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Sonar Model H Owners Manual

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INSTRUCTION MANUAL



MODEL H Citizens Band Transceiver



SONAR RADIO CORPORATION

73 Wortman Avenue • Brooklyn, N. Y. 11207

44-010-042A

MODEL "H"
CITIZENS BAND TRANSCEIVER

Transmitting equipment employed for voice communication in the Citizens Radio Service must be operated under a station license issued by the Federal Communications Commission and in accordance with the limitations on permissible communications contained in Part 95, (formerly Part 19) Citizens Radio Service, of its rules. The operation of such equipment as a hobby, in and of itself, or for the exchange of aimless small talk is not permitted.

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MODEL "H" TRANSCEIVER

SECTION 1 - SERVICE

1 - 1. WARRANTY

SONAR RADIO CORPORATION warrants each instrument manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument which is returned to the factory for that purpose and to replacing any defective parts thereof. This warranty on all parts is effective for one year after delivery to the original purchaser, and for free labor and servicing for ninety days after delivery to the original purchaser, provided that all instructions as to installation, use and operation are followed and the fault has not been caused by misuse, accidents, negligence, alteration, unauthorized repairs or has been damaged by excessive input power, lightning or water-flooding. Warranty of parts shall not include pilot lamps.

1 - 2. SERVICE POLICY

If it is necessary to return a MODEL "H" to the factory, a letter should first be sent describing the basic trouble. If an authorized service and sales agency is close to the customer, the customer will be so informed, otherwise, the unit will be returned to the factory. Do not return the unit without factory authorization.

1 - 3. CHANGES

Sonar Radio Corporation reserves the right to modify or change any design of equipment, mechanically or electrically, to any degree as is necessary without Sonar Radio Corporation being liable to modify, change or exchange previously delivered equipment.

SECTION 2 - FCC

2 - 1. FCC REGULATIONS state that the owner of any Citizens Band equipment must have in his possession a current copy of Part 95 of the FCC Rules and Regulations in addition to a Citizen's Band License to operate the same before transmitting any signals.

2 - 2. THE MODEL "H" has been tested prior to shipment to comply with the FCC Rules and Regulations regarding power input, receiver radiation, spurious signal attenuation and frequency stability.

SECTION 3 - DESCRIPTION

3 - 1. SPECIFICATIONS

A. TRANSMITTER:

Input: 5 watts (FCC Max.)
Output: At least 3 watts
Impedance: 50 ohms
Harmonic &
Spurious Output: Attenuated at least 75 db
Modulation: High level class "B", capable of 100% modulation.
Frequency: 23 assigned Citizens Band channels.
Stability: Better than .005%

B. RECEIVER:

Sensitivity: At least 1 microvolt for 10 db signal-to-noise ratio
Selectivity: 5 kc at - 6 db
Audio output: At least 2 watts @ 1000 cps.
Distortion: 10% maximum at 1 watt output
Noise Limiting: Fully automatic gating type circuit
Squelch: Passes audio when 2 microvolts of signal is presented to antenna input.
Tuning Range: Crystal controlled for all 23 channels
Stability: Same as transmitter
Remote Speaker: A closed circuit jack is provided for a 4 ohm speaker.

C. POWER SUPPLY:

Input: 120 VAC or 12 VDC (negative ground only) depending upon the power cable used.
High Voltage
Rectification: Voltage Doubler
Duty: Continuous operation

D. SIZE: 4½" high x 8" wide x 10" deep

Weight: 8½ lbs.

E. EQUIPMENT SUPPLIED:

- (1) One pair of crystals
- (2) Push-to-talk microphone with retractable cord
- (3) Microphone hanger
- (4) DC cord (12 VDC)
- (5) AC cord (120 VAC)
- (6) Universal mounting bracket and hardware
- (7) Channel markers

3 - 2. GENERAL

The Model "H" is a crystal-controlled receiver and transmitter designed to operate on all 23 Citizen Band channels. The receiver incorporates a "Fine Tuning" control enabling the operator to shift the receiver plus or minus 2 kc. The position of this control is not an indication of exact frequency but compensates the received signal and the frequency of the receiver crystal. The Model "H" uses an audio system common to both receiver output and transmitter modulation. The audio frequency response is restricted to 300 - 3000 cycles. This and Class "B" modulation give the "voice power" necessary to overcome noisy and crowded channel conditions.

Panel indicators show "Power On" and "Antenna Current" (relative power). The latter indicator glows brighter with modulation peaks. The tune-up procedure is simplified by tuning the transmitter for maximum indicator brilliance.

The power supply operates from either 120 VAC or 12 VDC (negative ground only). For 12 VDC operation a solid state power oscillator is used to provide a high degree of efficiency and long range reliability. All components are highly rated to give a wide margin of safety.

The "Automatic Noise Limiter" is very effective with ignition noises. A push-pull switch on the Squelch control disables the ANL. In the disabled position (ANL "Off") the receiver serves as a noise detector when suppressing ignition systems.

Seven internal crystal positions are provided. When all these positions are filled, crystals may be plugged in externally for the remaining 16 channels. Care must be taken to plug the crystals into the appropriate socket. The absence of crystals in a position will not result in damage should the channel switch be in that position, nor will there be the chance of spurious output since the R. F. Power Amplifier is neutralized.

3 - 3. TUBE AND SEMICONDUCTOR COMPLEMENT

V 1	.....	12 BA 6	.....	R. F. Amplifier
V 2	.....	6 J 6	.....	Mixer/Receive crystal oscillator
V 3	.....	12 BA 6	.....	I. F. Amplifier (455 kc)
V 4	.....	12 BA 6	.....	I. F. Amplifier (455 kc)
V 5	.....	12 A U 6	.....	Squelch
V 6	.....	12 A T 7	.....	A. F. Amplifier
V 7	.....	12 B H 7	.....	Audio power output and modulator
V 8	.....	6 A U 6	.....	Transmit crystal oscillator
V 9	.....	12 A Q 5	.....	Final amplifier, transmit
Q 1, Q 2	....	RCA 40050	...	Power oscillators
D 1	.....	Silicon Diode	....	Audio Detector, AVC
D 2	.....	Silicon Diode	....	Automatic noise limiter
D 3, D 4	....	Silicon Diodes	...	Fine tuning control
D 5, D 6	....	Silicon Diodes	...	Rectifiers

3 - 4. CRYSTAL COMPLEMENT

Both receiver and transmitter crystals for the MODEL "H" are fundamental type crystals operating at one-half the normal frequency. This gives more stable operation as opposed to the one-third overtone type. They are manufactured with 0.050 inch diameter pins on 0.486 inch spacing, to a tolerance of 0.0025%.

Chan. No.	Channel Freq. (mc)	Receiver Crystal Freq. (mc)	Transmitter Crystal Freq. (mc)	Chan. No.	Channel Freq. (mc)	Receiver Crystal Freq. (mc)	Transmitter Crystal Freq. (mc)
1	26.965	13.255	13.4825	13	27.115	13.330	13.5575
2	26.975	13.260	13.4875	14	27.125	13.335	13.5625
3	26.985	13.265	13.4925	15	27.135	13.340	13.5675
4	27.005	13.275	13.5025	16	27.155	13.350	13.5775
5	27.015	13.280	13.5075	17	27.165	13.355	13.5825
6	27.025	13.285	13.5125	18	27.175	13.360	13.5875
7	27.035	13.290	13.5175	19	27.185	13.365	13.5925
8	27.055	13.300	13.5275	20	27.205	13.375	13.6025
9	27.065	13.305	13.5325	21	27.215	13.380	13.6075
10	27.075	13.310	13.5375	22	27.225	13.385	13.6125
11	27.085	13.315	13.5425	23	27.255	13.400	13.6275
12	27.105	13.325	13.5525				

$$\text{RECEIVER CRYSTAL FREQ.} = \frac{\text{CHAN. FREQ. (MC)} - 0.455 \text{ MC}}{2}$$

$$\text{TRANSMITTER CRYSTAL FREQ.} = \frac{\text{CHAN. FREQ.}}{2}$$

ALWAYS GIVE MODEL OF EQUIPMENT WHEN ORDERING CRYSTALS.

3 - 5. PANEL CONTROLS

A. FRONT

VOLUME CONTROL, Power On/Off: CW rotation turns set on and increases volume.

SQUELCH: CW rotation restricts audio output until a signal is received, thereby eliminating annoying noises and background "hiss". Rotate control CW without a signal just until the noise disappears. Do not go beyond this point since it will take too strong a signal to overcome the squelch threshold.

FINE TUNING: Compensates for the frequency tolerances of other transmitters that are being received. Rotation of the control can shift the receiver frequency a total of 4 kc. The exact position of the control is immaterial and should not be used as a standard of comparison since the receiver crystals may vary 500 cycles.

CHANNELS: Switch selects any of the 7 crystal-controlled channels for both receiving and transmitting as well as the "external" position for 16 pair of plug-in crystals.

ANL: Automatic Noise Limiter is turned on by pushing the Squelch control knob "in". Pulling the control out disables the ANL. Slight audio clipping in the form of distortion is a by-product of effective Noise Limiting when the received signal is modulated above 85%. This slight distortion is normal.

The ANL switch in the "OFF" position allows for good "noise detection" when suppressing noise sources in mobile installations.

B. SIDE

TUNING: Located closest to front panel. This resonates the R. F. power amplifier to frequency.

LOADING: Matches the impedance of the antenna to the R. F. power amplifier.

C. REAR

ANTENNA CONNECTOR: Use matching male connector, type PL259 for RG-8 coaxial cable and PL259 with adapter for RG-58A/U.

EXTERNAL SPEAKER JACK: For external 4 ohm P. M. speaker.

SONAR-CALL: Socket for Sonar-Call two-tone squelch. The socket is not wired as standard factory equipment.

"S" METER: Socket for external "S" Meter and test point for P. A. grid voltage indication.

SECTION 4 - INSTALLATION

4 - 1. MOBILE INSTALLATION

Mount the "U" bracket supplied with the Model "H" under the dash panel using the bracket itself as a location template. Drill holes for the self-tapping type of screw. If possible use nut, bolts and lock washers. A hole is supplied on the rear panel for an additional strap. The use of a wing bolt will facilitate easy removal for servicing. Do not crowd the Model "H"; leave room for ventilation. The 12 VDC power cord has a cigar lighter receptacle adapter plug. In all cases, be sure to observe polarity.

4 - 2. MOBILE NOISE SUPPRESSION

The Model "H" Gated Noise Limiter is very effective in the reduction of noise, but this alone is not effective against all the different noises in a mobile installation. Particular attention is called to:

A. BONDING: The use of 1" copper braid to interconnect parts of the automobile that can radiate noise such as:

- (1) Hood to firewall
- (2) Rear bumper to body and chassis
- (3) Rear light fixtures to body
- (4) Tailpipe to body
- (5) Either side of muffler to body and chassis
- (6) Chassis to body in several places
- (7) Ignition coil body to firewall

When braid connections are made, be sure to clean the metal "bright" and coat with grease before tightening the connection. This will prevent contact corrosion which is the chief cause of noise.

A very good method for locating noisy fixtures is to put the Model "H" into operation and connect a 25' length of coaxial cable to the antenna connector on the rear of the Model "H". The other end of the coaxial cable should have the center conductor showing for about 1/2". This bare end of the coax will serve as a "noise probe." With the receiver volume turned up and squelch "off", touch the "noise probe" to all parts of the automobile (except the electrical system). A large increase in noise will indicate a noisy section. This section should then be bonded and rechecked. Continue this process until a substantial reduction of noise is achieved. Remember, ungrounded metal parts can radiate noise.

B. IGNITION RADIATION SUPPRESSION requires the use of resistor spark plugs, feed-thru capacitors and distributor suppressors. Of prime importance is a properly adjusted ignition system. The following steps serve only as a guide, since many noise suppression kits are available for different makes of engines:

- (1) SPARK PLUGS: Install resistor spark plugs or Belden IRS cable.
- (2) DISTRIBUTOR CAP: Install suppressor resistor or IRS cable between distributor cap and ignition coil.
- (3) GENERATOR: Install 0.5 mfd coaxial capacitor (Sprague #48P18 or equivalent) at the "A" terminal of the generator.
- (4) ALTERNATORS: Require no attention except when the diodes become defective or when the "slip-rings" are dirty.
- (5) IGNITION COIL PRIMARY: Install 0.1 mfd coaxial capacitor (Sprague #48P9 or equivalent) in the lead from ignition switch to coil. Keep capacitor close to coil terminal. Brighten the metal around the coil mounting bracket to engine block, apply grease and retighten mounting screws.
- (6) (a) REGULATOR FIELD TERMINAL: Connect 39 ohm resistor in series with 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 0.5 mfd coaxial capacitor at the alternator output terminal.
- (2) Install 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. The shorter antenna is a compromise. A low-loss transmission line of 12 to 14 feet of RG-58A/U cable is recommended to provide a low standing-wave ratio.

Antenna mounts are available to suit any installation. The most practical types are 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 coiled spring are used together. REMEMBER: ALWAYS BRIGHTEN THE BODY METAL FOR A GOOD COAXIAL SHIELD GROUND!

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 "H" 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

Inspect the Model "H" after unpacking. Connect it to the power source and antenna system. Turn the set "ON" and allow three minutes to "warm up". Set channel switch. Plug in microphone and depress the microphone push button. The lamp should indicate antenna current. Adjust C33 and C34 for maximum brilliance of "ANT" indicator. C35 adjusts the "ANT" lamp to half brilliance. Do not allow this lamp to glow to full brilliance. All adjustments should be made at channels 9, 10 or 11 in order to insure even output for all channels within + 10%.

5 - 2. RECEIVER

Set the receiver controls as follows:

Volume 1/2 CW
Squelch full CCW
Fine Tuning. center

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 as this will make the receiver insensitive. Rotate Fine Tuning for best response.

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

5 - 3. CRYSTALS

The Model "H" is shipped from the factory with one pair of crystals (transmit and receive). Additional crystals can be purchased and inserted in the remaining 6 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.
- (5) Make sure external crystals are inserted properly. Failure to do so can result in an FCC violation.

6 - 3. ALIGNMENT - TRANSMITTER

A. EQUIPMENT

- (1) VTVM and RF Probe
- (2) 50 ohm dummy load

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 4 of "S" meter socket. Set VTVM to 50 VDC range.
- (5) Press microphone button and adjust L3 for maximum VTVM reading, (about -30 VDC or more). Remove probe.
- (6) Adjust C33 and C34 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.
- (7) Reneutralization of the R. F. Power Amplifier is necessary only if the tube is changed. Disconnect jumper on terminal strip so that B+ is removed from RFC3 and R30 (plate and screen).
- (8) Disconnect antenna load and connect R. F. probe to antenna socket.
- (9) Press microphone button. Adjust C28 for minimum reading. Readjust C33 for maximum and C28 for minimum.
- (10) Reconnect jumper to apply B+ to the R. F. P. A. (V9).
- (11) Retune transmitter into antenna load (or 50 ohm dummy).
- (12) Neutralization is complete if R. F. output voltage is zero and no oscillation occurs when the transmit crystal is removed.

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 transmitter oscillator is adjusted by C21.

The crystal oscillators are factory calibrated using zero tolerance standards. Sonar crystals are ground 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 transmitter oscillator, C21 is adjusted so that the frequencies average out their error about the exact frequency.

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

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

VOLTAGE CHART

NO.	TUBE	POSITION	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V 1	12BA6	TRANSMIT	—	—	—	—	—	—	—		
		RECEIVE	-0.9	0	0	12.6 VAC	+260	+54	0		
V 2	6J6	TRANSMIT	—	—	—	—	—	—	—		
		RECEIVE	+85	+126	12.6 VAC	6.3 VAC	-4.2	-1.0	+0.16		
V 3	12BA6	TRANSMIT	—	—	—	—	—	—	—		
		RECEIVE	-0.9	0	0	12.6 VAC	+260	+120	+1.3		
V 4	12BA6	TRANSMIT	—	—	—	—	—	—	—		
		RECEIVE	-0.9	0	0	12.6 VAC	+268	+100	+2.6		
V 5	12AU6	TRANSMIT	—	—	—	—	—	—	—		
		RECEIVE	-0.9	0	0	12.6 VAC	+17	0	0		
V 6	12AT7	TRANSMIT	+75	+2.1	+4.2	0	12.6 VAC	+260	0	+2.3	6.3 VAC
		RECEIVE	+90	+18	+24	0	12.6 VAC	+260	0	+2.3	6.3 VAC
V 7	12BH7	TRANSMIT	+260	0	+10	12.6 VAC	0	+260	0	+8	6.3 VAC
		RECEIVE	+260	0	+10	12.6 VAC	0	+260	0	+8	6.3 VAC
V 8	6AU6	TRANSMIT	-24	0	0	6.3 VAC	+250	+220	+0.15		
		RECEIVE	—	—	—	—	—	—	—		
V 9	12AQ5	TRANSMIT	-45	0	0	12.6 VAC	+250	+150	-45		
		RECEIVE	—	—	—	—	—	—	—		

NOTES

1. LINE VOLTAGE MAINTAINED AT 117 VAC.
2. VOLUME AND SQUELCH CONTROLS AT FULL CCW ROTATION.
3. FINE TUNING AT MID RANGE (KNOB POINTER ALIGNED WITH DOT ON PANEL).
4. 50 OHM DUMMY LOAD CONNECTED TO OUTPUT.
5. ALL VOLTAGE MEASUREMENTS MADE WITH A VTVM (11 MEGOHM INPUT)
6. ALL VOLTAGE MEASUREMENTS MADE FROM SOCKET PIN TO GROUND (CHASSIS)
7. ALL VOLTAGES D.C. UNLESS OTHERWISE INDICATED.
8. VOLTAGE MAY VARY $\pm 15\%$.

RESISTANCE CHART

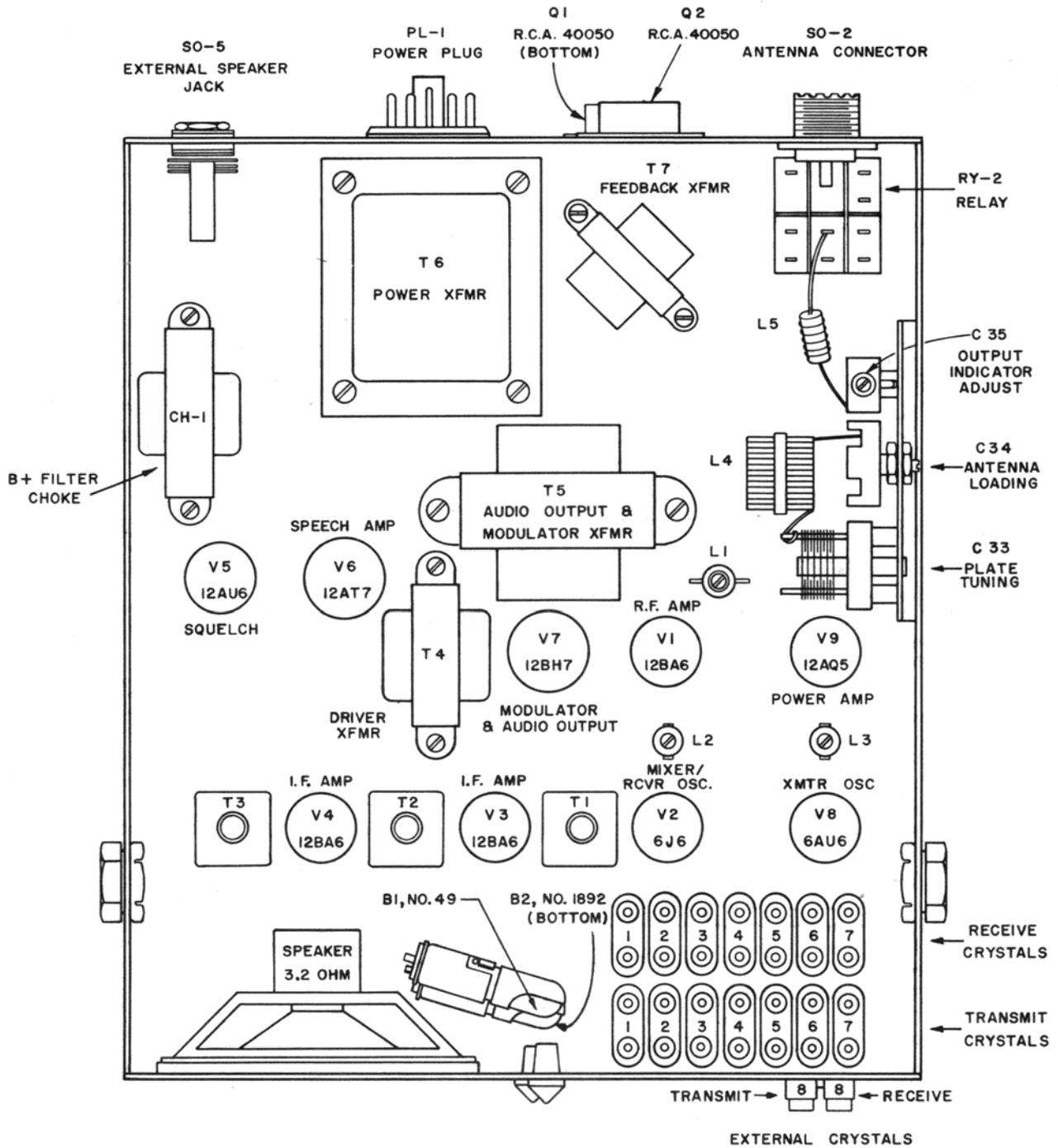
NO.	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V 1	12BA6	3.0 M	0	0	FIL	80 K *	175 K *	0		
V 2	6J6	110 K	110 K	FIL	1.5	100 K	100 K	11		
V 3	12BA6	3.0 M	0	0	FIL	70 K *	100 K *	100		
V 4	12BA6	3.0 M	0	0	FIL	70 K *	120 K *	62		
V 5	12AU6	3.0 M	0	0	FIL	450 K	150 K	0		
V 6	12AT7	600K	1.75 M	13 K	0	FIL	75 K *	500 K	220	FIL
V 7	12BH7	75 K *	140	470	FIL	0	75 K *	120	470	FIL
V 8	6AU6	110 K	0	0	FIL	70 K *	85 K *	INF		
V 9	12AQ5	27 K	INF	0	FIL	70 K *	200 K *	27 K		

LEGEND

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

NOTES

1. POWER SWITCH - "OFF"
2. SQUELCH CONTROL AT FULL CW ROTATION.
3. FINE TUNING AT MID RANGE (KNOB POINTER ALIGNED WITH DOT ON PANEL)
4. ALL RESISTANCE MEASUREMENTS MADE WITH A VTVM (11 MEGOHM INPUT)
5. ALL RESISTANCE MEASUREMENTS MADE FROM SOCKET PIN TO GROUND (CHASSIS)
6. ALL RESISTANCE VALUES ARE IN OHMS.
7. RESISTANCE MAY VARY $\pm 15\%$.



MODEL "H" PARTS IDENTIFICATION

TOP VIEW

PARTS LIST - MODEL "H"

DIAGRAM NO.	DESCRIPTION	SONAR PART NO.	* LIST PRICE	DIAGRAM NO.	DESCRIPTION	SONAR PART NO.	* LIST PRICE
R1, 2, 4, 6, 19, 25, 30, 39, 40	Resistor, Fixed, Composition 100 K Ohms, 10%, 1/2 w	01-104-531	\$0.25	R46	Resistor, Fixed, Composition 470 Ohms, 10%, 1 w	01-471-631	\$0.35
R3	Resistor, Fixed, Composition 2.2 K Ohms, 10%, 1/2 w	01-222-531	0.25	R47	Resistor, Fixed, Wirewound 90 Ohms, 10%, 10 w	02-900-522	0.50
R5, 24	Resistor, Fixed, Composition 33 K Ohms, 10%, 1 w	01-333-631	0.25	R48	Resistor, Fixed, Wirewound 1.8 Ohms, 10%, 2 w	02-167-322	0.50
R7	Resistor, Fixed, Composition 100 Ohms, 10%, 1/2 w	01-101-531	0.25	R49, 50	Resistor, Fixed, Composition 180 Ohms, 10%, 1 w	01-181-631	0.35
R8, 11, 45	Resistor, Fixed, Composition 47 K Ohms, 10%, 1/2 w	01-473-531	0.25	R51	Resistor, Fixed, Composition 47 Ohms, 10%, 1 w	01-470-631	0.35
R9, 27	Resistor, Fixed, Composition 1 K Ohms, 10%, 1/2 w	01-102-531	0.25	C1, 2, 4, 8	Capacitor, Fixed, Ceramic 25 MMFD, 10%, 1 KVDC, NPO	04-255-001	0.50
R10	Resistor, Fixed, Composition 62 Ohms, 10%, 1/2 w	01-620-531	0.25	C3, 16, 18, 20, 24, 29, 31, 41, 43	Capacitor, Fixed, Ceramic .001 MFD, GMV, 500 VDC	04-103-004	0.50
R12, 33	Resistor, Fixed, Composition 10 K Ohms, 10%, 1/2 w	01-103-531	0.25	C5, 19A, 26	Capacitor, Fixed, Ceramic 10 MMFD, 10%, 1 KVDC, NPO	04-105-001	0.50
R13, 18, 42, 43	Resistor, Fixed, Composition 470 K Ohms, 10%, 1/2 w	01-474-531	0.25	C6, 7, 9, 10, 11, 12, 13, 27, 36, 38, 49	Capacitor, Fixed, Ceramic .01 MFD, +80 -20, 500 VDC	04-102-012	0.50
R14, 15	Resistor, Fixed, Composition 33 K Ohms, 10%, 1/2 w	01-333-531	0.25	C14	Capacitor, Fixed, Dur-Mica 200 MMFD, 10%, 500 VDC	07-204-002	0.50
R16	Resistor, Fixed, Composition 2.2 M Ohms, 10%, 1/2 w	01-225-531	0.25	C15	Capacitor, Fixed, Ceramic .05 MFD, +80 -20, 100 VDC	04-502-003	0.75
R17	Resistor, Variable, Composition 500 K Ohms, Volume Control with On-Off Power Switch	03-504-018	2.00	C17, 18A	Capacitor, Fixed, Mylar .22 MFD, 20%, 400 VDC	05-221-022	1.00
S3	Resistor, Fixed, Composition 220 K Ohms, 10%, 1/2 w	01-224-531	0.25	C19	Capacitor, Fixed, Dur-Mica 50 MMFD, 10%, 500 VDC	07-505-002	0.50
R20, 23, 31, 34	Resistor, Fixed, Composition 6.8 K Ohms, 10%, 1/2 w	01-682-531	0.25	C21	Capacitor, Variable, Ceramic 3 - 12 MMFD, NPO	08-610-017	1.50
R38	Resistor, Variable, Composition 500 K Ohms, Fine Tuning Control	03-504-003	2.00	C22	Capacitor, Fixed, Ceramic 3.9 MMFD, 10%, 1 KVDC, NPO	04-396-001	0.50
R22	Resistor, Fixed, Composition 15 K Ohms, 10%, 1/2 w	01-153-531	0.25	C23	Capacitor, Fixed, Dur-Mica 85 MMFD, 5%, 300 VDC	07-855-007	0.50
R26	Resistor, Fixed, Composition 27 K Ohms, 10%, 1/2 w	01-273-531	0.25	C25	Capacitor, Fixed, Ceramic 2.7 MMFD, ±.25, 1 KVDC, NPO	04-276-001	0.50
R28	Resistor, Fixed, Composition 1 M Ohms, 10%, 1/2 w	01-105-531	0.25	C28	Capacitor, Variable, Compression Mica 55 - 300 MMFD	09-210-023	1.50
R29, 35	Resistor, Fixed, Composition 10 M Ohms, 10%, 1/2 w	01-106-531	0.25	C30	Capacitor, Fixed, Ceramic 2.2 MMFD (Gimmick)	04-226-007	0.50
R32	Resistor, Fixed, Composition 390 K Ohms, 10%, 1/2 w	01-394-531	0.25	C32	Capacitor, Fixed, Ceramic .001 MFD, GMV, 1400 VDC	04-103-016	0.50
R36	Resistor, Fixed, Composition 4.7 K Ohms, 10%, 1/2 w	01-472-531	0.25	C33	Capacitor, Variable, Air 3.9 - 31.9 MMFD, Plate Tuning	08-150-012	3.00
R37	Resistor, Variable, Composition 500 K Ohms, Squelch Control with On-Off ANL Switch(push-pull)	03-504-040	2.50	C34	Capacitor, Variable, Compression Mica 180-690 MMFD, Antenna Loading	09-210-022	1.50
R41	Resistor, Fixed, Composition 220 Ohms, 10%, 1/2 w	01-221-531	0.25	C35	Capacitor, Variable, Compression Mica 1-35 MMFD, Output Indicator Adjust	09-110-011	0.75
S2	Resistor, Fixed, Composition 18 K Ohms, 10%, 1/2 w	01-183-531	0.25	C37	Capacitor, Fixed, Mylar 0.1 MFD, 20%, 250 VDC	05-101-025	0.75
R44							
R21							

* MINIMUM CHARGE \$5.00. PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

PARTS LIST - MODEL "H"

DIAGRAM NO.	DESCRIPTION	SONAR PART NO.	* LIST PRICE	DIAGRAM NO.	DESCRIPTION	SONAR PART NO.	* LIST PRICE
C39	Capacitor, Fixed, Ceramic 150 MMFD, 10%, 1 KVDC	04-154-002	\$ 0.50	CH2	Choke, Hash	22-100-003	\$ 1.00
C40	Capacitor, Fixed, Min. Electrolytic 5 MFD, 64 VDC	06-530-043	1.00	RFC1, RFC2	Choke, R. F., 134 Microhenries	22-060-004	1.00
C42A-B	Capacitor, Fixed, Electrolytic 10 + 30 MFD, 350 VDC	06-230-001	2.00	RY1, RY2	Choke, R. F., 21 Microhenries	22-060-005	1.00
C44	Capacitor, Fixed, Min. Electrolytic 4 MFD, 10 VDC	06-530-042	1.00	S1A, B	Relay, 3 PDT, 110 VDC	16-010-010	7.50
C45, 46	Capacitor, Fixed, Ceramic .005 MFD, 20%, 1 KVDC	04-503-008	0.50	SO1	Switch, 8 position crystal	51-010-006	25.00
C47, 48	Capacitor, Fixed, Electrolytic 80 MFD, 150 VDC	06-130-035	2.00	SO2	Socket, "S" Meter, 4 pin	13-130-001	0.50
C50	Capacitor, Fixed, Electrolytic 500 MFD, 15 VDC	06-130-039	1.50	SO3-A	Connector, Antenna, SO-239	15-120-001	1.50
C51, 52	Capacitor, Fixed, Ceramic .01 MFD, +80 - 20, 1 KVDC	04-102-006	0.75	SO3-B	Cable, Power, 12 VDC	59-010-004	4.95
C53	Capacitor, Fixed, Ceramic .01 MFD, +80 - 20, 100 VDC	04-102-003	0.50	SO4	Cable, Power, 117 VAC	59-010-003	4.95
V1, V3, V4	Electron Tube, 12BA6	19-010-007	1.50	SO5	Jack, Microphone	15-010-001	0.75
V2	Electron Tube, 6J6	19-010-037	2.00	PL1	Jack, External Speaker	15-010-003	0.75
V5	Electron Tube, 12AU6	19-010-009	2.00	F1	Plug, Power, 11 Contacts	13-070-004	0.50
V6	Electron Tube, 12AT7	19-010-023	2.50	F2	Fuse, 3AG, 1 Amp.	42-010-021	0.50
V7	Electron Tube, 12BH7	19-010-020	2.50		Fuse, 3AG, 7.5 Amp.	42-010-014	0.50
V8	Electron Tube, 6AU6	19-010-012	2.00		Speaker, 3" PM, 3.2 Ohms	36-043-009	4.00
V9	Electron Tube, 12AQ5	19-010-001	2.50		Microphone w/plug	57-010-005G	17.95
Q1, Q2	Transistor, Power, RCA 40050	19-020-022	3.00		Socket, Sonar-Call, 8 Contacts	13-030-006	0.50
D1, D2	Diode, Silicon	19-080-001	1.00		Socket, Power, 11 Contacts	13-080-001	0.50
D3, D4, D5, D6	Diode, Silicon, 600 PIV	19-040-002	1.00		Power Socket Cap w/Cable Clamp	26-040-001	0.50
B1	Bulb, #49, Output Indicator	19-060-003	0.25		Fuseholder	42-020-003	0.50
B2	Bulb, #1892, Pilot Lamp, Neon	19-060-002	0.40		Socket, Crystal	13-100-003	0.50
NE-2	Lamp, Neon	19-070-003	0.25		Socket, Electron Tube, 9 Contact Min.	13-020-002	0.50
T1	Transformer, I. F., 455 KC	22-010-019	3.00		Socket, Electron Tube, 7 Contact Min.	13-010-002	0.50
T2, T3	Transformer, I. F., 455 KC	22-010-020	3.00		Socket, Electron Tube, 7 Contact Min. 9 Contact Socket Base (for V8)	13-010-006	0.75
T4	Transformer, Driver	14-020-001	4.00		Socket, Pilot Light	13-110-001	1.50
T5	Transformer, Modulator & Audio Driver	14-050-009	7.50		Knob, Gray, Channel Selector	33-010-009	0.50
T6	Transformer, Power, 12VDC or 117VAC	14-010-031	15.00		Knob, Blue-Gray, Volume, Squelch Fine Tuning	33-010-008	0.50
T7	Transformer, Feedback	14-110-002	5.00		Bushing, Gimbal Mtg.	34-070-019	0.50
L1	Coil, Rcv. Antenna	22-030-001	2.00		Knob, Knurled, Gimbal Mtg.	34-060-006	0.50
L2	Coil, Rcv. R. F. Amp. Plate	22-050-001	2.00		Front Panel	11-020-050	10.00
L3	Coil, Xmtr. Oscillator	22-040-002	2.00		Back Panel	11-020-056	10.00
L4	Coil, Xmtr. R. F. Amp. Plate	22-070-001	2.00		Speaker Grille	11-030-012	2.00
L5	Coil, Low Pass Filter	22-090-003	1.00		Chassis	11-010-001	15.00
CH1	Choke, Filter, 1.5 Henries	14-070-001	4.00		Cabinet - Top Shell	28-020-005	5.00
					Cabinet - Bottom Shell	28-020-006	5.00
					Gimbal	28-070-004	2.50
					Jewel, Pilot Lamp, Red	25-020-001	0.50
					Jewel, Pilot Lamp, Green	25-020-002	0.50
					Instruction Manual	44-010-042A	3.00

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