dirty slip-rings and faulty diodes. If further whine is encountered:

- (1) Install a 0.5 mfd coaxial capacitor at the alternator output terminal.
- (2) Install a 0.25 mfd coaxial capacitor at the regulator ignition terminal.
- (3) For extreme cases of whine, install a shielded lead between the alternator and regulator field terminals.

4 - 3. MOBILE ANTENNA

The mobile antenna represents an electrical quarter wave-length at the operation frequency or physically represents 109". Shorter equivalents are the "loaded" type of antenna. This type of antenna can be bottom, center or top-loaded and is usually 5 feet in length. Another loaded type is the spiral-wound antenna.

The best type, without a doubt, is the 109" whip antenna. This is usually mounted on the rear bumper or low on the rear of the body. The shorter antenna is a compromise. Between 14 to 18 feet of RG-58A/U cable is recommended as a low-loss transmission line to provide a low standing-wave ratio.

There are antenna mounts available to suit any installation. The most practical type is the swivel ball mount which is available for body mounting, and the coiled spring type which is used as a bumper mount. In certain instances, both the swivel ball and coil spring are used together.

4 - 4. MARINE ANTENNA AND INSTALLATION.

The antenna system for a boat requires a ground plane antenna. The common name for such an antenna is "coaxial ground plane antenna." The boat ground system which usually consists of a ground plate is not efficient at 27 mc and therefore should not be relied upon for use with a simple whip antenna. This does not hold true if the boat is of all-metal construction.

The same bonding and ignition suppression techniques must be applied to a boat as to an automobile. In many cases a boat requires more work because the engine compartment is of wood, whereas an automobile has a hood and firewall to shield the engine. A boat's wooden engine compartment requires copper mesh shielding that is adequately connected to a bonded electrical system.

Bonding a boat requires that all metal fittings that come in contact with the electrical system or water be continuously interconnected by 2" wide copper "flashing" strips. The engine shaft will require a "wiper" resting on the shaft and connected to the bonded ground system. This "wiper" is usually a piece of spring steel resting on a cleaned portion of the shaft.

4 - 5. BASE ANTENNA

The transmission line (antenna lead) of a Base installation may be lengthy even though the antenna is only 20' off a roof. In such an installation RG-8U cable (heavier than RG-58A/U) should be used to minimize the transmission line losses.

Base antenna falls into two categories:

- (a) Ground Plane types
- (b) Beam antenna types

Ground plane antennas are omni-directional. Beam antennas are uni-directional. If the Model "E" is used in a restricted direction, a Beam will have a greater advantage since the antenna response will be concentrated in only one direction. The antenna should have an impedance of 50 ohms regardless of the type chosen.

SECTION 5 - OPERATION

5 - 1. TRANSMITTER

After the Model "E" has been unpacked and inspected, connect it to the power source and antenna system. Allow a three minute warm-up period. Plug in the microphone and depress the button. The antenna indicator should glow. Adjust the Tuning and Loading controls for maximum brilliance. If the lamp glows too bright, adjust C40 CCW. CW rotation increases brilliance. The lamp should be set for half brilliance after the transmitter is tuned. Note that speaking into the microphone will raise the brilliance to maximum on voice peak; therefore, do not set C40 for maximum. Failure to do so will result in a burnt out lamp.

The above adjustment is best done on channel 9, 10 or 11 so that channels 1 and 23 will be properly tuned without further adjustment.

5 - 2. RECEIVER

Set the receiver controls as follows:

Volume....... 1/2 CW Squelch...... full CCW Crystal (Xtal).... position

Noise should be heard from the loudspeaker or speech when another station is transmitting. The background noise is eliminated by rotating the Squelch control CW until the noise disappears. Any signal on the channel will override the Squelch, but when no signal is present the receiver will be quiet. Do not advance the Squelch too far.

An external speaker jack, located on the rear panel, allows the operator to connect a remote speaker, at the same time disabling the panel speaker.

5 - 3. CRYSTALS

The Model "E" is shipped from the factory with one pair of crystals (transmit and receive). Additional crystals can be purchased and inserted in the remaining 7 positions. It is very important that the crystals be of the type made specially for use in Sonar equipment. NOTE: Crystals other than those designed for Sonar equipment will be off frequency, in violation of the FCC Rules and Regulations. Crystals are available from any Sonar dealer. Insert crystals as follows:

- (1) Remove the line cord from the power source.
- (2) Loosen the four side screws and remove top cover.
- (3) Insert crystals in the proper sockets (see top layout diagram).
- (4) Mark front panel with respective channel markers.

SECTION 6 - MAINTENANCE

6 - 1. FUSES

It is recommended that the Model "E" be checked at least once a year by a licensed technician to insure continuous trouble-free operation.

Fuses are located on the underside of the chassis by first removing the bottom cover. When a fuse "blows", make no attempt to jump the fuse holder with bare wire; this can result in very costly damage. When a replacement fuse "blows", disconnect the set from power and consult the resistance chart. If all resistances check within reason, check the power supply for shorted capacitors or silicon rectifiers.

REPLACEMENT FUSES...... 6VDC...20A
12VDC...7.5A
32VDC...7.5A
117VAC...0.7A

6 - 2. ALIGNMENT - RECEIVER

A. EQUIPMENT

- (1) Signal generator covering 455 kc and 27 mc ranges.
- (2) Vacuum Tube Voltmeter.
- (3) Alignment tool for hexagon cores.

B. METHOD

- (1) Set generator to exactly 455 kc.
- (2) Connect generator to pin 2 of V2 (6J6).
- (3) Input should be about 30-100 microvolts.
- (4) Adjust top and bottom cores of T1, T2, and T3. Use the VTVM to read AVC voltage as a tuning indicator.
- (5) Set Model "E" to a crystal-controlled channel, preferably 9, 10, or 11.
- (6) Connect generator to antenna input.
- (7) Adjust generator for 27 mc range.
- (8) Tune generator for maximum indication of AVC voltage with attenuator at 1-2 microvolt level.
- (9) Adjust L1 and L2 for maximum AVC voltage.
- (10) Switch Model "E" to tunable position and adjust tuning control to pick up the generator signal as set in (5) and (8).
- (11) Check dial calibration.
- (12) If necessary to recalibrate the tuning dial, set dial to proper channel and adjust L3 for maximum AVC voltage.

BE CAREFUL! THE ACTUAL AMOUNT OF ADJUSTMENT NECESSARY IN ALL OF THE ABOVE IS SMALL SINCE AN ADJUSTMENT CANNOT VARY TOO MUCH FROM THE ORIGINAL FACTORY SETTING.

6 - 3. ALIGNMENT - TRANSMITTER

A. EQUIPMENT

- (1) VTVM
- (2) 50 ohm dummy load
- (3) 1 megohm resistor

B. METHOD

- (1) Connect 50 ohm dummy load to antenna input connector.
- (2) Set channel switch to channel 9, 10 or 11.
- (3) Plug microphone into microphone jack.
- (4) Connect VTVM probe to Pin 1 or 7 of V9 (12AQ5) through the 1 megohm resistor, making sure that the resistor lead to the tube pin is approximately 1/2" long or less. Set VTVM to 50 VDC range.
- (5) Press microphone button and adjust L4 for maximum VTVM reading, (about -30 VDC or more). Remove probe.

(6) Adjust C41 and C43 for maximum antenna output indication. If the 50 ohm load is calibrated and metered for output, a 3.0 to 3.5 watt output should be noted.

6 - 4. CRYSTAL OSCILLATORS - CALIBRATION

No attempt should be made to alter the crystal frequency unless an accurate frequency standard is available. The accuracy of such a standard should be at least .001%. The oscillators are adjusted by C24 and C54.

The crystal oscillators are factory calibrated using zero tolerance standards. Sonar crystals are gound within an allowable tolerance of ±500 cycles (FCC allows ±1300 cycles) and plugged into the pre-calibrated oscillators. This assures the operator of being able to purchase Sonar crystals and plug them into his Sonar equipment without having to recalibrate the oscillators. Even under these ideal conditions, a frequency check should be carried out.

When it is necessary to recalibrate the oscillators, C24 and C54 are adjusted so that the eight frequencies average out their error about the exact frequency.

EXAMPLE: 3 crystals might read +340, +200, +400 cycles, while the other 5 crystals read -20, -80, -190, -270, -410 cycles.

REMEMBER: DO NOT MAKE UNNECESSARY ADJUSTMENTS UNLESS
THE PROPER INSTRUMENTS ARE AVAILABLE!

VOLTAGE CHART (117 VAC/12 VDC POWER SUPPLY)

NO	TUBE	POSITION	PIN I	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
	10040	TRANSMIT		-							
VI	12BA6	RECEIVE	- 0.8	0	0	12.6 VAC	+230	+54	0		-
	6.16	TRANSMIT									
V2	616	RECEIVE	+ 108	+ 95	6.3 VAC	0	0	0	+ 1.5		
		TRANSMIT						and the same			
V3	6BA6	RECEIVE	- 0.65	0	0	6.3 VAC	+ 230	- 110	- 1.1		\$ 2.
	10046	TRANSMIT									
V4	12BA6	RECEIVE	- 0.66	0	0	12.6 VAC	+235	+90	+ 0.8		
		TRANSMIT						-			
V5	12AU6	RECEIVE	- 0.65	0	0	12.6 VAC	+18	0	0		
	10477	TRANSMIT	+ 70	+ 2.2	+ 4.0	0	12.6 VAC	+ 230	0	+2.1	
V6	IZAT7	RECEIVE	+ 80	+ 18	+20	0	12.6 VAC	+230	0	+ 2.1	
	100117	TRANSMIT	+ 230	0	+ 6.8	12.6 VAC	0	+230	0	+ 6.8	
۷7	12BH7	RECEIVE	+ 230	0	+6.8	12.6 VAC	0	+ 230	0	+ 6.8	
	0.4110	TRANSMIT						+ 0.2	- 15	+120	+ 230
8٧	6AU8	RECEIVE	+ 3.7	- 5.4	+ 205	6.3 VAC	12.6 VAC				
	10.4.05	TRANSMIT	- 40	0	0	12.6 VAC	+ 210	+135	- 40	2	
V9	12AQ5	RECEIVE			to the second						

NOTES

- 2. ALL MEASUREMENTS MADE WITH II MEG VTVM.
 3. ALL VOLTAGE MEASUREMENTS. ALL VOLTAGE MEASUREMENTS MADE FROM SOCKET PIN TO GROUND (CHASSIS)
- 4. VOLUME & SQUELCH CONTROLS ARE CCW.
- 5. 50 OHM DUMMY LOAD CONNECTED TO OUTPUT.
- 6. ALL VOLTAGES D.C. UNLESS OTHERWISE SPECIFIED.
- 7. RECEIVE SWITCH IN TUNE POSITION.
- 8. SET TUNING AT CHANNEL II.
- 9. VOLTAGE MAY VARY 10%.

RESISTANCE CHART

NO.	TUBE	PIN I	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
٧ı	12846	I.I MEG	0	0	FIL.	80 K*	170 K *	0		
V 2	616	120 K	120 K	FIL.	0	470 K	100 K	180		
V 3	6BA6	I.O MEG	0	0	FIL.	85 K *	110 K *	100		Andrea Control
V 4	12BA6	I.O MEG	0	0	FIL.	84 K *	135 K *	62	er okolog sam	
V 5	I2AU6	I.2 MEG	0	0	FIL.	380 K	260 K	0	- 4	
V 6	IZAT7	570 K	I.4 MEG	12 K		FIL.	84 K*	470 K	220	FIL.
V 7	128H7	84 K *	110	220	FIL.	FIL.	84 K*	110	220	FIL.
V 8	6AU8	560	100 K	88 K *	FIL.	FIL.	INF.	100 K	140 K*	85 K
V 9	12AQ5	27 K	INF.	FIL.	FIL.	85 K *	135 K *	27 K		

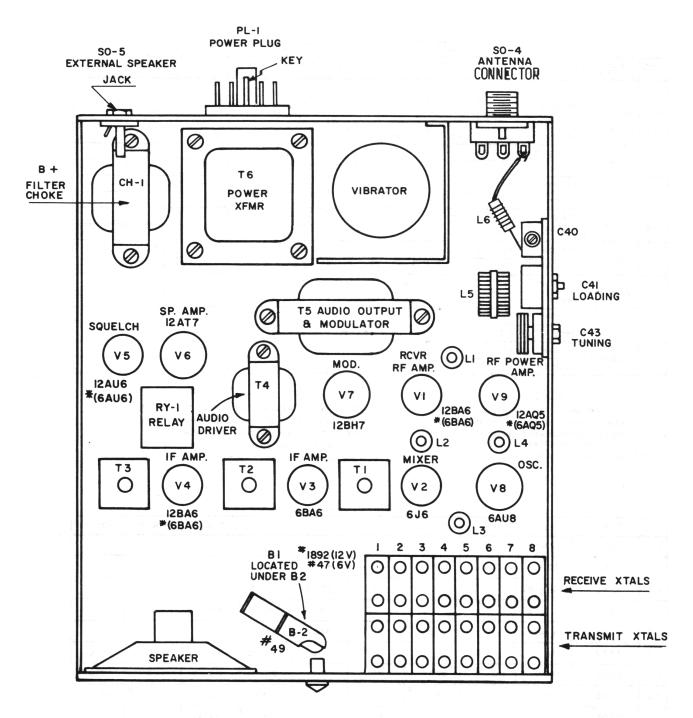
LEGEND

ALLOW METER READING TO STABILIZE DUE TO ELECTROLYTIC CHARGING IN CIRCUIT.

NOTES

1. SQUELCH CONTROL FULL CW.

- 2. ALL RESISTANCE VALUES MADE FROM SOCKET PIN TO GROUND (CHASSIS)
- 3. ALL MEASUREMENTS MADE WITH A SIMPSON 270 YOM PROBE GROUNDED & FUNCTION SWITCH IN
- 4. ALL MEASUREMENTS ARE IN OHMS.
- 5. ALL MEASUREMENTS MAY VARY 10%.



*****____6 VOLT MODEL

MODEL "E" PARTS LAYOUT

TOP VIEW

PARTS LIST - MODEL "E"

SONAR PART NO.	04-255-001	04-103-004	04-103-016	04-102-012	04-102-008	04-105-001	04-503-008	05-100-023	04-101-003	04-154-002	04-396-001	04-226-007	07-104-002	05-151-001	06-230-001	06-130-004	06-130-035	08-100-001	08-150-012	09-210-001	05-101-005	04-102-003	06-530-043
*LIST PRICE	\$0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.50	0.75	0.50	0.50	0.50	0.50	1.00	2.00	1.00	2.00	2.00	3.00	1.50	0.75	0.50	1.00
DESCRIPTION	Capacitor, Fixed, Ceramic 25 MMFD, 1 KVDC, NPO	Capacitor, Fixed, Ceramic . 001 MFD, 500 VDC	Capacitor, Fixed, Ceramic .001 MFD, 1400 VDC	Capacitor, Fixed, Ceramic . 01 MFD, 500 VDC	Capacitor, Fixed, Ceramic .01 MFD, 1 KVDC	Capacitor, Fixed, Ceramic 10 MMFD, 1 KVDC, NPO	Capacitor, Fixed, Ceramic . 005 MFD, 1 KVDC	Capacitor, Fixed, Mylar 1.0 MFD, 250 VDC	Capacitor, Fixed, Ceramic . 1 MFD, 100 VDC	Capacitor, Fixed, Ceramic 150 MMFD, 1 KVDC	Capacitor, Fixed, Ceramic 3.9 MMFD, 1 KVDC, NPO	Capacitor, Fixed, Ceramic 2.2 MFD (Gimmick)	Capacitor, Fixed, Dur-Mica 100 MMFD, 500 VDC	Capacitor, Fixed, Mylar 0.15 MFD, 400 VDC	Capacitor, Fixed, Electrolytic 10 + 30 MFD, 350 VDC	Capacitor, Fixed, Electrolytic 4 MFD, 10 VDC	Capacitor, Fixed, Electrolytic 80 MFD, 150 VDC	Capacitor, Variable, Air 2. 2-6 MMFD, Rec. Tuning	Capacitor, Variable, Air 3.9 - 31.9 MMFD, Plate Tuning	Capacitor, Variable, Compression 100-500 MMFD, Ant. Loading	Capacitor, Fixed, Mylar . 1 MFD, 200 VDC	Capacitor, Fixed, Ceramic 01 MFD 100 VDC	
DIAGRAM NO.	C1, 2, 4, 68	C3, 7, 15, 16, 33, 37, 38, 50, 58, 63, 69, 73, 73	C39	C5, 8, 9, 9A, 10, 11, 114, 14, 23, 29, 29A, 36, 51, 59, 66	C65, 67	C22, 35, 45, 46	C13, 18, 20, 53, 55	C25	C26, 27	C12, 57, 60	C56	C21, 64	C48	C30, 47	C19A-B	C17	C31, 32	C24	C43	C41	C61	C42, 44, 49	C52
SONAR PART NO.	01-561-531	01-104-531	01-563-531	01-102-531	01-273-531	01-101-531	01-473-531	01-474-531	01-105-531	01-224-531	01-221-531	01-472-531	01-620-531	01-394-531	01-682-531	01-181-531	01-103-531	01-221-631	01-472-631	01-333-631	03-504-018	03-504-003	
_	 Greensie 		,	,	_					0	0	0	0	0	0	0			0	0	0		
*LIST PRICE	\$0.25	0.25			0.25	0.25	0.25	0.25	0.25 0	0.25 0	0.25 0	0.25 0	0.25 0	0.25 0	0.25 0	0.25 0	0.25	0.35	0.35 0	0.35 0	2.50 03	00 6	8
*LIST DESCRIPTION PRICE	Resistor, Fixed, Composition \$0.25			0.25	+	0.25	Composition 0.25	ition 0.25	ion 0.25	Composition 0.25	ion 0.25	Composition 0.25	ion 0.25	Composition 0.25	ion 0.25	ion 0.25	0.25	0.35	-	sition 0.35	Composition 2.50	00 6	Kesistor, Variable, Composition 500 K Ohm, Squelch Control

*MINIMUM ORDER - \$5.00. PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

PARTS LIST - MODEL "E"

	DESCRIPTION	*LIST PRICE	SONAR PART NO.	DIAGRAM NO.	DESCRIPTION	*LIST PRICE	SONAR PART NO.
C40	Capacitor, Variable, Compression 3 - 30 MMFD	\$0.75	09-210-011		MODEL "E" 12 VDC/117 VAC		
C22A, 54	Capacitor, Variable, Compression	1.50	09-610-017	V1, 4	12BA6 Vacuum Tube	\$1.50	19-010-0-07
C71	Selected at Factory			V2 V3	6BA6 Vacuum Tube	2 00	19-010-0-37
RFC1	Choke, R. F., 21 microhenries	1.00	22-060-005	V5		2.00	19-010-0-09
RFC2	Choke, R. F., 250 microhenries	1.00	22-060-001	V6	12AT7 Vacuum Tube	2.50	19-010-0-05
RFC3, 4, 5	Choke, R. F., 22 microhenries	0.50	22-060-009	77	12BH7 Vacuum Tube	2.50	19-010-0 20
T1	Transformer, I. F., 455 kc	3.00	22-010-019	V8	6AU8 Vacuum Tube	3.00	19-010-0 17
T2, 3	Transformer, I. F., 455 kc	3.00	22-010-020	6A		2.50	19-010-01
T4	Transformer, Driver	4.00	14-020-001	R53	Resistor, Fixed, Composition	0.35	01-470-6-31
T5	Transformer, Modulator/Audio	7.50	14-050-009		47 Ohm, \pm 10%, 1 w		
D1	Diode: Silicon, RD 5079	1.00	19-080-001	T6	Transformer, Power	15.00	14-010-0-31
D2	Diode, Silicon, HC-67	1.00	19-040-005		Vibrator, G1601, 12 VDC	4.00	29-030-0-01
D3, 4	Diode, Silicon, CER-71	1,00	19-040-002	B1		0.40	19-060-0-03
CH1		4.00	14-070-001	F1	3AG. 7	0.50	42-010-0 14
<u>L1</u>	RCV. Ant.	2.00	22-030-001	F2	3AG,	0.50	42-010-0 18
L2		2.00	22-050-001	S01-B	Power Cable, 12 VDC, Assembly	4.95	59-010-0-04
L3		2.00	22-040-001	CH2. CH3		100	22-100-0 03
L4		2.00	22-040-002	0110 (0110	choncy mann	3	200
Γ 2	Coil, Xmtr. R. F. Amp.	2.00	22-070-001				
L6	Coil, Low Pass Filter	1,00	22-090-003		MODEL "E" 6 VDC/117 VAC		
Ry1	Relay, 4 PDT, 110 VDC, Plug-In	10.00	16-010-011	1		00 0	
S1A, B	Switch, Xtal-Tune	3.00	10-030-001	V1, V3, V4	9	2.00	19-010-0 10
S2A, B	Switch, 8 position xtal; Assembly	25.00	51-010-006	V2		2.00	19-010-0 37
SOS	Socket, "S" Meter, 4 pin	0.50	13-130-001	V5		2.00	19-010-0 12
SO3	Jack, Microphone	0.75	15-010-001	N6		2.50	19-010-0 05
SO4	Connector, Antenna, SO-239	1, 50	15-120-001	V7	7	2.50	19-010-0 20
SO5	Jack, External Speaker	0.75	15-010-003	V8		3.00	19-010-017
PL1	Plug, Octal, Power	0.50	13-070-001	60	6AQ5 Vacuum Tube	2.50	19-010-0-03
B2	Bulb, #49, Output Indicator	0.25	19-060-003	T6	Transformer, Power	15.00	14-010-0 27
NE2	Neon Lamp	0.25	19-070-003		or 117		
		17.90	57-010-005		tor, 1	4.00	29-030-0-02
- C	Speaker, 3" PM, 4 Ohm	5.00	36-043-009	B1	#47, 6	0.25	19-060-0-01
SO1-A	Power Cable, 117 VAC	4.95	59-010-003	F1	Fuse, 3 AG, 20 Amp	0.50	42-010-0-01
		0.50	13-030-001	F2	Fuse, 3 AG, 0.7 Amp	0.50	42-010-0 18
	Power Socket Cap w/Cable Clamp	0.50	26-040-001	SO1-B	Power Cable, 6 VDC, Assembly	4.95	59-010-0-09
	Control Knob	0.50	33-010-004	сн2, сн3	Choke, Hash	1.00	22-100-0-02
	Instruction Manual	3.00	44-010-040A				March 1997 Commission

*MINIMUM ORDER - \$5.00. PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.