BRUTE

MODEL SBE-34CB

SERVICE MANUAL

SBE®

TABLE OF CONTENTS

ILLUSTRATIONS

SECTION 1
GENERAL

1.1 CUSTOMER SERVICE

The SBE Technical Services Department functions as a source of information on the application, installation and use of SBE products. In addition, the Technical Services Department provides technical consultation on service problems and availability of local and factory repair facilities.

In any communications to the Technical Services Department, please include a complete description of your problems or needs, including model and serial numbers of the unit or units in question, accessories being used, any modifications or attachments in use, or any non-standard installation details.

For assistance on any of the above matters, please contact SBE, Incorporated, Technical Services Department, 220 Airport Boulevard, Watsonville, California 95076. Phone: 408/722-4177.

1.2 PARTS ORDERS

SBE original replacement parts are available from the Factory Parts Department at 1045 Main Street, Watsonville, California 95076.

When ordering parts, please supply the following information:

Model number of the unit.
Serial number of the unit.
Part number.
Description of the part.

1.3 FACTORY RETURNS

Repair services are available locally through SBE Certified Service Stations across the country. A list of these Service Stations is available upon request from the Technical Services Department. Do not return any merchandise to the Factory without authorization from the Factory.

SECTION 2

SPECIFICATIONS

2.1 GENERAL

Compliance	F.C.C. Type Accepted (Part 95, Class D)
Channels	23
Frequency Range	(26.965 - 27.255) MHz
Frequency Control	Crystals, Synthesized
Frequency Tolerance	±0.003%
Operating Temperature Range	-20°C to + 50°C
Humidity	95%
Input Voltage	(11.7 - 15.9) VDC positive or negative ground
Microphone	Dynamic
Size	2½"H (60mm), 6¾"W (170mm), 9-3/8"D (240mm)
Weight	2.2 lbs., 1.0 Kg.
PA Output	2 watts into an external 8Ω speaker
Power Consumption	13.8 VDC Receive (squelched) 0.2 amps Receive (2 watts audio) 0.35 amps Transmit (95% modulation) 1.4 amps
Fuse	2 amp fast blow (Type 3AG or A.G.C.)

2.2 RECEIVER

Sensitivity	0.7 uV for 10 db S+N/N ratio
Selectivity	6 db @ ±5 KHz, 40 db @ ±20 KHz, 50 db @ ±40 KHz
IF Frequency	455 KHz
AGC Response	Less than 10 db for 10 - 100,000 uV
Squelch Threshold	Less than 0.7 uV
Audio Power Output	2 watts @ 10% distortion

External Speaker	(Not Supplied) 4 or 8Ω. Disables internal speaker when connected.
Squelch Range	200 uV (Minimum)

2.3 TRANSMITTER

Power Output	4 watts (Maximum)
Modulation	95 - 100%
Modulator Response	300 - 2500 Hz
Output Impedance	50Ω, unbalanced
Emission	6A3

SECTION 3
INSTALLATION

GENERAL

The first step in installation of the mobile transceiver is selection of antenna and transceiver mounting positions.

The selection of an antenna and its mounting position is the most critical factor in determining the end performance of an installation. Generally, the most satisfactory installation position for most vehicles is the center of the passenger compartment roof. As a second choice, the trunk can be a satisfactory antenna mounting point, especially on those cars where the trunk is large and flat. Due to increased susceptibility to ignition noise, mounting the antenna in the hood area is discouraged. Follow antenna manufacturer's recommendations carefully during installation.

The SBE-34CB is supplied with a universal mounting bracket and microphone holder. The transceiver may be mounted in any position and on any rigid surface, such as underneath an automobile dashboard, truck roof or vertically on a boat bulkhead.

The transceiver should be mounted with accessibility and operation convenience in mind.

CAUTION: Avoid mounting the transceiver in the direct air stream of the vehicle's heater. Temperatures in this area can exceed 150° F and can result in serious damage to the unit.

It is recommended that the mounting bracket be installed on the transceiver and mounting clearances checked, with the unit held in the desired mounting position. It is especially important to leave sufficient space behind the unit for antenna and accessory cable connections.

When the most desirable mounting installation point has been decided upon, a pencil or other marking device should be used to outline the mounting bracket on the mounting surface. The transceiver should then be removed from the mounting bracket and the bracket held against the dash or other mounting surface, in the position marked, so that mounting holes may be marked and drilled.

CAUTION: Be sure to check behind the dash or other mounting surface to insure against damage of wiring and other devices before drilling any holes.

Install the microphone holder on the radio or other mounting surface as desired.

Install any accessories at this time, including external speaker, public address speaker, etc.

This unit is designed for either 12 volt positive or negative ground systems. In either system, the positive battery terminal always connects to the red supply wire, and the negative battery terminal always connects to the black supply wire. If the transceiver's power lead must be lengthened, use No. 14 or larger wire.

CAUTION: When using this radio in a positive ground system, it is important that none of the accessories are electrically connected to the vehicle's chassis (external speakers, P.A. speakers, etc.). Positive ground installations must utilize an additional 2 ampere fuse in the negative (black) supply lead to avoid possible damage to the transceiver. NOTE: The transceiver power lead may be connected to the accessory section of the ignition switch if desired. However, due to the possible presence of high-level noise from the ignition and accessories, this connection may not be desirable. In cases where excessive noise is present on the accessory line, a direct connection to the battery is recommended.

3.2 ANTENNA TUNING

The final step in installation is to trim the antenna for minimum S.W.R. The recommended method of antenna tuning is to use an in-line wattmeter or S.W.R. bridge to adjust the antenna for minimum reflected power on channel 11. A properly tuned antenna system will present a suitable load to the transceiver and will insure that maximum power is transfered from the radio to the antenna. If the antenna system in use presents a poor load, as indicated by a high S.W.R. reading, transmitter range will be substantially reduced and damage to the transmitter final amplifier transistor may occur. Poor S.W.R. can usually be corrected by altering the antenna's electrical length in accordance with the manufacturer's instruction. Extremely high S.W.R. readings may be indicative of a defective transmission line, antenna, or connections.

To determine whether the antenna should be lengthened or shortened, test the S.W.R. on channels 1 and 23. If the S.W.R. is the highest on channel 23, the antenna is too long and if highest on channel 1, the antenna is too short. When the antenna system has been tuned correctly, channel 11 should have the lowest S.W.R. and channels 1 and 23 will be slightly higher.

3.3 FINAL CHECK

Test drive the vehicle and make an operational check-out of the transceiver to insure proper operation of it and all the accessories installed. At this time, note any degradation of performance due to vehicle noise and take appropriate action to correct any noise suppression and deficiencies as outlined in the following section.

3.4 NOISE SUPPRESSION

The first step in assuring minimum ignition noise is to insure that the engine ignition system is in a good state of tune, and all factory original noise suppression devices are installed and operational. This includes an inspection of distributor points and condenser, check to see that the spark plugs are clean and properly adjusted. The condition of the ignition wiring should be checked (radio resistor type ignition wire is standard on most late model vehicles and should be installed on vehicles not so equipped). The distributor cap should be checked for traces of carbon tracking or signs of arcing. Resistor type spark plugs are helpful in further reducing ignition noise and are standard as original equipment on many late model vehicles.

Alternator noise may be minimized by the installation of an alternator line filter, available from radio parts distributors.

Installation of bonding straps in the engine compartment will further reduce ignition noise. Short lengths of metal strap or heavy shield braid between the engine and frame, engine and fire wall, alternator and frame, exhaust pipe and frame, or hood to frame, will in many cases, greatly reduce ignition noise. Extremely high ignition noise levels or noise levels that become worse after a period of time are usually indicative of deterioration of the vehicle's electrical system. In some cases, interference may be caused by dash instruments including gasoline gauges, heater blowers and fans, etc. This interference may often be reduced by the installation of bypass capacitors from the terminals of the interfering instruments to ground. .01 microfarad capacitors of the ceramic disc variety rated at 500 working volts DC are recommended for this purpose.

For further information on the suppression of ignition noise in the automotive and marine environment, the Champion Spark Plug Company publication "Giving Two Way Radio Its Voice" is highly recommended. This publication is available from the automotive technical service department Champion Spark Plug Company, Post Office Box 910, Toledo, Ohio 43661. This publication is also available, at no charge, from the SBE Technical Services Department, upon request.

SECTION 4

CIRCUIT DESCRIPTION

4.1 INTRODUCTION

The SBE-34CB is an AM transceiver with a single-conversion receiver using an intermediate frequency of 455 KHz.

Refer to the block and schematic diagrams while following the circuit description.

With the PA/CB switch (S3) in CB, the unit will operate as a Citizen Band transceiver.

TRANSMIT MODE is initiated by pressing the push-to-talk switch which:

disables the RF AMP (Q1 and Q2), the IF AMP (Q4), and the first stage of audio (Q5),

disables the CB SPEAKER by opening its ground return,

energizes PL2 – the red transmit indicator lamp,

forward biases D9 – the transmitter crystal switching diode,

enables the MIC AMP by grounding the emitter circuit of Q11 through D12,

biases D1 to protect Q1 – the 1st RF AMP.

RECEIVE MODE is initiated by releasing the push-to-talk switch which:

enables the RF AMP (Q1 and Q2), the IF AMP (Q4), and the first stage of audio (Q5),

enables the CB SPEAKER by closing its ground return,

enables the RF AMP (Q1 and Q2), the IF AMP (Q4), and the first stage of audio (Q5),

forward biases D10 – the receiver crystal switching diode,

disables the MIC AMP by lifting the emitter circuit of Q11.

PA MODE is initiated by placing the PA/CB switch (S3) in PA which:

disables the transmitter RF,

disables the CB SPEAKER,

enables the PA speaker jack, J3.

The push-to-talk switch then enables the MIC AMP.

4.2 RECEIVER

GENERAL

In the receive mode, the RF signal is fed from the antenna to the RF AMP (Q1). The amplified RF signal is then fed to Q2 – the mixer – where it is mixed with an injection signal 455 KHz above the receive channel frequency. The ceramic filter F1 selects the 455 KHz converted signal to be fed to the 1st and 2nd IF amplifiers Q3 and Q4. The amplified IF signal is then detected by D3 which also develops the AGC voltage. After passing through the automatic noise limiter, which will be discussed separately, the detected audio signal is applied across potentiometer VR1 – the volume control. The audio signal

developed on the VR1 wiper is then fed to audio amplifier stage Q5 which then feeds Q12. The output of Q12 is transformer coupled to push-pull speaker driver amplifier Q13 and Q14.

AUTOMATIC GAIN CONTROL CIRCUIT

The AGC (Automatic Gain Control) on the SBE-34CB reduces the gain of the RF and IF amplifiers in response to a strong signal by lowering their bias voltage. The rectified output of D3 is filtered by R20 and C22 to produce the AGC voltage which is then fed to the bases of Q1 by R4, Q2 by R7, and Q3 by R12.

AUTOMATIC NOISE LIMITER CIRCUIT

The ANL circuit prevents impulse noise, such as ignition noise, from being amplified. The audio output voltage from the detector diode D3 is halved by the voltage divider R22 and R23 and fed to the anode of D4 – the ANL diode. The audio output from D3 is also fed through R24 to C25 where it is filtered and then through R25 to the cathode of D4. Since the audio signal is negative, the signal at the cathode of D4 is normally more negative than the anode and the diode is forward biased providing a low impedance path for the audio to the first audio stage, Q5. When a noise pulse appears in the output of the detector, the time constant of R24 and C25 prevents the cathode of D4 from responding as fast as the anode. The anode of D4 is thus driven more negative than the cathode causing D4 to become backed biased. D4 then becomes a high impedance that blocks the noise.

SQUELCH CIRCUIT

The squelch circuit turns the audio off when the received signal is less than the threshold level as determined by the squelch control – VR2. If Q6 is off, R36, R34 and R27 form a voltage divider network that provides the proper forward bias to the base of Q5 permitting it to amplify the audio signal. Raising the wiper on VR2 tends to forward bias the base of Q6 which turns Q6 on. When Q6 is on, the bias is removed from the base of Q5 – the 1st audio stage – thus preventing amplification of the audio signal. As the received signal becomes stronger, the AGC voltage lowers the bias on the base of Q3 thus lowering its emitter voltage. This emitter voltage feeds the base of Q6 through R35. Lowering the base voltage on Q6 turns it off permitting Q5 to amplify audio. Thus raising the wiper on VR2 increases the threshold level a signal must overcome to turn Q6 off and permit Q5 to amplify audio.

4.3 TRANSMITTER

GENERAL

In transmit mode, the outputs of oscillators Q7 and Q9 are mixed in the TX MIXER Q10. The output of Q10 is then fed through BAND PASS FILTER L10, L11, and L12 (26.965 - 27.255 MHz) to the TX BUFFER Q16. The output of the BUFFER feeds the DRIVER Q17 which in turn feeds the RF POWER AMP Q18. The output of the RF POWER AMP is then fed through a low pass filter, L17, L18 and L19, and a second harmonic trap, C9 and L20, to the antenna. Modulation is accomplished by driving the collector of the RF POWER AMP Q18 through L16 and the collector of the TX DRIVER Q17 through R91 and L14 by the AUDIO OUTPUT AMP (Q13 and Q14).

OVERMODULATION CONTROL CIRCUIT

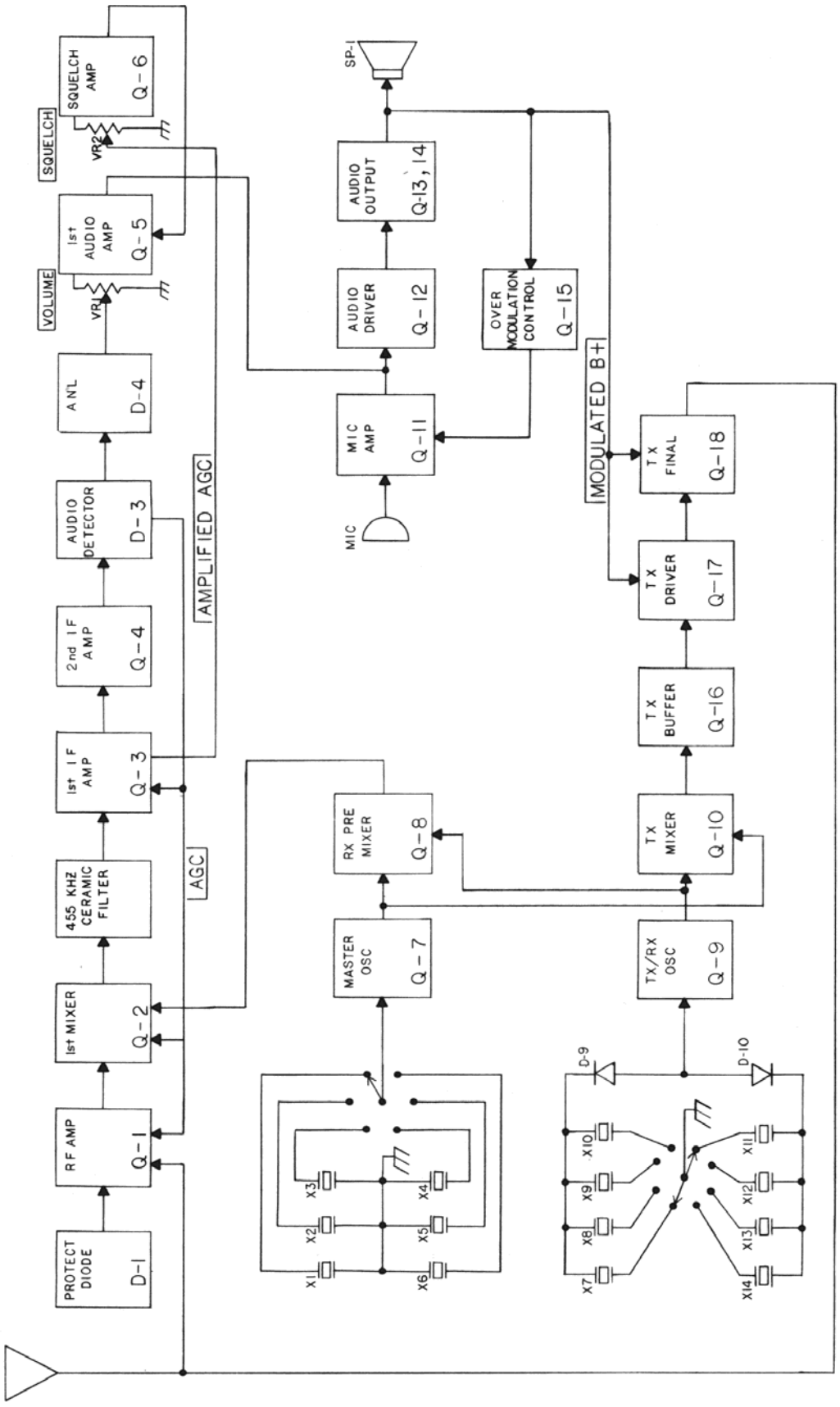
The OMC regulates the gain of the audio amplifier so as to accommodate a wide range of voice levels. The audio signal is fed from T2, the secondary of the audio output amplifier, to D11 where it is rectified; it is then filtered by R81 and C71 and fed to the base of Q15 – the OMC transistor. As the sound level

into the MIC increases, Q15 will begin conducting thus clamping the bottom of C55 to ground and reducing the signal level into Q11 — the MIC AMP.

FREQUENCY MIXING SCHEME

Channel Selector switch S1 selects one of six crystals (X1 - X6) for the master oscillator Q7 and one of four transmit (X7 - X10) or receive (X11 - X14) crystals for the transmit/receive oscillator Q9 (See Table 5-3). In receive mode, D9 is backed biased disconnecting any transmit crystals from the oscillator Q9; D10 is forward biased connecting the particular receive crystal selected by S1-b and -c. In transmit mode, the condition of the diodes is reversed and a particular transmit crystal is selected by S1-b and -c. The receiver injection signal is synthesized by mixing the output of Q7, the master oscillator, and Q9, the transmit/receive oscillator, in the RX PRE MIX Q8. Likewise, the transmit frequency is synthesized by mixing the output of Q7 and Q9 in the TX MIX Q10.

FIG. 4-1 SBE-34CB TRANSCEIVER BLOCK DIAGRAM



SECTION 5

SERVICING

5.1 INTRODUCTION

Read this section carefully before attempting any repair of the SBE-34CB. Refer to the circuit description, block and schematic diagrams. The transistor case diagrams are shown on the schematic diagram. Refer to these diagrams before checking transistors. Component layout and location prints are provided to aid troubleshooting and alignment. Use only recommended replacement parts. Refer to the parts list in the back of this book. **Never replace blown fuses with higher rated ones or fast acting with slow blow.** To check operation of the unit, refer to Table (5-1), PERFORMANCE VERIFICATION PROCEDURE. Figures (5-5, -6), TRANSMITTER TEST CONNECTION and RECEIVER TEST CONNECTION respectively, show the proper manner to connect the unit to test instruments for performance verification or alignment. Table (5-2) lists RECOMMENDED TEST INSTRUMENTS. Tables (5-7, -8) show the proper TRANSMITTER ALIGNMENT PROCEDURE and RECEIVER ALIGNMENT PROCEDURE respectively. Figure (5-9), ALIGNMENT LAYOUT, is placed next to the alignment procedures to show alignment adjustments at a glance.

5.2 TEST SIGNALS

OSCILLOSCOPE WAVEFORMS are shown which were taken from various points in the SBE-34CB during normal operation. Figure (5-11) shows RF amplification through a properly aligned transmitter. Figure (5-12) shows 50%, 100% and overmodulation respectively. Notice that the waveform at the collector of Q10 – the TX MIXER – contains several frequency components. Also notice that the waveform at the collector of Q18 – the TX FINAL – is unsymmetrical (Figure 5-12). This is proper since the TX FINAL operates class C for greater efficiency. Figure (5-12) shows how the output should look at the dummy load.

VOLTAGE MEASUREMENTS are shown on the schematic diagram for normal operation. RECEIVER INJECTION VOLTAGES are given in Table (5-10). This table specifies the voltage level, carrier frequency and particular points in the receiver string at which a 30% - 1 KHz modulated signal injected through a .01 MFD capacitor should produce 2 VAC of audio across the speaker or 8Ω load plugged into the speaker jack, EXT SP.

AGC VOLTAGES versus RF INPUT LEVEL are shown in Table (5-4). This table should be consulted before any adjustments are made on the squelch circuit since squelch is a function of AGC.

5.3 TROUBLESHOOTING

Troubleshooting the SBE-34CB transceiver is not essentially different than troubleshooting any other electronic device. Be a detective; suspect everything and everyone. Carefully inspect the unit for evidence of overheated components, cold solder joints, or tampering. Understand thoroughly the circuit description and block diagram. Try to start big and isolate the problem. Devise tests that will divide the transceiver in two and isolate the trouble to a particular half. Continue to divide into two parts until the trouble is located. For example, it is determined that a problem exists in the particular transceiver. The unit is divided into:

TRANSMITTER – RECEIVER.

Suppose that the transmitter puts out properly modulated carrier, but the receiver will not respond to a modulated RF signal at the proper frequency fed into the antenna jack. Since the transmitter modulates, it can be assumed that all of the audio amplifier except Q5 is good. After checking the TX/RX switch and receiver B+, the receiver is then divided into:

TABLE 5-1 PERFORMANCE VERIFICATION PROCEDURE

TRANSMITTER

INITIAL SET-UP
Connect the SBE-34CB to a 13.8 VDC supply. Connect a wattmeter and dummy load to the antenna jack.
STEP 1 Key the transmitter and observe that the transmit lamp is lit and that the output is at least 3 watts.
STEP 2 Whistle into microphone with transmitter keyed. Check for 90-100% modulation.
STEP 3 Connect counter to dummy load and check transmit frequencies on channels 1, 2, 3, 4, 8, 12, 16, and 20. (See Table 5-3.)

RECEIVER

INITIAL SET-UP
Connect SBE-34CB to 13.8 VDC supply. Connect RF signal generator to the antenna jack and set to 27.085 MHz 30% - 1 KHz modulation. Set the unit to channel 11; switch the PA/CB switch to CB. Turn the volume control full clockwise and the squelch control full counterclockwise. Connect 8Ω load to external speaker jack, EXT SP, and connect AC VTVM to 8Ω load. (See Figure 5-6.)
STEP 1 Adjust signal generator for 0.7 microvolts output. Verify that at least 4 VAC appear across the 8Ω load.
STEP 2 Increase signal generator output to 200 microvolts. Rotate squelch knob full clockwise. Receiver should squelch.
STEP 3 Set PA/CB switch to PA. Connect 8Ω load and AC VTVM to PA jack. Whistle into microphone with push-to-talk switch pressed. Check for a least 4 VAC audio.

BEFORE IF – IF and AFTER IF.

Table (5-10), RECEIVER INJECTION VOLTAGES, shows that the proper signal level to inject at the base of Q3 – the 1st IF AMP – to produce a 2 VAC signal at the speaker is 455 KHz @ 300 uV through a .01 MFD capacitor. If the signal appears at the speaker, the problem is in the RF amplifier. Divide this and continue until the trouble is found.

This technique is sometimes called "partitioning," "boxing-in-the-trouble," "divide and conquer," or "binary search"; it is mandatory for complex electronic systems, but can save time and energy on almost any electronic device.

A blown fuse should only be replaced by one of the proper rating and type. If the fuse blows again, replace it, but place an ohm meter at the power terminals in place of the supply. Make certain that the + side of the ohm meter is connected to the red power wire of the SBE-34CB. Some VOM's place the - side of the ohm meter out the red test jack. Observe that D13 protects the unit from a reversed supply. The push-to-talk, and PA/CB switch can be used to start isolating the short.

A fuse may blow only when the unit is connected in a vehicle because the vehicle has a positive ground and there is a short from the PCB ground to the chassis, or a grounded speaker was plugged into EXT SP J2.

The second harmonic trap (L20 and C91) is adjusted at the Factory; field adjustment should not be attempted without proper equipment. Failure of particular channels to work or be on frequency probably indicates a defective crystal. Refer to Table (5-3) SYNTHESIZER MIXING SCHEME. Notice that the same Transmit and Receive crystals are used every fourth channel while each Master crystal is used on four adjacent channels. Check channel selector switch, S1, by swapping crystals.

FIG. 5-2 RECOMMENDED TEST INSTRUMENTS

TEST INSTRUMENT	REQUIRED SPECIFICATIONS	USE	RECOMMENDED INSTRUMENT TYPE
R.F. Signal Generator	Output frequency: 26.965 to 27.255 MHz. Output level calibrated from .1 microvolts to 500,000 microvolts. Internal modulation capability of 30% minimum at 1 KHz. (Calibrated)	Receiver service and alignment.	Hewlett-Packard Model 606A or B. Wavetek Model 3000.
Oscilloscope	Vertical bandwidth of 25 MHz or greater at 3db point. Triggered sweep capability.	Transmitter and receiver test and alignment.	Tektronics Model T932. Tektronics Model 465. Hewlett-Packard Model 180. Phillips Model PM3260E.
Frequency Counter	Frequency range DC to 30 MHz. Sensitivity: 10mv R.M.S. at 30 MHz. Overall timebase accuracy ±.002%, 6 digit resolution.	Transmitter frequency check and synthesizer troubleshooting.	Heath-Schlumburger Model SM118A
Wattmeter	5 watts full scale into 50 ohm load ±5% accuracy.	Measure power output and S.W.R.	Bird Model 43 with type 5A element. (May be terminated with antenna load
AC VTVM	-40 to +20db range.	Measure audio output.	Heath Model IM-21.
Audio Oscillator	400 Hz to 4000 Hz output: Adjustable level, 0-1 volt output impedence 600 ohm.	Audio and modulator tests.	Hewlett-Packard Model 204C. Heath Model SG18A.
DC Power Supply	13.8 volt DC ±10% at 2 amperes.	Primary supply voltage for servicing.	Heath Model SP2720 (SBE Model SBE-1AC may be used if available.)

TABLE 5-3 SBE-34CB BRUTE

SYNTHESIZER MIXING SCHEME

Synthesizer Alignment

CH	CHANNEL FREQUENCY	MASTER OSC XTAL FREQ.	TX OSC XTAL FREQ.	RX OSC XTAL FREQ.
1	26.965		X7 = 10.635	X11 = 10.180
2	26.975	X1 = 37.600	X8 = 10.625	X12 = 10.170
3	26.985		X9 = 10.615	X13 = 10.160
4	27.005		X10 = 10.595	X14 = 10.140
5	27.015		X7	X11
6	27.025	X2 = 37.650	X8	X12
7	27.035		X9	X13
8	27.055		X10	X14
9	27.065		X7	X11
10	27.075	X3 = 37.700	X8	X12
11	27.085		X9	X13
12	27.105		X10	X14
13	27.115		X7	X11
14	27.125	X4 = 37.750	X8	X12
15	27.135		X9	X13
16	27.155		X10	X14
17	27.165		X7	X11
18	27.175	X5 = 37.800	X8	X12
19	27.185		X9	X13
20	27.205		X10	X14
21	27.215		X7	X11
22	27.225	X6 = 37.850	X8	X12
23	27.255		X10	X14

TABLE 5-4 AGC VOLTAGES versus RF INPUT LEVEL

INPUT LEVEL (1)	AGC VOLTAGES (2)
1uV	+1.35
10uV	+0.97
100uV	+0.80
1000uV	+0.70
10,000uV	+0.64

(1) Channel Frequency at Antenna Jack.

(2) Measured with 10MΩ input.

FIG. 5-5 TRANSMITTER TEST CONNECTION

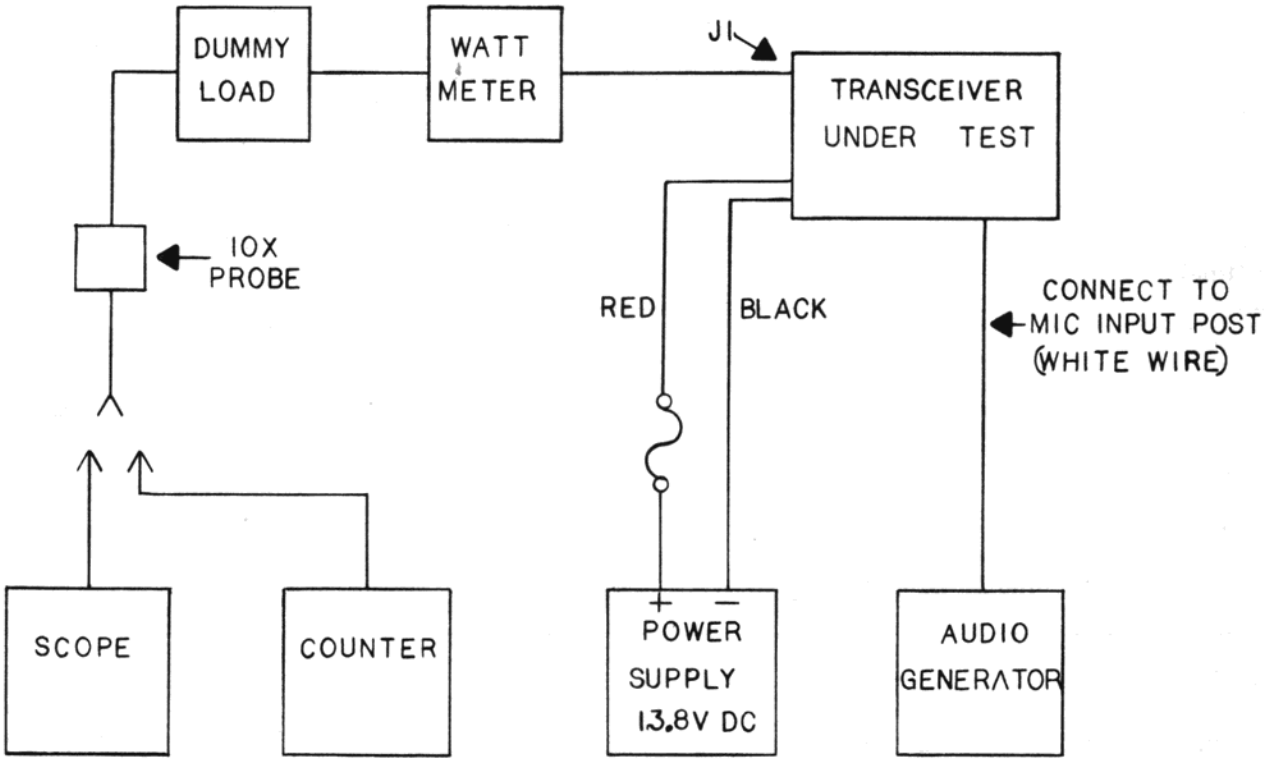


FIG. 5-6 RECEIVER TEST CONNECTION

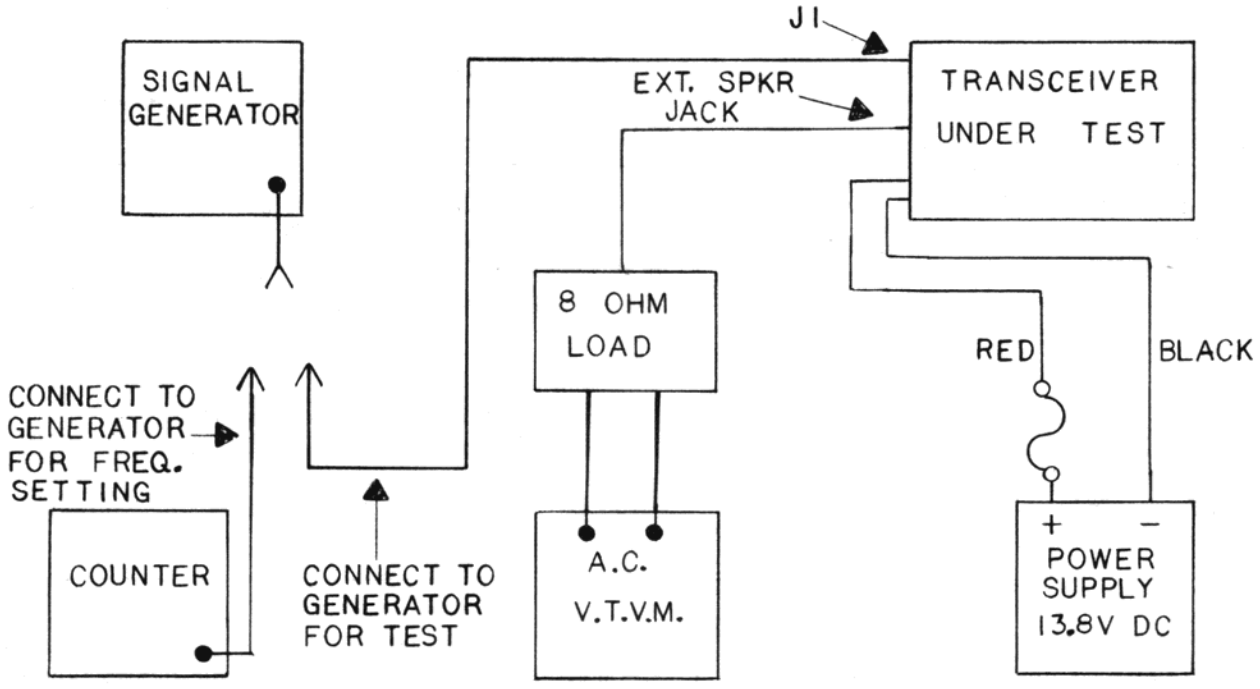


FIG. 5-7 TRANSMITTER ALIGNMENT PROCEDURE

INITIAL SET-UP
Connect the SBE-34CB transceiver to a 13.8 VDC supply. Connect an audio oscillator to the MIC input, a wattmeter and dummy load to the antenna jack, an oscilloscope to the dummy load, and set the channel selector to channel 11. (See Figure 5-5.)
STEP 1 With no modulation, key the transmitter and adjust L6, L10, L11, L13, L14, and L18 for maximum wattmeter indication.
STEP 2 With the transmitter keyed, observe the output envelope on the oscilloscope. Turn on the audio oscillator and set to 1 KHz and adjust output for approximately 50% modulation. (See Figure 5-12.)
STEP 3 Adjust L19 for maximum upward modulation.
STEP 4 Switch between channels 1 and 23. Readjust L6, L10, L11, L12, L13, L14 and L18 for minimum shift in power and to keep power under 4 watts.
STEP 5 Connect the frequency counter to the output of the dummy load. Check channels 1, 2, 3, 4, 8, 16, 20, and 23. (See Table 5-3.)

FIG. 5-8 RECEIVER ALIGNMENT PROCEDURE

INITIAL SET-UP
Connect an AC VTVM across the speaker 8Ω load plugged into the EXT SP. Connect the RF signal generator to the antenna jack, set to 27.085 MHz 30% - 1KHz modulation. Set the PA/CB switch to CB. Turn the squelch control full counterclockwise and the volume control full clockwise.
STEP 1 Adjust the RF output level of the signal generator to a level sufficient to produce approximately 2 VAC on the AC VTVM. Adjust L1, L2, L3, L4, L5, L7, and L8 for maximum indication on the AC VTVM. If at any time during the alignment procedure the audio level increases to more than 4 VAC, reduce the generator output level. Repeat adjustment until 0.7 microvolts RF signal produces approximately 2 VAC on the AC VTVM.
STEP 2 Turn squelch control full clockwise. Increase the RF signal generator output to 300 microvolts. Squelch should break. If squelch fails to break, adjust R32 to break squelch.

FIG. 5-9 ALIGNMENT LAYOUT

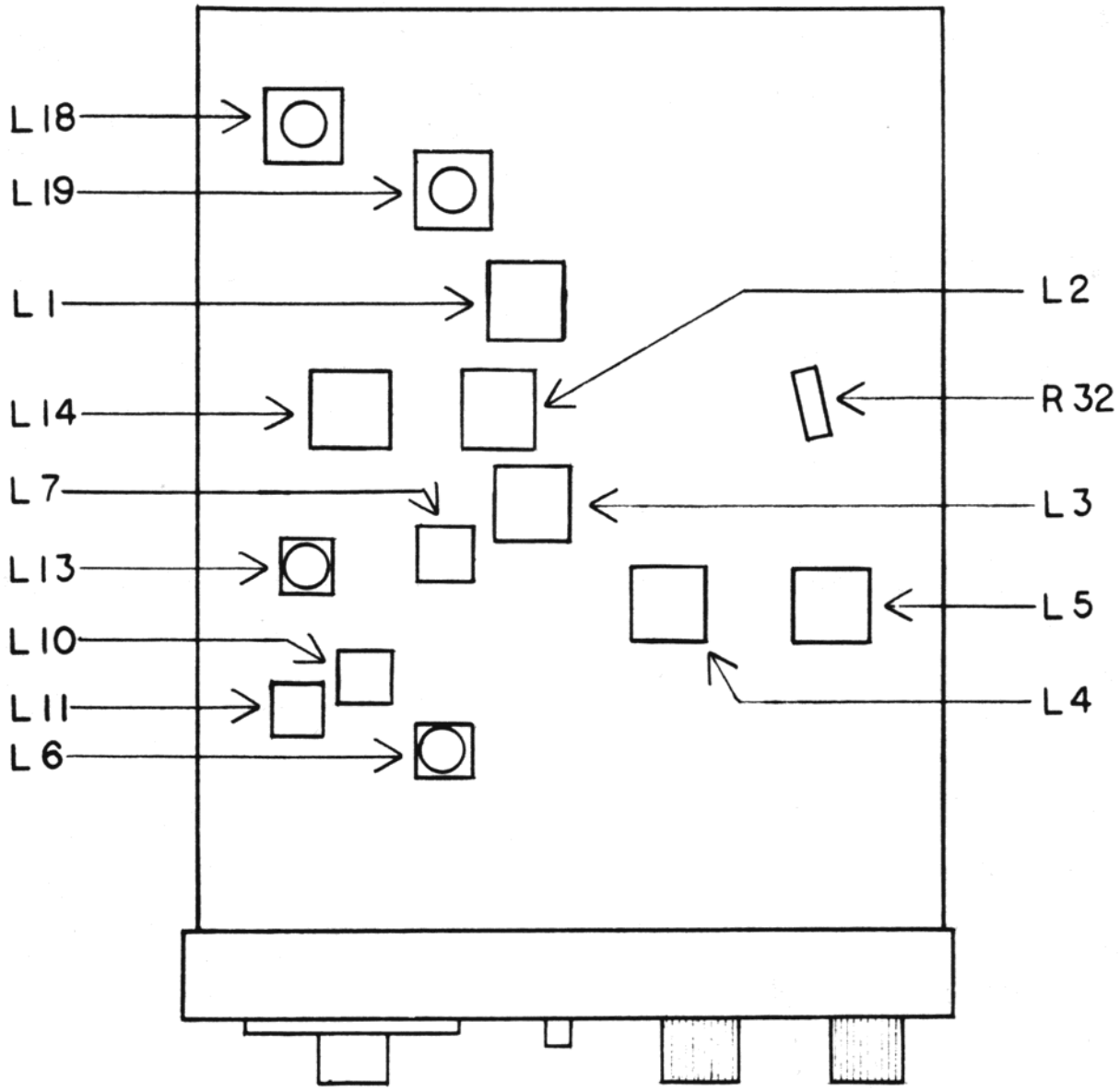
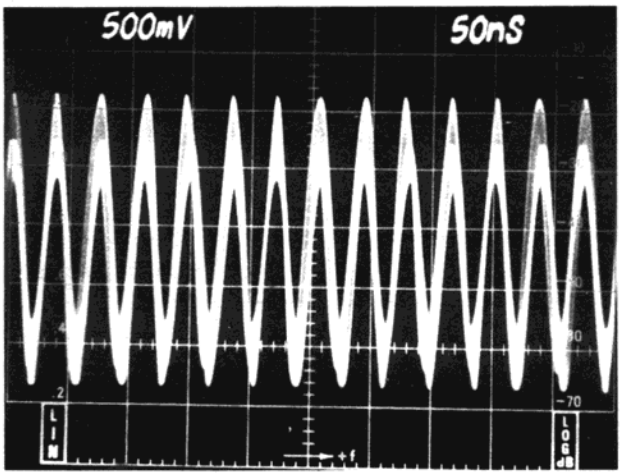


TABLE 5-10 RECEIVER INJECTION VOLTAGES

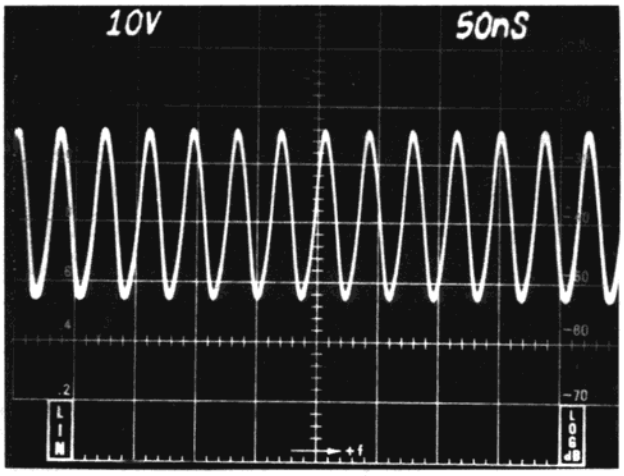
All injection voltages are at 30% - 1 KHz modulation, are fed through a .01 MFD capacitor and should produce at least 2 VAC across an 8Ω load connected at EXT SP J2.

INJECTION POINT	INJECTION LEVEL	FREQUENCY
ANT JACK	1uV	Channel Frequency
Base of Q1	1uV	Channel Frequency
Base of Q2	30uV	Channel Frequency
Base of Q3	300uV	455 KHz
Base of Q4	5000uV	455 KHz

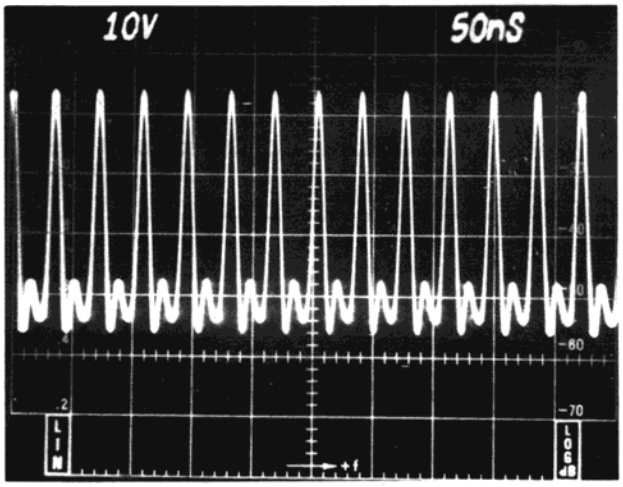
FIG. 5-11 TRANSMITTER ALIGNMENT WAVEFORMS



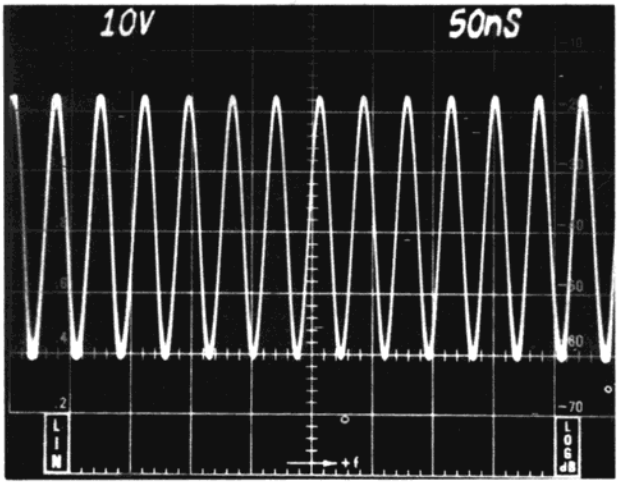
TX MIXER Q10
COLLECTOR



DRIVER Q17
COLLECTOR

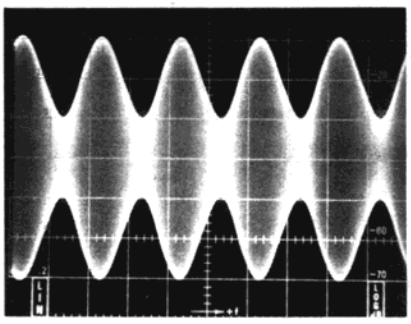


FINAL Q18
COLLECTOR

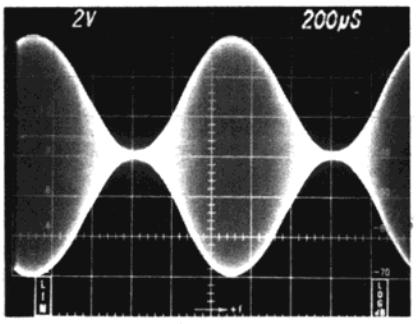


OUTPUT
DUMMY LOAD

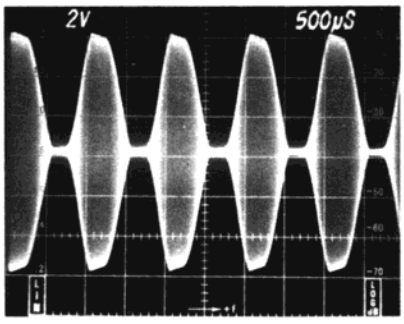
FIG. 5-12 MODULATION WAVEFORMS



50% MODULATION



100% MODULATION



OVERMODULATION

FIG. 5-13 COMPONENT LOCATION

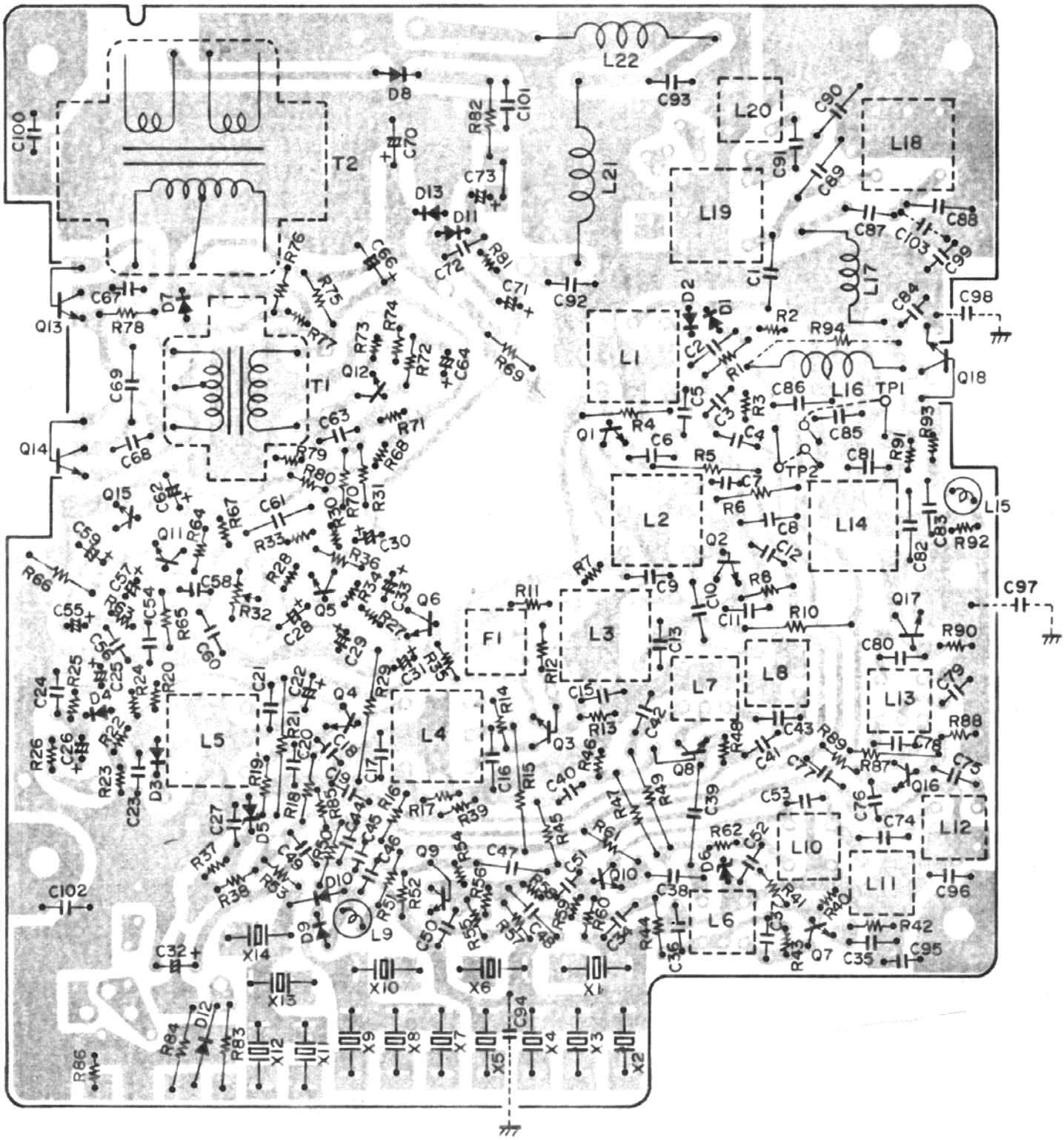
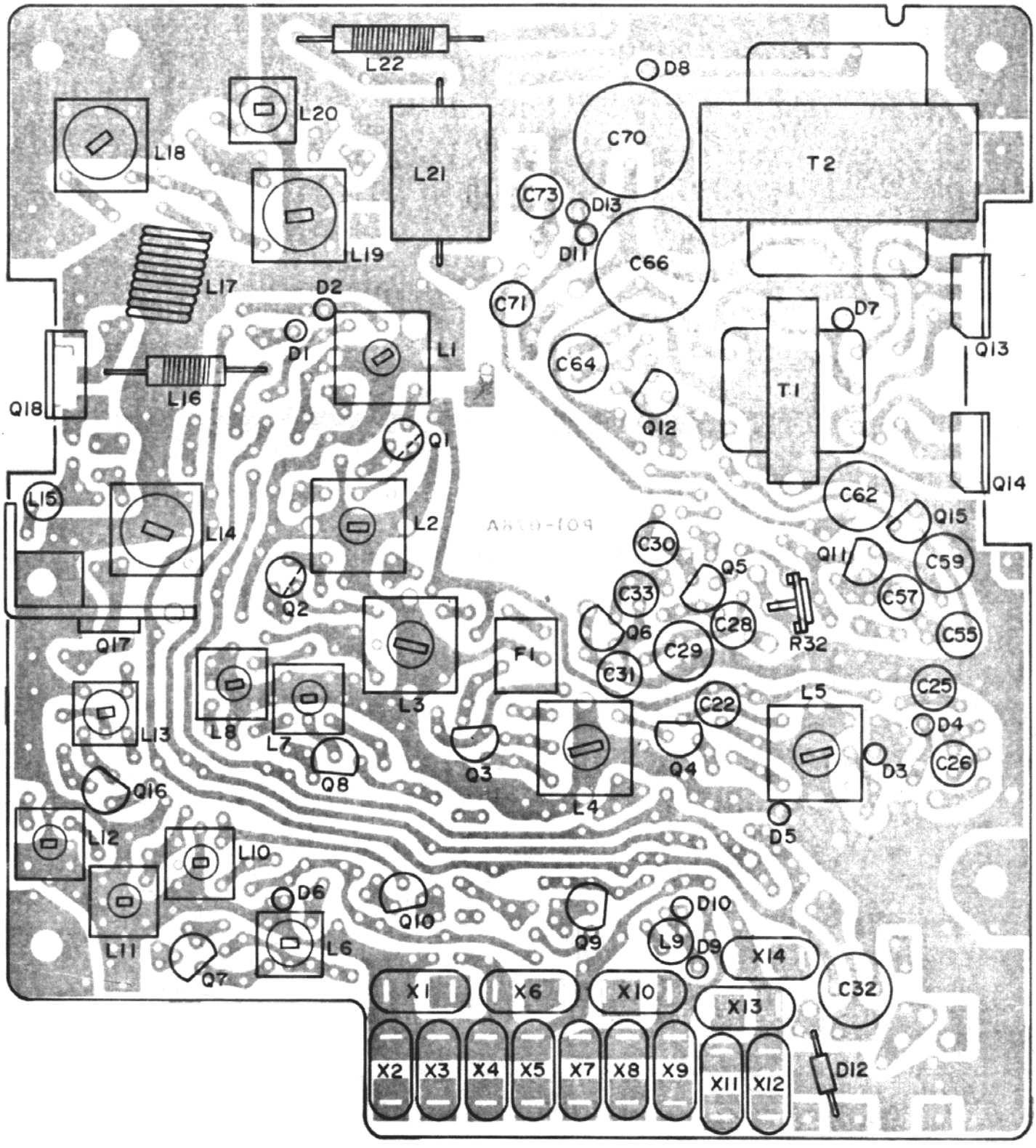


FIG. 5-14 COMPONENT LAYOUT



SBE-34CB BRUTE PARTS LIST

SYMBOL NO.	PART NUMBER	DESCRIPTION
C1	8000-00040-041	Capacitor, Fixed, 20pfd, 50V, Ceramic
C2	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C3	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C4	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C5	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C6	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C7	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C8	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C9	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C10	8000-00006-222	Capacitor, Fixed, 8pfd, 50V, Ceramic
C11	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C12	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C13	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C14	Not Used	
C15	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C16	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C17	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C18	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C19	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C20	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C21	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C22	8000-00028-024	Capacitor, Fixed, 1mfd, 50V, Electrolytic
C23	8000-00041-006	Capacitor, Fixed, 0.002mfd, 50V, Ceramic
C24	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C25	8000-00041-010	Capacitor, Fixed, 0.47mfd, 50V, Electrolytic
C26	8000-00028-024	Capacitor, Fixed, 1 mfd, 50V, Electrolytic
C27	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C28	8000-00041-010	Capacitor, Fixed, 0.47mfd, 50V, Electrolytic
C29	8000-00041-012	Capacitor, Fixed, 33mfd, 10V, Electrolytic
C30	8000-00041-010	Capacitor, Fixed, 0.47mfd, 50V, Electrolytic
C31	8000-00041-011	Capacitor, Fixed, 10mfd, 10V, Electrolytic
C32	8000-00041-013	Capacitor, Fixed, 100mfd, 10V, Electrolytic
C33	8000-00028-024	Capacitor, Fixed, 1mfd, 50V, Electrolytic
C34	8000-00041-007	Capacitor, Fixed, 0.02mfd, 25V, Ceramic
C35	8000-00028-004	Capacitor, Fixed, 50pfd, 50V, Ceramic
C36	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C37	8000-00028-004	Capacitor, Fixed, 50pfd, 50V, Ceramic
C38	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C39	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C40	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C41	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C42	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C43	8000-00006-223	Capacitor, Fixed, 7pfd, 50V, Ceramic
C44	8000-00041-007	Capacitor, Fixed, 0.02mfd, 25V, Ceramic
C45	8000-00041-007	Capacitor, Fixed, 0.02mfd, 25V, Ceramic
C46	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C47	8000-00041-003	Capacitor, Fixed, 200pfd, 50V, Ceramic
C48	8000-00041-003	Capacitor, Fixed, 200pfd, 50V, Ceramic
C49	8000-00041-007	Capacitor, Fixed, 0.02mfd, 25V, Ceramic
C50	8000-00041-007	Capacitor, Fixed, 0.02mfd, 25V, Ceramic
C51	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C52	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic

SYMBOL NO.	PART NUMBER	DESCRIPTION
C53	8000-00040-047	Capacitor, Fixed, 4pfd, 50V, Ceramic
C54	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C55	8000-00041-011	Capacitor, Fixed, 10mfd, 10V, Electrolytic
C56	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C57	8000-00006-064	Capacitor, Fixed, 4.7mfd, 16V, Electrolytic
C58	8000-00028-013	Capacitor, Fixed, 0.001mfd, 50V, Ceramic
C59	8000-00041-012	Capacitor, Fixed, 33mfd, 10V, Electrolytic
C60	8000-00041-009	Capacitor, Fixed, 0.033mfd, 50V, Mylar
C61	8000-00006-276	Capacitor, Fixed, 0.047mfd, 50V, Mylar
C62	8000-00028-023	Capacitor, Fixed, 47mfd, 16V, Electrolytic
C63	8000-00041-005	Capacitor, Fixed, 250pfd, 50V, Ceramic
C64	8000-00005-077	Capacitor, Fixed, 47mfd, 10V, Electrolytic
C65	Not Used	
C66	8000-00041-014	Capacitor, Fixed, 330mfd, 16V, Electrolytic
C67	8000-00028-200	Capacitor, Fixed, 0.022mfd, 50V, Mylar
C68	8000-00028-200	Capacitor, Fixed, 0.022mfd, 50V, Mylar
C69	8000-00028-021	Capacitor, Fixed, 0.1mfd, 50V, Mylar
C70	8000-00011-143	Capacitor, Fixed, 470mfd, 16V, Electrolytic
C71	8000-00041-011	Capacitor, Fixed, 10mfd, 10V, Electrolytic
C72	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C73	8000-00028-024	Capacitor, Fixed, 1mfd, 50V, Electrolytic
C74	8000-00040-047	Capacitor, Fixed, 4pfd, 50V, Ceramic
C75	8000-00028-004	Capacitor, Fixed, 50pfd, 50V, Ceramic
C76	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C77	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C78	8000-00028-004	Capacitor, Fixed, 50pfd, 50V, Ceramic
C79	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C80	8000-00041-007	Capacitor, Fixed, 0.02mfd, 25V, Ceramic
C81	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C82	8000-00041-004	Capacitor, Fixed, 250pfd, 50V, Ceramic
C83	8000-00041-004	Capacitor, Fixed, 250pfd, 50V, Ceramic
C84	8000-00003-009	Capacitor, Fixed, 30pfd, 50V, Ceramic
C85	8000-00028-008	Capacitor, Fixed, 0.01mfd, 25V, Ceramic
C86	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C87	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C88	8000-00041-003	Capacitor, Fixed, 200pfd, 50V, Ceramic
C89	8000-00041-004	Capacitor, Fixed, 250pfd, 50V, Ceramic
C90	8000-00041-002	Capacitor, Fixed, 130pfd, 50V, Ceramic
C91	8000-00028-004	Capacitor, Fixed, 50pfd, 50V, Ceramic
C92	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C93	8000-00028-014	Capacitor, Fixed, 0.04mfd, 25V, Ceramic
C94	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C95	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C96	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C97	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C98	8000-00041-006	Capacitor, Fixed, 0.002mfd, 50V, Ceramic
C99	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C100	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C101	8000-00041-008	Capacitor, Fixed, 0.047mfd, 25V, Ceramic
C102	8000-00028-160	Capacitor, Fixed, 0.01mfd, 50V, Ceramic
C103	8000-00041-001	Capacitor, Fixed, 10pfd, 50V, Ceramic
D1	8000-00038-008	Diode, WG713
D2	8000-00038-008	Diode, WG713
D3	8000-00041-015	Diode, 1S188FM1

SYMBOL NO.	PART NUMBER	DESCRIPTION
D4	8000-00041-016	Diode, S3838GA
D5	8000-00041-018	Diode, XZ092
D6	8000-00041-018	Diode, XZ092
D7	8000-00041-017	Diode, 1S1209
D8	8000-00030-010	Diode, 1N4002
D9	8000-00041-019	Diode, SG9150
D10	8000-00041-019	Diode, SG9150
D11	8000-00004-063	Diode, 1N60P
D12	8000-00038-008	Diode, WG713
D13	8000-00030-010	Diode, 1N4002
F1	8000-00006-291	Ceramic Filter Type CFU455H
FUSE	8000-00004-152	
J1	8000-00041-053	Connector, Antenna
J2	8000-00006-088	Jack, External Speaker
J3	8000-00006-088	Jack, PA Speaker
L1	8000-00041-020	Ant. Coil
L2	8000-00041-021	RF Coil
L3	8000-00041-022	IFT Coil, 455 KHz Yellow
L4	8000-00041-023	IFT Coil, 455 KHz White
L5	8000-00041-024	IFT Coil, 455 KHz Black
L6	8000-00041-025	Oscillation Coil, 37 MHz
L7	8000-00041-026	B.P.F. Coil (RX) White
L8	8000-00041-027	B.P.F. Coil (RX) Yellow
L9	8000-00041-028	RF Choke Coil, 270uh, LF1271K
L10	8000-00041-029	B.P.F. Coil (TX) Black
L11	8000-00041-029	B.P.F. Coil (TX) Black
L12	8000-00041-030	B.P.F. Coil (TX) Red
L13	8000-00041-031	Pre. Driver Coil
L14	8000-00041-032	Driver Coil
L15	8000-00028-143	RF Choke Coil, 2.2uh, LF42R2K
L16	8000-00041-033	RF Choke Coil, 2.2uh
L17	8000-00041-034	L.P.F. Coil
L18	8000-00041-035	L.P.F. Coil
L19	8000-00041-036	L.P.F. Coil
L20	8000-00041-037	T.V.I. Trap, Coil
L21	8000-00041-038	Choke Coil, 1.25mH
L22	8000-00041-039	Choke Coil, 0.85uh
PL1	8000-00041-054	Pilot Lamp, Channel
PL2	8000-00041-055	Pilot Lamp, TX
Q1	8000-00041-040	Transistor, 2SC930D
Q2	8000-00041-040	Transistor, 2SC930D
Q3	8000-00041-046	Transistor, 2SC1675L
Q4	8000-00041-046	Transistor, 2SC1675L
Q5	8000-00041-041	Transistor, 2SC945R
Q6	8000-00041-042	Transistor, 2SC945Q
Q7	8000-00041-046	Transistor, 2SC1675L
Q8	8000-00041-046	Transistor, 2SC1675L
Q9	8000-00041-046	Transistor, 2SC1675L
Q10	8000-00041-046	Transistor, 2SC1675L
Q11	8000-00041-041	Transistor, 2SC945R
Q12	8000-00041-041	Transistor, 2SC945R

SYMBOL NO.	PART NUMBER	DESCRIPTION
Q13	8000-00041-043	Transistor, 2SC1096M
Q14	8000-00041-043	Transistor, 2SC1096M
Q15	8000-00041-045	Transistor, 2SC1648LNS
Q16	8000-00041-046	Transistor, 2SC1675L
Q17	8000-00041-047	Transistor, 2SC1957 or 2SC2028
Q18	8000-00041-044	Transistor, 2SC1306 (1) or 2SC2029
R32	8000-00041-049	Resistor, Semi-Fixed
R78	8000-00041-048	Resistor, Wire-wound, 1/2W, 0.3Ω, ±10%
S1	8000-00041-056	Switch, Channel Selector
S3	8000-00041-057	Switch, PA-CB
SP-1	8000-00041-058	Speaker
T1	8000-00041-050	Input Transformer
T2	8000-00041-051	Output Transformer
X1	8000-00041-092	Crystal, 37.60 MHz, HC25/U
X2	8000-00041-093	Crystal, 37.65 MHz, HC25/U
X3	8000-00041-094	Crystal, 37.70 MHz, HC25/U
X4	8000-00041-095	Crystal, 37.75 MHz, HC25/U
X5	8000-00041-096	Crystal, 37.80 MHz, HC25/U
X6	8000-00041-097	Crystal, 37.85 MHz, HC25/U
X7	8000-00041-098	Crystal, 10.635 MHz, HC25/U
X8	8000-00041-099	Crystal, 10.625 MHz, HC25/U
X9	8000-00041-100	Crystal, 10.615 MHz, HC25/U
X10	8000-00041-101	Crystal, 10.595 MHz, HC25/U
X11	8000-00041-102	Crystal, 10.18 MHz, HC25/U
X12	8000-00041-103	Crystal, 10.17 MHz, HC25/U
X13	8000-00041-104	Crystal, 10.16 MHz, HC25/U
X14	8000-00041-105	Crystal, 10.14 MHz, HC25/U
VR1	8000-00041-059	Variable, Volume & Power Switch, 50KΩ
VR2	8000-00041-060	Variable, Squelch Control, 50KΩ
	8000-00041-061	Chassis, main
	8000-00041-062	Bezel
	8000-00041-063	Protector, Clear, Channel Indicator
	8000-00041-064	Lamp Shade, Red
	8000-00041-065	Name Plate
	8000-00041-066	Knob, Channel Selector
	8000-00041-067	Knob, Squelch/Volume Control
	8000-00041-068	Dial, Channel Indicator
	8000-00041-069	Felt, Squelch/Volume Control
	8000-00041-070	Rubber Cushion, Crystal
	8000-00041-071	Cabinet, Upper
	8000-00041-072	Cabinet, Lower
	8000-00041-073	Cloth, Speaker (Black)
	8000-00041-074	Cloth, Cabinet Protector (Black)
	8000-00041-075	Cloth, Speaker Protector (Green)
	8000-00041-076	Holder, Speaker
	8000-00041-077	Cloth, Panel Protector
	8000-00041-078	Grommet, Rubber
	8000-00041-079	Holder, Pilot Lamp

PART NUMBER	DESCRIPTION
8000-00041-080	Plastic Chip, Blind, CB-PA
8000-00041-081	Clamper, Mike Cord
8000-00041-082	Radiator, Transistor
8000-00041-083	Label, F.C.C. Acceptance
8000-00041-084	Washer, Ant.
8000-00041-085	Connector, Pin
8000-00041-086	Display Box
8000-00006-233	Microphone, Complete
8000-00041-087	Power Cord w/Fuse Holder
8000-00030-031	Retainer, Power Cord
8000-00041-088	Rubber Sleeve, Mike Cord
8000-00006-089	Crystal Socket
8000-00041-052	Printed Circuit Board
8000-00041-089	Screws, Mounting Bracket
8000-00041-090	Mounting Bracket
8000-00024-204	Mike Hanger w/Screws
8000-00041-091	External Speaker Plug

SCHEMATIC DIAGRAM M-349

R.F. AMP Q1 2SC930D
RX MIXER Q2 2SC930D
1st I.F. AMP Q3 2SC1675L or 2SC930D
2nd I.F. AMP Q4 2SC1675L or 2SC930D
DETECTOR ANL
1st AUDIO Q5 2SC945R
SQUELCH Q6 2SC945Q
AUDIO DRIVER Q12 2SC945R
AUDIO OUTPUT Q13,14 2SC1096M×2
RX PRE MIXER Q8 2SC1675L
Q7 2SC1675L MASTER OSC.
TX/RX OSC Q9 2SC1675L
TX MIXER Q10 2SC1675L
MIC AMP Q11 2SC945R
OMC AMP Q15 2SC1648S
TX BUFFER Q16 2SC1675L
TX DRIVER Q17 2SC1957 or 2SC2028
TX FINAL Q18 2SC1306(1) or 2SC2029

MIC 600OHM
RX
TX
PA SP J3 8OHM
EXT. SP J2 8OHM
PA
CB
S3-a
S3-b
OPA
SP
ANT J1
TX
PL2
POWER
PL1
S1-a
S1-b
S1-c
S2
FUSE + DC 12V

37.75MHz X4 37.8 X5 37.85 X6 37.6 X1 37.65 X2 37.7 X3
10.17MHz X12 10.14 X14 10.625 X8 10.595 X10
10.18 X11 10.16 X13 10.635 X7 10.615MHz X9

[ ] VOLTAGES TX MODE
( ) FULLY SQUELCHED VOLTAGE

BOTTOM VIEW
2SC930
2SC945 2SC1648 2SC1675
FRONT VIEW
2SC1957 2SC1306 2SC1096
① EMITTER ② COLLECTOR ③ BASE