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Realistic TRC-216 Service Manual

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REALISTIC[®]

Service Manual

21-1663

**TRC-216
40 CHANNEL
CB WALKIE-TALKIE**

Catalog Number: 21-1663



CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

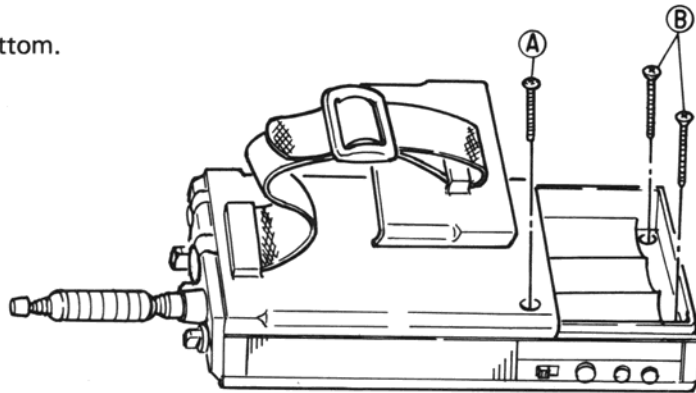
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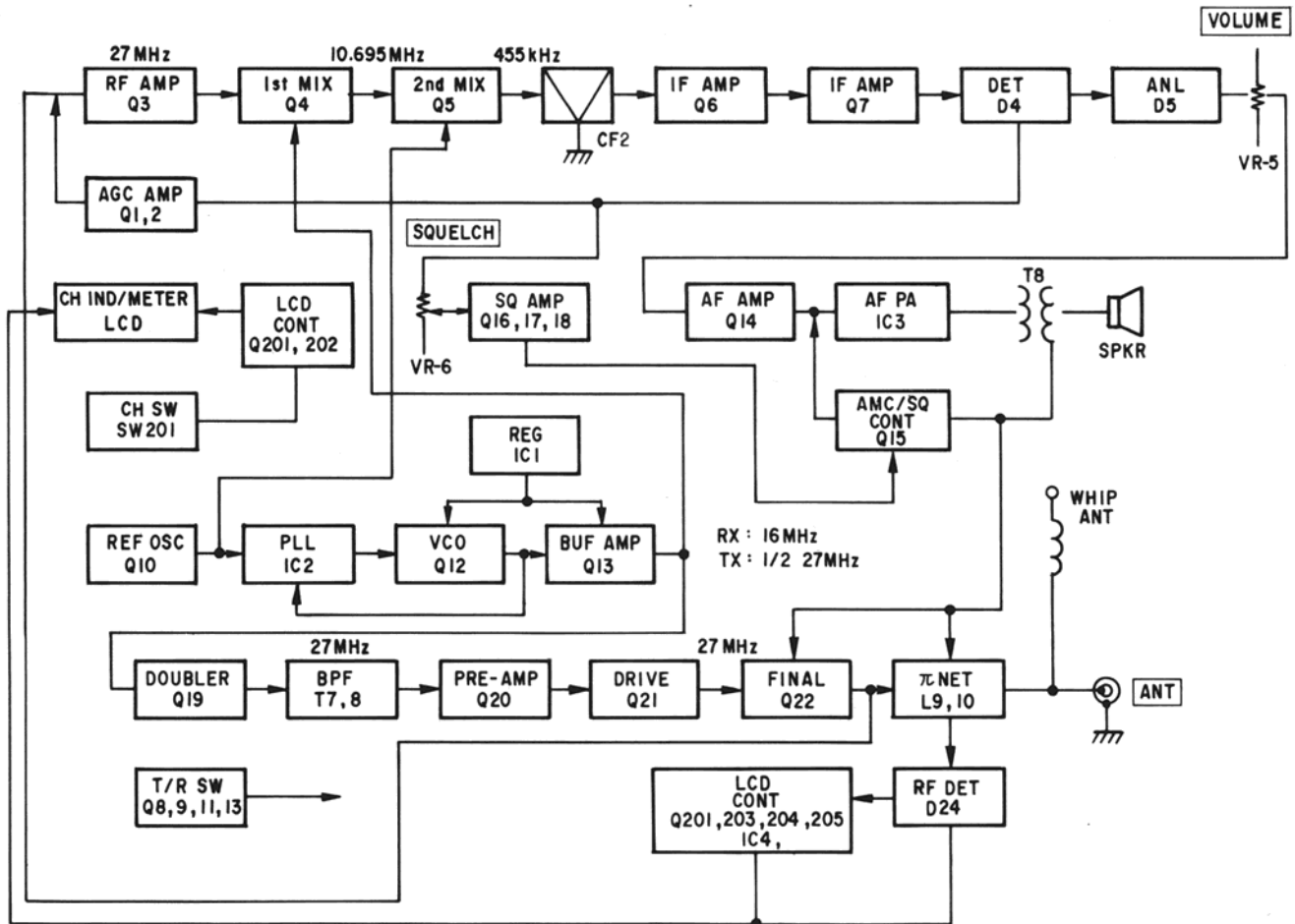
DISASSEMBLY

To Remove the Front Case:

1. Remove one screw (A) on the cabinet bottom.
2. Remove two screws (B) at battery pack.
3. Detach the front and rear case.



BLOCK DIAGRAM



PRINCIPLES OF OPERATION

PLL CIRCUIT

The TRC-216 uses a Digital Phase Lock Loop circuit to synthesize each of the channel frequencies using only one crystal. The PLL Circuit consists of a Phase Detector, Low Pass Filter (LPF) and a Voltage Controlled Oscillator (VCO, which uses a varicap diode as the frequency control device).

Refer to the Block Diagram of the PLL circuit as you go through the following description. A 10.24 MHz Crystal is used as a reference frequency. The Crystal oscillates in the Q10 circuit. The 10.24 MHz is processed by the PLL IC, as well as being used for the 2nd Mixer.

VCO frequencies (see Table 1) are divided by "N" 3254 through 3342 as determined by the channel selector switch. Thus the resulting frequency is 5.0 kHz for receiving.

Also, the reference oscillator frequency, 10.24 MHz, is divided by 2048 (internally by the IC) resulting in another 5.0 kHz frequency.

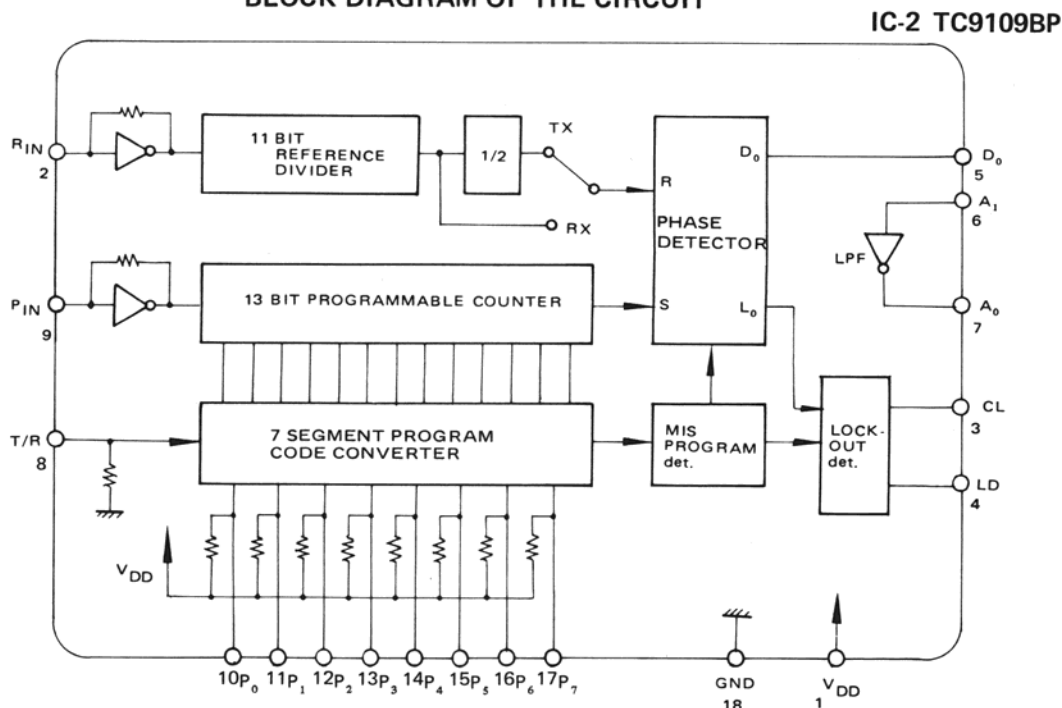
These two 5.0 kHz signals are fed to the Phase Detector (internally by the IC). A DC error voltage is generated by the Phase Detector which is in proportion to the phase difference between these two 5.0 kHz signals. This error voltage appears at Pin 5. The error voltage that appears at Pin 5 is the result of the phase difference, plus effects of harmonics and extraneous noise. Pin 6 is the input to an LPF and Pin 7 is output, where the error voltage is integrated and harmonics and noises are filtered out. The resulting DC voltage is applied to the VCO (a varicap diode) whose capacity varies with applied DC voltage. With proper circuit design and precise adjustments, the VCO frequency is accurate and precise. When the Phase Detector senses no frequency or phase difference between the two 5.0 kHz signals, the system is "locked" and the VCO generates a frequency that is as accurate and stable as the reference crystal oscillator.

The Channel Selector switch provides a ROM code output that is connected to Pins 10 – 17; the IC converts these signals into binary code. The resulting code determines "N," the divider that produces the required output frequency for each channel (precisely spaced 10 kHz apart).

For Transmit, the same VCO is used, which oscillates in the 13.5 MHz band. (See Table 1.) These signals are divided by "N" (5393 through 5481) as determined by the Channel Selector switch. The circuits function in the same way, except for the method of dividing the VCO frequencies.

When the PLL is "unlocked," an inhibit signal is available at Pin 4. This signal is applied to Q19 to turn it off.

BLOCK DIAGRAM OF THE CIRCUIT



VCO OUTPUT FREQUENCY AND IC-2 INPUT CODE TABLE

| CH No. | Frequency (MHz) | Program code | | | | | | | | R/T = H (Rx) | | R/T = L (Tx) | |
|--------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|------------------|--------------|------------------|
| | | P ₀ | P ₁ | P ₂ | P ₃ | P ₄ | P ₅ | P ₆ | P ₇ | N | f _{vco} | N | f _{vco} |
| 1 | 26.965 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 3254 | 16.27 | 5393 | 13.4825 |
| 2 | 26.975 | ○ | | | | | ○ | ○ | ○ | 3256 | 16.28 | 5395 | 13.4875 |
| 3 | 26.985 | ○ | | | ○ | | ○ | ○ | ○ | 3258 | 16.29 | 5397 | 13.4925 |
| 4 | 27.005 | | ○ | | ○ | ○ | ○ | ○ | ○ | 3262 | 16.31 | 5401 | 13.5025 |
| 5 | 27.015 | | | | ○ | | ○ | ○ | ○ | 3264 | 16.32 | 5403 | 13.5075 |
| 6 | 27.025 | | ○ | | | | ○ | ○ | ○ | 3266 | 16.33 | 5405 | 13.5125 |
| 7 | 27.035 | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | 3268 | 16.34 | 5407 | 13.5175 |
| 8 | 27.055 | | | | | | ○ | ○ | ○ | 3272 | 16.36 | 5411 | 13.5275 |
| 9 | 27.065 | | | | ○ | ○ | ○ | ○ | ○ | 3274 | 16.37 | 5413 | 13.5325 |
| 10 | 27.075 | | | ○ | | | | ○ | ○ | 3276 | 16.38 | 5415 | 13.5375 |
| 11 | 27.085 | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | 3278 | 16.39 | 5417 | 13.5425 |
| 12 | 27.105 | ○ | | | | | | ○ | ○ | 3282 | 16.41 | 5421 | 13.5525 |
| 13 | 27.115 | ○ | | | ○ | | | ○ | ○ | 3284 | 16.42 | 5423 | 13.5575 |
| 14 | 27.125 | | ○ | | ○ | ○ | | ○ | ○ | 3286 | 16.43 | 5425 | 13.5625 |
| 15 | 27.135 | | | | ○ | | | ○ | ○ | 3288 | 16.44 | 5427 | 13.5675 |
| 16 | 27.155 | | ○ | | | | | ○ | ○ | 3292 | 16.46 | 5431 | 13.5775 |
| 17 | 27.165 | ○ | | ○ | ○ | ○ | | ○ | ○ | 3294 | 16.47 | 5433 | 13.5825 |
| 18 | 27.175 | | | | | | | ○ | ○ | 3296 | 16.48 | 5435 | 13.5875 |
| 19 | 27.185 | | | | ○ | ○ | | ○ | ○ | 3298 | 16.49 | 5437 | 13.5925 |
| 20 | 27.205 | | | ○ | | | ○ | | ○ | 3302 | 16.51 | 5441 | 13.6025 |
| 21 | 27.215 | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | 3304 | 16.52 | 5443 | 13.6075 |
| 22 | 27.225 | ○ | | | | | | ○ | ○ | 3306 | 16.53 | 5445 | 13.6125 |
| 23 | 27.255 | ○ | | | ○ | | | ○ | ○ | 3312 | 16.56 | 5451 | 13.6275 |
| 24 | 27.235 | | ○ | | ○ | ○ | ○ | | ○ | 3308 | 16.54 | 5447 | 13.6175 |
| 25 | 27.245 | | | | ○ | | | ○ | ○ | 3310 | 16.55 | 5449 | 13.6225 |
| 26 | 27.265 | | ○ | | | | | ○ | ○ | 3314 | 16.57 | 5453 | 13.6325 |
| 27 | 27.275 | ○ | | ○ | ○ | ○ | ○ | | ○ | 3316 | 16.58 | 5455 | 13.6375 |
| 28 | 27.285 | | | | | | | ○ | ○ | 3318 | 16.59 | 5457 | 13.6425 |
| 29 | 27.295 | | | | ○ | ○ | ○ | | ○ | 3320 | 16.60 | 5459 | 13.6475 |
| 30 | 27.305 | | | ○ | | | | | ○ | 3322 | 16.61 | 5461 | 13.6525 |
| 31 | 27.315 | ○ | ○ | ○ | ○ | ○ | | | ○ | 3324 | 16.62 | 5463 | 13.6575 |
| 32 | 27.325 | ○ | | | | | | | ○ | 3326 | 16.63 | 5465 | 13.6625 |
| 33 | 27.335 | ○ | | | ○ | | | | ○ | 3328 | 16.64 | 5467 | 13.6675 |
| 34 | 27.345 | | ○ | | ○ | ○ | | | ○ | 3330 | 16.65 | 5469 | 13.6725 |
| 35 | 27.355 | | | | ○ | | | | ○ | 3332 | 16.66 | 5471 | 13.6775 |
| 36 | 27.365 | | ○ | | | | | | ○ | 3334 | 16.67 | 5473 | 13.6825 |
| 37 | 27.375 | ○ | | ○ | ○ | ○ | | | ○ | 3336 | 16.68 | 5475 | 13.6875 |
| 38 | 27.385 | | | | | | | | ○ | 3338 | 16.69 | 5477 | 13.6925 |
| 39 | 27.395 | | | | ○ | ○ | | | ○ | 3340 | 16.70 | 5479 | 13.6975 |
| 40 | 27.405 | | | ○ | | | | | ○ | 3342 | 16.71 | 5481 | 13.7025 |

○ Mark: H level

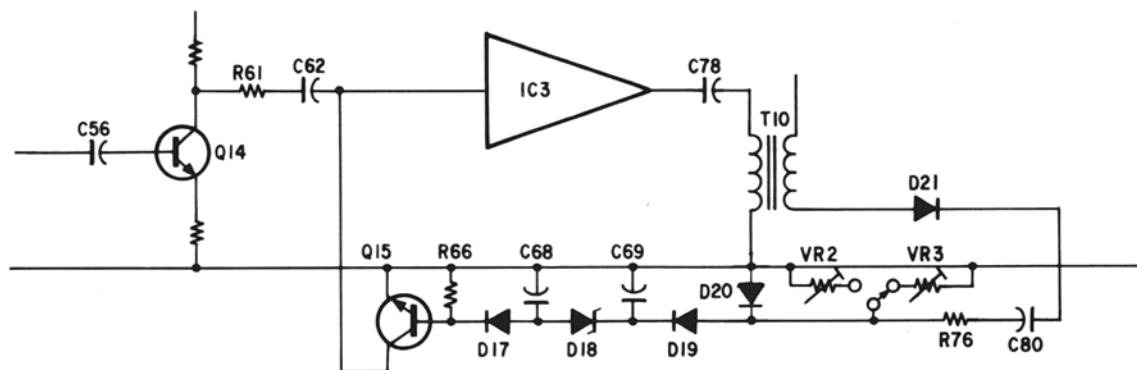
$$f_{RXVCO} = 0.005 \times N \text{ (MHz)}$$

$$f_{TXVCO} = 0.0025 \times N \text{ (MHz)}$$

Table 1

AUTOMATIC MODULATION CONTROL CIRCUIT

The Automatic Modulation Control (AMC) circuit consists of Q15, D17, D18, D19 and D20. The Mic input signal is fed to base of Q14, where it is amplified. The Audio Amplifier/Modulation IC (IC3) further amplifies this signal and drives T10, whose secondary incorporates C80 which couples a portion of the signal to AMC detector diodes D19 and D20. This applies a DC voltage to the base of Q15, and thus controls the output signal of Q14. The DC voltage automatically sets the desired audio signal level processed by the audio amplifier circuit; VR-2 is adjusted to set a modulation level of less than 100% for Lo power and VR-3 is adjusted for Hi power.



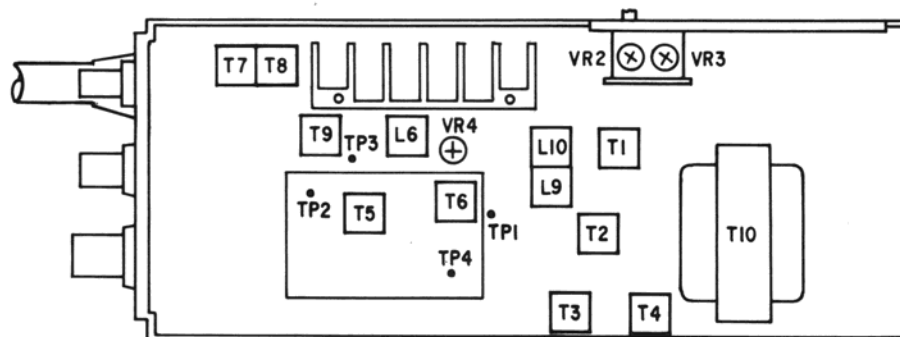
ALIGNMENT PREPARATION

Test instruments required

- | | |
|--|--------------------------------|
| 1. Oscilloscope | 7. Power Meter (50Ω) |
| 2. AC SSVM (RF) | 8. 50Ω 5W Dummy Load |
| 3. DC SSVM | 9. Audio Signal Generator |
| 4. Frequency Counter | 10. Distortion Meter |
| 5. 8Ω Dummy Load | 11. DC Power Supply (12.5V 2A) |
| 6. RF Signal Generator 455 kHz to 30 MHz | 12. DC Current Meter |

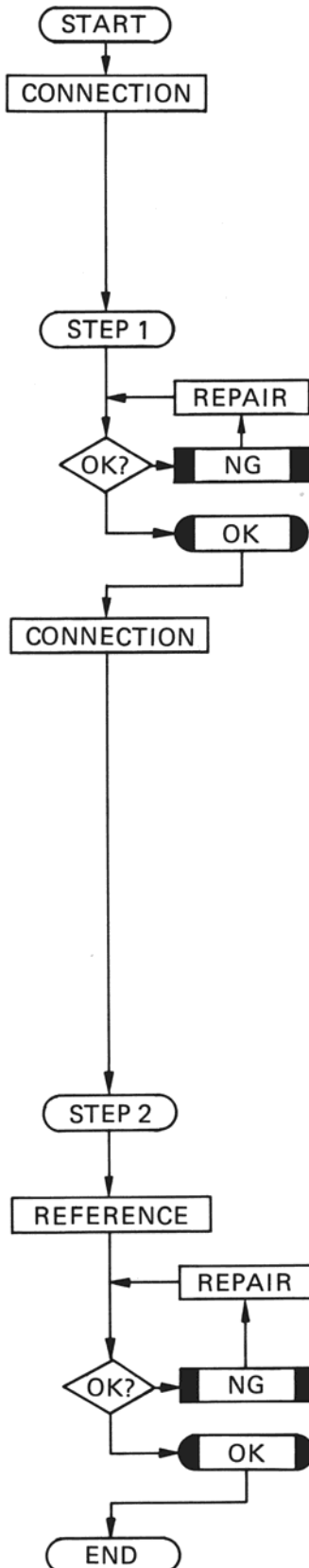
NOTE: Use non-metallic tuning tools.
Allow instruments and unit 15 minutes to warm-up prior to alignment. Maintain generator output level at minimum necessary to obtain usable output readings. (This will avoid saturation and clipping.)

ALIGNMENT LOCATIONS AND POINTS



Note: Use bare leads of R17, R43, L5 and R54 for test points.

AF OPERATION CHECK BEFORE ALIGNMENT



Connect POWER SUPPLY to plus (+) and minus (-) terminal on Ext. PWR jack J2 through the DC current meter as shown in Figure 1.

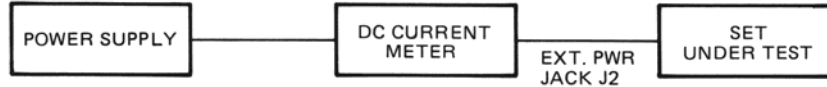


Figure 1

Check DC current drain (must be 60~90 mA).
Control Setting: VOLUME (minimum), SQUELCH (fully counterclockwise).

See TROUBLESHOOTING items 1, 3.

DC current drain exceeds 90 mA or is less than 60 mA.

DC current drain is 60~90 mA.

Connect the AF generator to the "hot" end of VOLUME control. Connect oscilloscope, distortion meter and AC SSVM to Ext. SPeaker Jack J1 across 8Ω dummy load as shown in Figure 2.

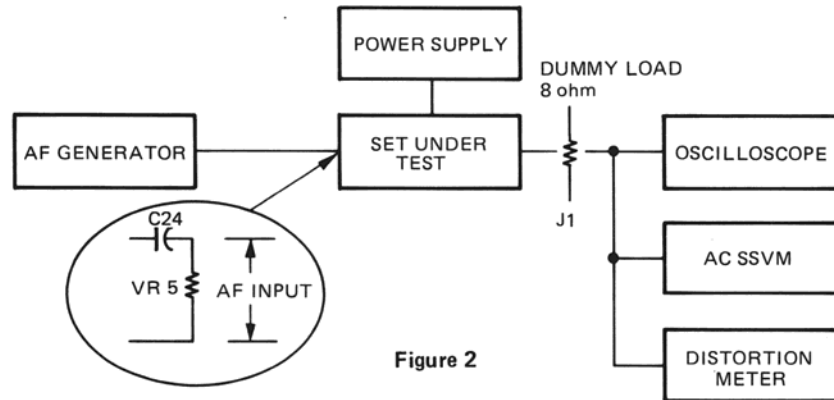


Figure 2

Check AF output with 10–20 mV input
Control Setting: VOLUME (maximum), SQUELCH (fully counterclockwise).
Set AF generator frequency to 1 kHz.

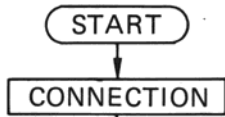
AF output power is 2W with 10–20 mV input and distortion is below 10%.

Check AF circuit. See TROUBLESHOOTING item 4.

AF output power is not 2W with 10–20 mV input and/or distortion exceeds 10%.

AF output power is 2W with 10–20 mV input and distortion is no more than 10%.

RECEIVER OPERATION CHECK BEFORE ALIGNMENT



Connect the instruments as shown in Figure 3.

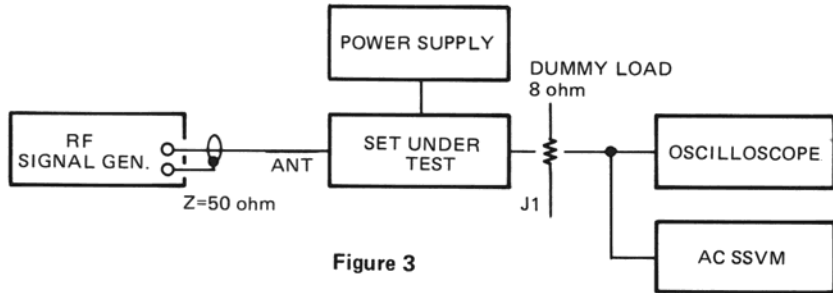
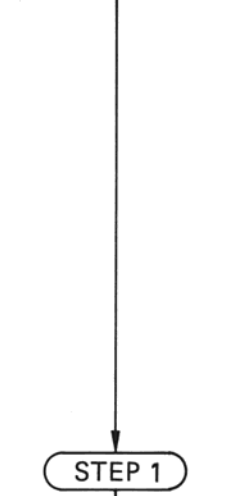


Figure 3

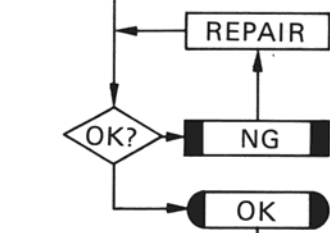
Set RF generator to CH-18 (27.175 MHz), mod. 1 kHz 30% and $1\mu\text{V}$ output.
 Control Setting: VOLUME [output level for approx. 0.775V (0 dB)]
 SQUELCH (fully counterclockwise).



Turn off the modulation.



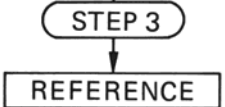
Nominal S/N should be 15 dB (over 10 dB is acceptable) with $1\mu\text{V}$ input.



See TROUBLESHOOTING items 5, 6.

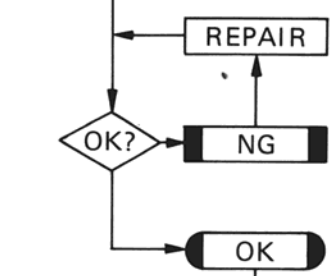
S/N ratio is less than 10 dB.

S/N ratio is over 10 dB.



Turn SQUELCH control fully clockwise. Set RF generator output to open squelch.

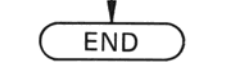
Squelch should turn on/off with an RF input level of 1 mV, ± 10 dB.



See TROUBLESHOOTING item 7.

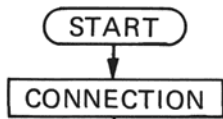
Squelch action did not take place with an RF input level of 1 mV, ± 10 dB.

Squelch action takes place at correct input level.



Proceed to TRANSMITTER OPERATION CHECK.

TRANSMITTER OPERATION CHECK BEFORE ALIGNMENT



Connect the instruments as shown in Figure 4.

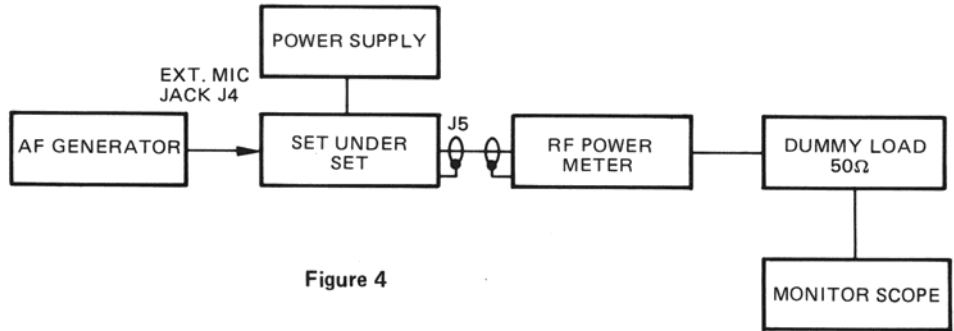


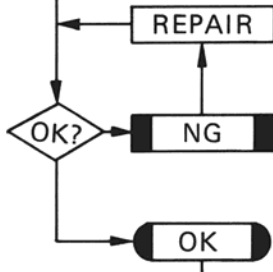
Figure 4

STEP 1

Set AF generator frequency to 1 kHz. Increase level of AF generator from approximately 5 mV to 63 mV. Set POWER switch to Hi.

REFERENCE

Nominal modulation should be 90–100% with 7.5–63 mV input. RF output power should be 3–4W.



See TROUBLESHOOTING items 8, 9, 10.

Modulation is not 90–100% with 7.5–63 mV input. RF output power is not 3–4W.

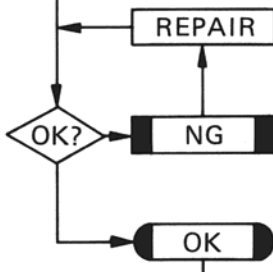
Modulation is 90–100% with 7.5–63 mV input. RF output power is 3–4W.

STEP 2

Set AF generator frequency to 1 kHz. Increase level of AF generator from 5 mV to 63 mV. Set POWER switch to Low.

REFERENCE

Nominal modulation should be 90–100% with 5–63 mV input. RF output power should be 1–2.



Check POWER HI-LOW switch and associated circuit.

Modulation is not 90–100% with 5–63 mV input. RF output power is not 1–2W.

Modulation is 90–100% with 5–63 mV input. RF output power is 1–2W.

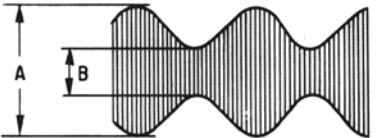
END

PLL SECTION ALIGNMENT CHART

| Step | Control Setting | Test Equipment | Test Equipment Connection | Adjust |
|-----------------|--------------------------------------|-------------------|---------------------------|---|
| 1 | Power Switch: ON CH: 18 | DC SSVM | TP2 | T5 for $3.4V \pm 0.2V$ |
| 2 | Power Switch: ON CH: 18 | Frequency Counter | TP4 | TC1 $16.48 \text{ MHz} \pm 50 \text{ Hz}$ |
| 3 | Power Switch: ON CH: 18 TX: ON | Frequency Counter | TP4 | Check the frequency Nominal: $13.5875 \text{ MHz} \pm 50 \text{ Hz}$ |
| | | | | |
| Figure 5 | | | | |
| 4 | Power Switch: ON CH: 18 TX: ON | DC SSVM | TP2 | Check the voltage Nominal: $2.5 \pm 0.5V$ |

NOTE: Activate channels 1 through 40 and check that the PLL circuit will “lock.” (Use a frequency counter at TP4 in RX-mode and TX-mode.)
At the same time, check the VCO control voltage at TP2. It should vary as shown in Figure 5. If necessary, repeat Steps 2 and 3.

TRANSMITTER ALIGNMENT CHART

| Step | Control Setting | Test Instruments Connection and Setting | Adjust | Remarks |
|------|--|---|-----------------------------------|--|
| 1 | Power Switch: ON CH: 18. Power HI/LOW SW: Hi Press-to-Talk Button: Push | Connect RF Power Meter, Dummy Load, and Monitor Scope to ANT Jack on set. (Figure 6) | T7 T8 T9 L6 L9 L10 | Alignment of Power Stage |
| | | | | Adjust T7, T8, T9, L6, L9 and L10 for max. indication on RF Power Meter. |
| 2 | Same as step 1 | Same as step 1 | VR4 | Adjustment of Power |
| | | | | Adjust VR4 for approx. 3.3 W |
| 3 | Same as step 1 Power HI/LOW SW: Low | Same as step 1 | | Check that RF power output is between 1.0 and 2.0 watts |
| 4 | Same as step 1 | Connect RF Power Meter, Dummy Load, and Monitor Scope to ANT Jack. Connect AF Generator to EXT. MIC jack J4 across AC SSVM (Figure 4) Adjust output of Audio Gen. so that the waveform on Monitor scope shows 50% modulation. | | <p>Calculation of Modulation Degree</p> $\text{Mod.} = \frac{A - B}{A + B} \times 100$ <p>Mod. (%): Modulation Degree</p> <div style="text-align: center;">  <p>The diagram shows a sinusoidal wave with amplitude modulation. A vertical double-headed arrow labeled 'A' spans the total height of the wave, from the lowest trough to the highest peak. A smaller vertical double-headed arrow labeled 'B' spans the height of the unmodulated carrier wave, which is the average height of the wave.</p> </div> <p style="text-align: center;">Modulation Waveform</p> |
| 5 | Same as step 1 | Same instrument connection as for step 4. Increase input level to EXT. MIC jack J4 +20 dB from 50% modulation input level. | VR2 VR3 | Adjustment of AMC |
| | | | | Adjust VR2 for 90 – 100% mod. on Low power and VR3 on Hi power (but not so that over modulation occurs). |

NOTE: If no output appears in step 1, pre-adjust T7 and T8 for max. output on RF SSVM or Oscilloscope at TP3.

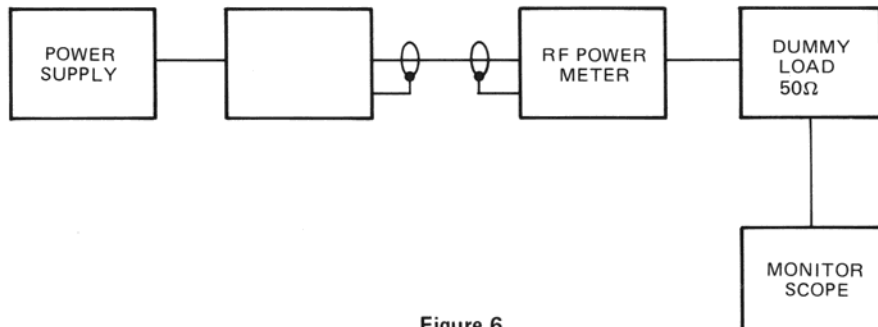


Figure 6

RECEIVER ALIGNMENT CHART

NOTE: Alignment of Receiver Section must not be done until PLL and Transmitting Section alignment is completed.

| Step | Control Setting | Test Instrument Connection | Signal Generator Setting | Adjust | Remarks |
|------|--|--|--|----------------|---|
| 1 | Power Switch: ON | Connect RF Signal Generator, DC SSVM, and Power Supply as shown in Figure 8. | R.F.S.G.: Set to 455 kHz (no modulation). | T3 T4 | Alignment of IF Adjust the core of T3, 4 for max. indication on DC SSVM. |
| 2 | VOLUME control: Fully clockwise SQUELCH control: Fully counter-clockwise CH: 18 | Connect RF Signal Generator, AC SSVM, Oscilloscope, 8 ohm Dummy Load, and Power Supply as shown in Figure 3. | Freq. 27.175 MHz (Channel 18) at 1 kHz 30% Modulation | T1 T2 T6 | Alignment of RF Adjust the core of T1, T2 and T6 for max. indication on Oscilloscope and AC SSVM. Keep output of RF SG as low as possible (to avoid overloading AGC and swamping problems) and still obtain usable output. |
| 3 | Repeat Steps 1 and 2 as necessary to obtain maximum output (keep output of RF Signal Generator at low level to avoid overloading, swamping and AGC action.) After final adjustments, seal the cores of T1 and T2 (then check sensitivity once more.) | | | | |
| 4 | Turn SQUELCH control fully clockwise and check Squelch function (output should cease). Return SQUELCH to minimum. | | | | |
| 5 | VOLUME control: set AF output level for approx. 0.775 V (0 dB) SQUELCH control: Fully clockwise CH: 18 | Same as step 2 | Freq. 27.175 MHz (Channel 18) at 1 kHz 30% Modulation Increase SG output to 1 mV. | VR1 | Adjustment of SQUELCH Adjust VR1 so Squelch just opens/closes with 1 mV signal input. |

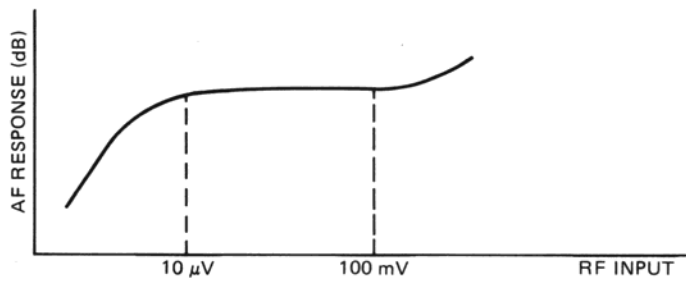


Figure 7

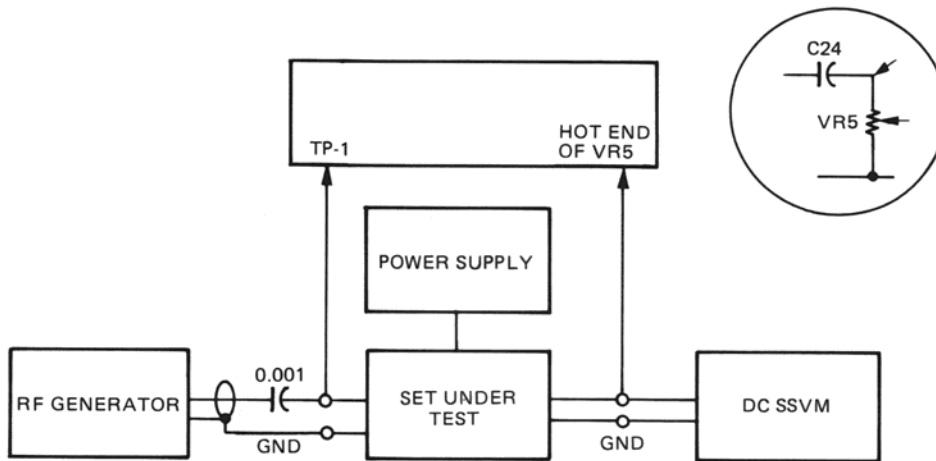


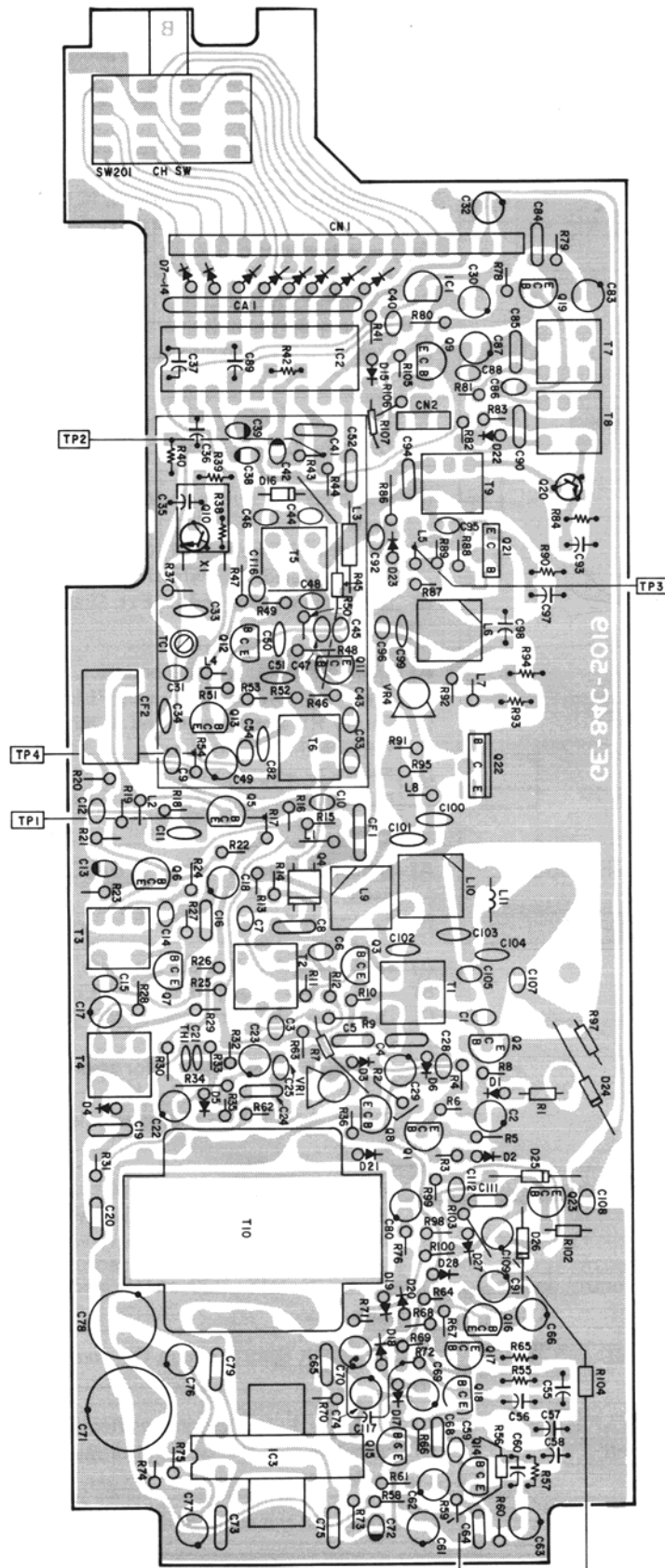
Figure 8

TROUBLESHOOTING

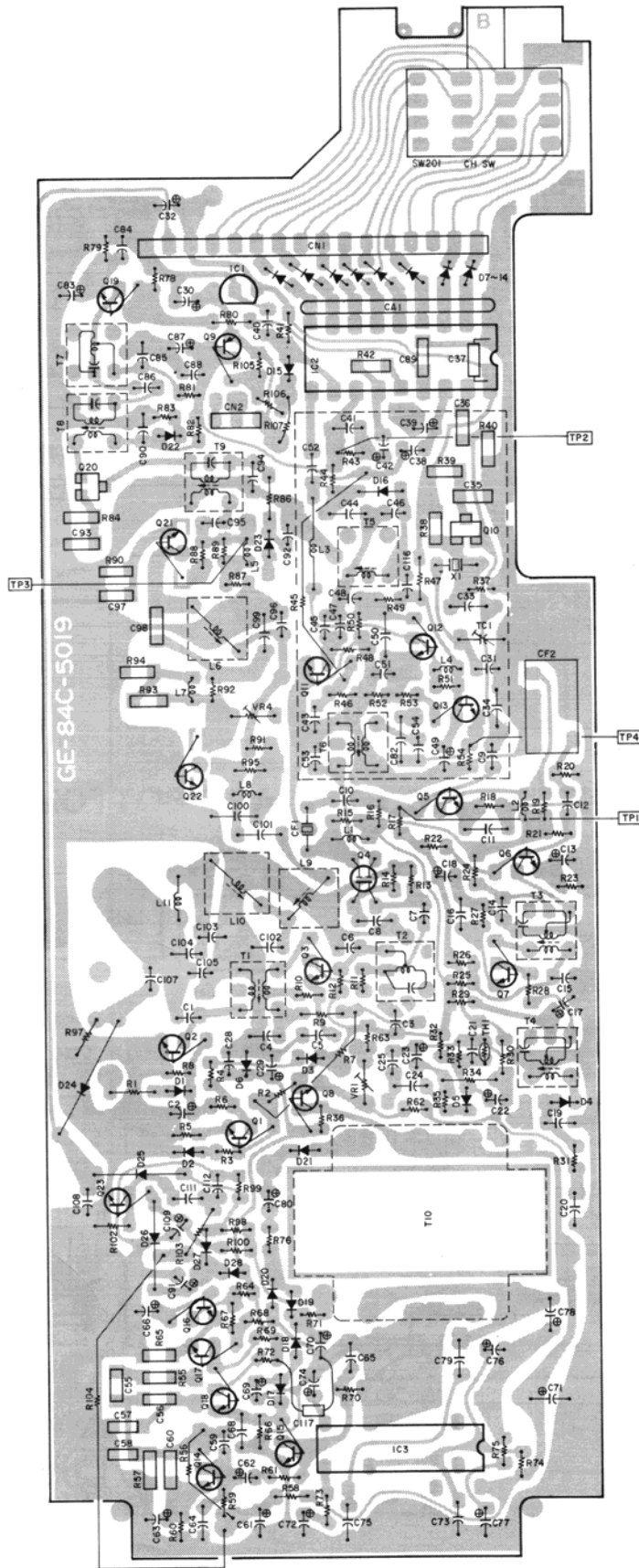
| Symptom | Cause and Remedy |
|--|--|
| 1) Channel LCD does not light and/or set fails to operate when power is on. | A) Weak batteries: Change batteries. B) Wrong battery polarity: Adjust polarity of batteries. C) Defective power switch: Replace. D) Defective power jack: Replace. E) Defective LCD, Q201, 202 and/or associated circuit components: Replace the defective parts. |
| 2) Channel LCD remains on. | Defective LCD driver circuit Q201, 202 and/or associated circuit components: Replace the defective parts. |
| 3) Batteries become hot and/or short circuit when ext. power supply is used. | A) Defective power jack: Replace. B) Defective IC201: Replace. |

| Symptom | Cause and Remedy |
|---|--|
| 4) Battery meter indicator reads OK, but there's no sound on any channel. | A) Defective speaker and/or Ext. SPeaker jack: Replace the defective parts. B) Defective talk switch and/or Mic jack switch: Replace the defective parts. C) Defective AF amplifier circuit, IC 3, and/or associated circuit components: Replace the defective parts. D) Defective squelch circuit, Q16, 17, 18 and/or associated circuit components: Replace the defective parts. E) Defective AMC circuit Q15 and/or associated circuit components: Replace the defective parts. F) Defective pre-amp circuit Q14 and/or associated circuit: Replace the defective parts. |
| 5) Transmits but does not receive. | A) Poor and/or wrong frequency PLL: Replace the defective parts. B) Defective Q8 and/or associated circuit components: Replace the defective parts. C) Defective talk switch and/or Mic jack switch: Replace the defective parts. D) Defective RF circuit Q1, Q2, Q3 and/or associated circuit components: Replace the defective parts. E) Defective speaker and/or Ext. SPeaker jack: Replace the defective parts. |
| 6) Poor Receive sensitivity. | A) Weak batteries: Replace batteries. B) Poor and/or wrong frequency PLL: Replace the defective parts. C) Faulty RF amplifier Q3 and or mixer circuit Q4 components: Replace the defective parts. D) Faulty IF amplifier circuit Q6, Q7: Replace the defective parts. E) Defective ceramic filter CF-1 and/or CF-2: Replace the defective parts. |
| 7) Receiver works but squelch control does not operate. | A) Defective squelch control circuit Q16–18: Replace the defective parts. B) Faulty VR6: Replace the defective parts. |
| 8) Does not transmit. | A) Weak batteries: Replace batteries. B) Poor and/or wrong frequency PLL: Replace the defective parts. C) Defective talk switch and/or Mic jack switch: Replace the defective parts. D) Defective Q19–Q22, and/or associated circuit components: Replace the defective parts. E) Defective Q23, D26 and/or associated circuit: Replace the defective parts. |
| 9) Receiver works but no modulation. | A) Faulty microphone unit: Replace. B) Defective Mic jack and/or Mic jack switch: Replace the defective parts. |
| 10) Automatic Modulation Control does not operate. | Defective Q15, D18–D20, and/or associated circuit: Replace the defective parts. |
| 11) Self-oscillation on transmit. | Faulty TX/RX control circuit Q8, and/or Q9: Replace the defective parts. |
| 12) Receiver and/or Transmitter does not work when ext. Mic is used. | A) Defective Ext. microphone: Replace. B) Defective Ext. Mic jack and/or Mic jack switch: Replace the defective parts. |
| 13) Microphone operates on receive mode. | Defective Q23 and associated circuit: Replace the defective parts. |

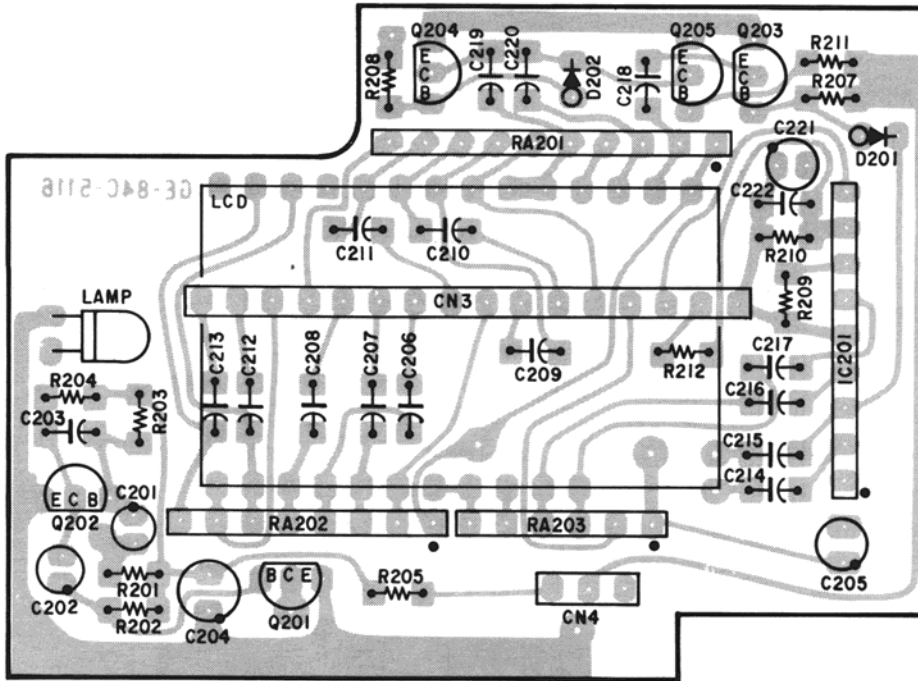
MAIN PRINTED CIRCUIT BOARD TOP VIEW



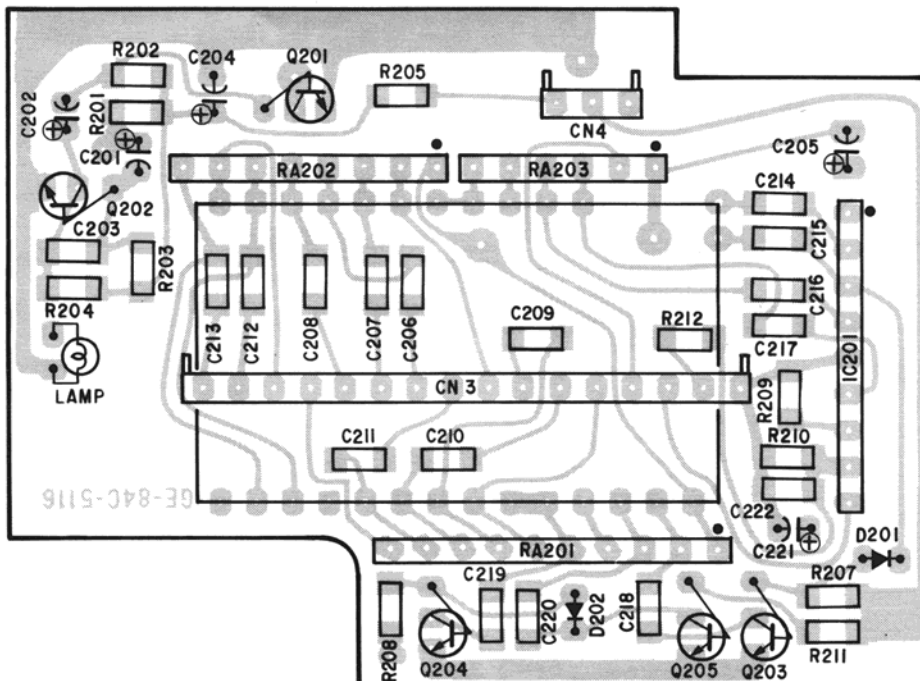
MAIN PRINTED CIRCUIT BOARD BOTTOM VIEW



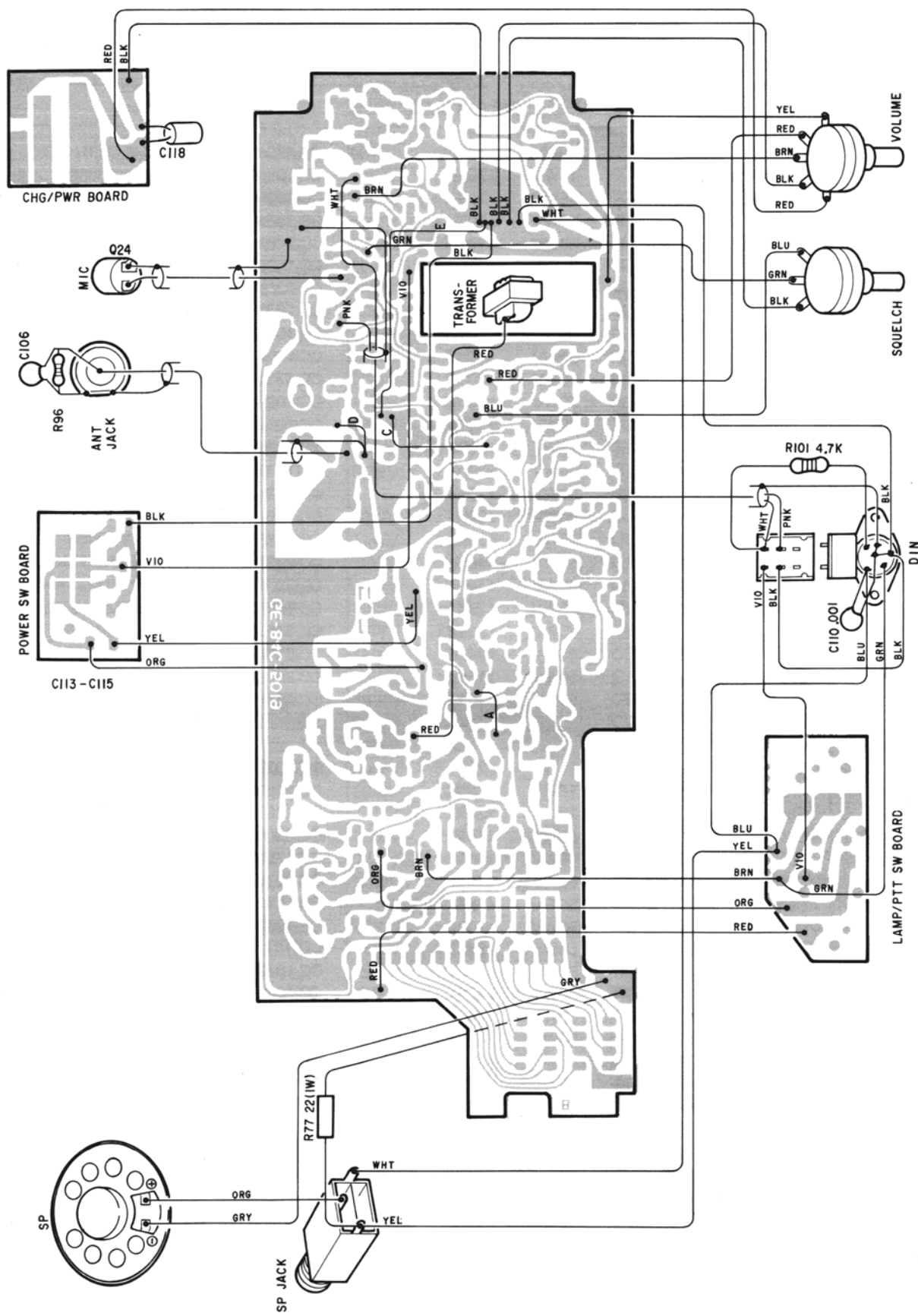
LCD PRINTED CIRCUIT BOARD TOP VIEW



LCD PRINTED CIRCUIT BOARD BOTTOM VIEW



WIRING DIAGRAM



ELECTRICAL PARTS LIST

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|-------------------|--------------------------------|----------------|-------------------|
| CAPACITORS | | | |
| C1 | Ceramic Disk 10pF 50WV ±10% | CC-100KJCP | CC45CH1H110K |
| C2 | Electrolytic 10μF 16WV ±20% | CC-106MDAP | 16MV100SS |
| C3 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C4 | Mylar* 0.01μF 50WV ±10% | CC-103KJMP | AK1-UU103K50 |
| C5 | Mylar 0.01μF 50WV ±10% | CC-103KJMP | AK1-UU103K50 |
| C6 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C7 | Ceramic Disk 22pF 50WV ±10% | CC-220KJCP | CC45CH1H220K |
| C8 | Mylar 0.01μF 50WV ±10% | CC-103KJMP | AK1-UU103K50 |
| C9 | Ceramic Disk 10pF 50WV ±10% | CC-100KJCP | CC45CH1H100K |
| C10 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C11 | Ceramic Disk 0.047μF 25WV ±20% | CC-473MFCP | SS45X1E473M |
| C12 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C13 | Tantalum 1μF 35WV ±20% | CC-105MGTP | CS15E1V1R0M1S |
| C14 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C15 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C16 | Mylar 0.033μF 50WV ±10% | CC-333KJMP | AK1-UU333K50 |
| C17 | Electrolytic 1μF 50WV ±20% | CC-105MJAP | 50MV1R0SS |
| C18 | Electrolytic 10μF 16WV ±20% | CC-106MDAP | 16MV100SS |
| C19 | Mylar 0.022μF 50WV ±10% | CC-223KJMP | AK1-UU223K50 |
| C20 | Mylar 0.022μF 50WV ±10% | CC-223KJMP | AK1-UU223K50 |
| C21 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C22 | Electrolytic 3.3μF 35WV ±20% | CC-335MGAP | 35MV3R3SS |
| C23 | Electrolytic 3.3μF 35WV ±20% | CC-335MGAP | 35MV3R3SS |
| C24 | Mylar 0.0033μF 50WV ±10% | CC-332KJMP | AK1-UU332K50 |
| C25 | Ceramic Disk 470pF 50WV ±10% | CC-471KJCP | CK45B1H471K |
| C26 | Not used | | |
| C27 | Not used | | |
| C28 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C29 | Electrolytic 10μF 16WV ±20% | CC-106MDAP | 16MV100SS |
| C30 | Electrolytic 22μF 16WV ±20% | CC-226MDAP | 16MV220HA |
| C31 | Ceramic Disk 33pF 50WV ±10% | CC-330KJCP | CC45RH1H330K |
| C32 | Electrolytic 47μF 16WV ±20% | CC-476MDAP | 16MV470HA |
| C33 | Ceramic Disk 220pF 50WV ±10% | CC-221KJCP | CC45CH1H221K |
| C34 | Ceramic Disk 120pF 50WV ±10% | CC-121KJCP | CC45CH1H121K |
| C35 | Ceramic Chip 0.01μF 50WV ±20% | CC-103MJCP | C2K31P1HC103M |
| C36 | Ceramic Chip 100pF 50WV ±5% | CD-101JJCP | C1C31P1HCG101J |
| C37 | Ceramic Chip 0.01μF 50WV ±20% | CC-103MJCP | C2K31P1HC103M |
| C38 | Tantalum 0.1μF 35WV ±20% | CC-104MGTP | CS15E1V0R1M1S |
| C39 | Tantalum 0.1μF 35WV ±20% | CC-104MGTP | CS15E1V0R1M1S |
| C40 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C41 | Mylar 0.033μF 50WV ±10% | CC-333KJMP | AK1-UU333K50 |
| C42 | Tantalum 0.22μF 35WV ±20% | CC-224MGTP | CS15E1VR22M1S |
| C43 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C44 | Ceramic Disk 39pF 50WV ±10% | CC-390KJCP | CC45CH1H390K |
| C45 | Ceramic Disk 22pF 50WV ±10% | CC-220KJCP | CC45CH1H220K |
| C46 | Ceramic Disk 10pF 50WV ±0.5pF | CC-100DJCP | CC45RH1H100D |
| C47 | Ceramic Disk 2pF 50WV ±0.25pF | CC-020CJCP | CC45CH1H020C |
| C48 | Ceramic Disk 22pF 50WV ±10% | CC-220KJCP | CC45CH1H220K |

* Mylar is a registered trademark of E.I. Du Pont de Nemours and Company.

| Ref. No. | Description | | | | RS Part Number | MFR's Part Number |
|----------|--------------|----------------|------|--------------|----------------|-------------------|
| C49 | Electrolytic | 10 μ F | 16WV | \pm 20% | CC-106MDAP | 16MV100SS |
| C50 | Ceramic Disk | 47pF | 50WV | \pm 10% | CC-470KJCP | CC45CH1H470K |
| C51 | Ceramic Disk | 47pF | 50WV | \pm 10% | CC-470KJCP | CC45CH1H470K |
| C52 | Mylar | 0.01 μ F | 50WV | \pm 10% | CC-103KJMP | AK1-UU103K50 |
| C53 | Ceramic Disk | 27pF | 50WV | \pm 10% | CC-270KJCP | CC45RH1H270K |
| C54 | Ceramic Disk | 22pF | 50WV | \pm 10% | CC-220KJCP | CC45CH1H220K |
| C55 | Ceramic Chip | 0.01 μ F | 50WV | \pm 20% | CC-103MJCP | C2K31P1HC103M |
| C56 | Ceramic Chip | 0.022 μ F | 50WV | \pm 20% | CC-223MJCP | C2K31P1HC223M |
| C57 | Ceramic Chip | 0.022 μ F | 50WV | \pm 20% | CC-223MJCP | C2K31P1HC223M |
| C58 | Ceramic Chip | 330pF | 50WV | \pm 10% | CD-331KJCP | C1C31P1HCG331K |
| C59 | Ceramic Disk | 22pF | 50WV | \pm 10% | CC-220KJCP | CC45CH1H220K |
| C60 | Ceramic Chip | 0.01 μ F | 50WV | \pm 20% | CC-103MJCP | C2K31P1HC103M |
| C61 | Electrolytic | 47 μ F | 16WV | \pm 20% | CC-476MDAP | 16MV470HA |
| C62 | Electrolytic | 0.47 μ F | 50WV | \pm 20% | CC-474MJAP | 50MVR47SS |
| C63 | Electrolytic | 1 μ F | 50WV | \pm 20% | CC-105MJAP | 50MV1R0SS |
| C64 | Mylar | 0.015 μ F | 50WV | \pm 10% | CC-153KJMP | AK1-UU153K50 |
| C65 | Mylar | 0.033 μ F | 50WV | \pm 10% | CC-333KJMP | AK1-UU333K50 |
| C66 | Electrolytic | 3.3 μ F | 35WV | \pm 20% | CC-335MGAP | 35MV3R3SS |
| C67 | Not used | | | | | |
| C68 | Mylar | 0.01 μ F | 50WV | \pm 10% | CC-103KJMP | AK1-UU103K50 |
| C69 | Electrolytic | 10 μ F | 16WV | \pm 20% | CC-106MDAP | 16MV100SS |
| C70 | Electrolytic | 10 μ F | 16WV | \pm 20% | CC-106MDAP | 16MV100SS |
| C71 | Electrolytic | 470 μ F | 16WV | \pm 20% | CC-477MDAP | 16MV471HA |
| C72 | Tantalum | 10 μ F | 10WV | \pm 20% | CC-106MCTP | CS15E1A100M1S |
| C73 | Mylar | 0.047 μ F | 50WV | \pm 10% | CC-473KJMP | AK1-UU473K50 |
| C74 | Electrolytic | 33 μ F | 16WV | \pm 20% | CC-336MDAP | 16MV330HA |
| C75 | Mylar | 0.022 μ F | 50WV | \pm 10% | CC-223KJMP | AK1-UU223K50 |
| C76 | Electrolytic | 10 μ F | 16WV | \pm 20% | CC-106MDAP | 16MV100SS |
| C77 | Electrolytic | 0.1 μ F | 50WV | \pm 20% | CC-104MJAP | 50MV0R1SS |
| C78 | Electrolytic | 220 μ F | 16WV | \pm 20% | CC-227MDAP | 16MV221HA |
| C79 | Mylar | 0.0033 μ F | 50WV | \pm 10% | CC-332KJMP | AK1-UU332K50 |
| C80 | Electrolytic | 1 μ F | 50WV | \pm 20% | CC-105MJAP | 50MV1R0SS |
| C81 | Not used | | | | | |
| C82 | Ceramic Disk | 120pF | 50WV | \pm 10% | CC-121KJCP | CC45CH1H121K |
| C83 | Electrolytic | 22 μ F | 16WV | \pm 20% | CC-226MDAP | 16MV220HA |
| C84 | Mylar | 0.01 μ F | 50WV | \pm 10% | CC-103KJMP | AK1-UU103K50 |
| C85 | Mylar | 0.01 μ F | 50WV | \pm 10% | CC-103KJMP | AK1-UU103K50 |
| C86 | Ceramic Disk | 2pF | 50WV | \pm 0.25pF | CC-020CJCP | CC45CH1H020C |
| C87 | Electrolytic | 22 μ F | 16WV | \pm 20% | CC-226MDAP | 16MV220HA |
| C88 | Ceramic Disk | 0.01 μ F | 25WV | \pm 20% | CC-103MFCP | SS45X1E103M |
| C89 | Ceramic Chip | 0.01 μ F | 50WV | \pm 20% | CC-103MJCP | C2K31P1HC103M |
| C90 | Mylar | 0.01 μ F | 50WV | \pm 10% | CC-103KJMP | AK1-UU103K50 |
| C91 | Electrolytic | 1 μ F | 50WV | \pm 20% | CC-105MJAP | 50MV1R0SS |
| C92 | Ceramic Disk | 0.01 μ F | 25WV | \pm 20% | CC-103MFCP | SS45X1E103M |
| C93 | Ceramic Chip | 0.022 μ F | 50WV | \pm 20% | CC-223MJCP | C2K31P1HC223M |
| C94 | Mylar | 0.01 μ F | 50WV | \pm 10% | CC-103MKJP | AK1-UU103K50 |
| C95 | Ceramic Disk | 0.001 μ F | 50WV | \pm 10% | CC-102KJCP | CK45B1H102K |
| C96 | Ceramic Disk | 0.01 μ F | 25WV | \pm 20% | CC-103MFCP | SS45X1E103M |
| C97 | Ceramic Chip | 0.01 μ F | 50WV | \pm 20% | CC-103MJCP | C2K31P1HC103M |
| C98 | Ceramic Chip | 220pF | 50WV | \pm 10% | CC-221KJCP | C1C31P1HCG221K |
| C99 | Ceramic Disk | 220pF | 50WV | \pm 10% | CC-221KJCP | CC45CH1H221K |
| C100 | Ceramic Disk | 0.047 μ F | 25WV | \pm 20% | CC-473MFCP | SS45X1E473M |
| C101 | Ceramic Disk | 150pF | 50WV | \pm 10% | CC-151KJCP | CC45CH1H151K |
| C102 | Ceramic Disk | 330pF | 50WV | \pm 10% | CC-331KJCP | CC45SL1H331K |

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|------------------------|--------------------------------|----------------|---------------------------|
| C103 | Ceramic Disk 180pF 50WV ±10% | CC-181KJCP | CC45CH1H181K |
| C104 | Ceramic Disk 68pF 50WV ±10% | CC-680KJCP | CC45CH1H680K |
| C105 | Ceramic Disk 56pF 50WV ±10% | CC-560KJCP | CC45SL1H560K |
| C106 | Ceramic Disk 68pF 50WV ±10% | CC-680KJCP | CC45CH1H680K |
| C107 | Ceramic Disk 2pF 50WV ±0.25pF | CC-020CJCP | CC45CH1H020C |
| C108 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C109 | Electrolytic 1μF 50WV ±20% | CC-105MJAP | 50MV1R0SS |
| C110 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C111 | Mylar 0.033μF 50WV ±10% | CC-333KJMP | AK1-UU333K50 |
| C112 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C113 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C114 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C115 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C116 | Ceramic Disk 0.001μF 50WV ±10% | CC-102KJCP | CK45B1H102K |
| C117 | Ceramic Disk 0.01μF 25WV ±20% | CC-103MFCP | SS45X1E103M |
| C118 | Electrolytic 470μF 16WV ±20% | CC-477MDAP | 16MV471HA |
| C201 | Electrolytic 0.22μF 50WV ±20% | CC-224MJAP | 50MVR22SS |
| C202 | Electrolytic 0.22μF 50WV ±20% | CC-224MJAP | 50MVR22SS |
| C203 | Ceramic Chip 0.022μF 50WV ±20% | CD-223MJCP | C2K31P1HC223M |
| C204 | Electrolytic 47μF 16WV ±20% | CC-476MDAP | 16MV470SS |
| C205 | Electrolytic 1μF 50WV ±20% | CC-105MJAP | 50MV1R0SS |
| C206 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C207 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C208 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C209 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C210 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C211 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C212 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C213 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C214 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C215 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C216 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C217 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C218 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C219 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C220 | Ceramic Chip 0.047μF 25WV ±20% | CD-473ZJCP | C1K31P1HF473Z |
| C221 | Electrolytic 10μF 16WV ±20% | CC-106MDAP | 16MV100SS |
| C222 | Ceramic Chip 0.001μF 50WV ±10% | CD-102KJCP | C2K31P1HC102K |
| CA1 | Ceramic Array 0.01μF 50WV ±10% | CF-2296 | EXF-P8102ZW |
| CERAMIC FILTERS | | | |
| CF1 | 10.695 MHz | C-1327 | 10.7MF-23 or SFE10.7MJ |
| CF2 | 455 kHz | C-1350 | LFH-6SD or CFW455HT |
| DIODES | | | |
| D1 | Diode US1040 Silicon | DX-2421 | US1040 |
| D2 | Diode 1K60 Germanium | DX-2013 | 1K60 |
| D3 | Diode 1K60 Germanium | DX-2013 | 1K60 |
| D4 | Diode 1K60 Germanium | DX-2013 | 1K60 |
| D5 | Diode 1K60 Germanium | DX-2013 | 1K60 |

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|----------------------------|--|----------------|-------------------------|
| D6 | Diode Zener HZ11A2L Silicon | DX-1316 | HZ11A2L |
| D7 | Diode US1040 Silicon | DX-2421 | US1040 |
| D8 | Diode US1040 Silicon | DX-2421 | US1040 |
| D9 | Diode US1040 Silicon | DX-2421 | US1040 |
| D10 | Diode US1040 Silicon | DX-2421 | US1040 |
| D11 | Diode US1040 Silicon | DX-2421 | US1040 |
| D12 | Diode US1040 Silicon | DX-2421 | US1040 |
| D13 | Diode US1040 Silicon | DX-2421 | US1040 |
| D14 | Diode US1040 Silicon | DX-2421 | US1040 |
| D15 | Diode US1040 Silicon | DX-2421 | US1040 |
| D16 | Diode 1S2268 Silicon | DX-1030 | 1S2268 |
| D17 | Diode US1040 Silicon | DX-2421 | US1040 |
| D18 | Diode Zener HZ7B3L Silicon | DX-1687 | HZ7B3L |
| D19 | Diode US1040 Silicon | DX-2421 | US1040 |
| D20 | Diode US1040 Silicon | DX-2421 | US1040 |
| D21 | Diode SR1K-2 Silicon | DX-0475 | SR1K-2 |
| D22 | Diode 1K60 Germanium | DX-2013 | 1K60 |
| D23 | Diode US1090 Silicon | DX-0014 | US1090 |
| D24 | Diode 1K60 Germanium | DX-2013 | 1K60 |
| D25 | Diode US1040 Silicon | DX-2421 | US1040 |
| D26 | Diode 1K60 Germanium | DX-2013 | 1K60 |
| D27 | Diode US1040 Silicon | DX-2421 | US1040 |
| D28 | Diode US1040 Silicon | DX-2421 | US1040 |
| D29 | Diode SR1K-2 Silicon | DX-0475 | SR1K-2 |
| D201 | Diode US1040 Silicon | DX-2421 | US1040 |
| D202 | Diode US1040 Silicon | DX-2421 | US1040 |
| INTEGRATED CIRCUITS | | | |
| IC1 | 6V Regulator, Linear TA78L006AP or AN78L06 | MX-4568 | TA78L006P or AN78L06 |
| IC2 | PLL, Linear/Logic TC9109BP | MX-4960 | TC9109BP |
| IC3 | Audio Amp, Linear TBA810S | MX-3364 | TBA810S |
| IC201 | LCD Drive, Linear BA6124 | MX-5588 | BA6124 |
| COILS | | | |
| L1 | RFC 470 μ H | CA-0010 | LAL03NA471K |
| L2 | RFC 470 μ H | CA-0010 | LAL03NA471K |
| L3 | RFC 3.3 μ H | CA-0008 | LAL03NA3R3K |
| L4 | RFC 4.7 μ H | CA-0009 | LAL03NA4R7K |
| L5 | RFC 4.7 μ H | CA-0009 | LAL03NA4R7K |
| L6 | Coil Drive | CA-0005 | GR-M730 |
| L7 | RFC 4.7 μ H | CA-0009 | LAL03NA4R7K |
| L8 | RFC 1 μ H | CA-0007 | LAL04NA1R0M |
| L9 | Coil T Network | CA-0006 | GR-M729 |
| L10 | Coil π Network | CA-0005 | GR-M730 |
| L11 | RFC 0.12 μ H | CA-3488 | 4LNC-092(T) |
| L12 | RFC 20 μ H | CA-0011 | 3B037(T) |
| L13 | RFC 20 μ H | CA-0011 | 3B037(T) |

| Ref. No. | Description | | | | RS Part Number | MFR's Part Number |
|--------------------|-------------|-------------------|------|-----------|-------------------|-------------------|
| LCD | | | | | | |
| LCD1 | LCD Display | | | | L-1579 | LU-196 |
| TRANSISTORS | | | | | | |
| Q1 | Transistor | 2SC1815(O) | NPN | 2SC-1815 | 2SC1815(O) | |
| Q2 | Transistor | 2SC1923(O) | NPN | 2SC-1923 | 2SC1923(O) | |
| Q3 | Transistor | 2SC1923(O) | NPN | 2SC-1923 | 2SC1923(O) | |
| Q4 | Transistor | 3SK77(GR-LB) | FET | 3SK-77 | 3SK77(GR-LB) | |
| Q5 | Transistor | 2SC1815(GR) | NPN | 2SC-1815 | 2SC1815(GR) | |
| Q6 | Transistor | 2SC1815(GR) | NPN | 2SC-1815 | 2SC1815(GR) | |
| Q7 | Transistor | 2SC1815(GR) | NPN | 2SC-1815 | 2SC1815(GR) | |
| Q8 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q9 | Transistor | JA101(Q) | PNP | MX-0014 | JA101(Q) | |
| Q10 | Transistor | 2SC2712(GR) | NPN | 2SC-2712 | 2SC2712(GR) | |
| Q11 | Transistor | 2SC1923(O) | NPN | 2SC-1923 | 2SC1923(O) | |
| Q12 | Transistor | 2SC1815(GR) | NPN | 2SC-1815 | 2SC1815(GR) | |
| Q13 | Transistor | 2SC1815(GR) | NPN | 2SC-1815 | 2SC1815(GR) | |
| Q14 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q15 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q16 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q17 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q18 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q19 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q20 | Transistor | 2SC2712(GR) | NPN | 2SC-2712 | 2SC2712(GR) | |
| Q21 | Transistor | 2SC2314(E) or (F) | NPN | 2SC-2314 | 2SC2314(E) or (F) | |
| Q22 | Transistor | 2SC2078(E) | NPN | 2SC-2078 | 2SC2078(E) | |
| Q23 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q201 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q202 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q203 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q204 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| Q205 | Transistor | JC501(Q) | NPN | MX-0015 | JC501(Q) | |
| RESISTORS | | | | | | |
| R1 | Carbon film | 2.2k Ω | 1/6W | $\pm 5\%$ | N-0216ECC | RD-1/6M222J |
| R2 | Carbon film | 180k Ω | 1/6W | $\pm 5\%$ | N-0387ECC | RD-1/6U184J |
| R3 | Carbon film | 27k Ω | 1/6W | $\pm 5\%$ | N-0316ECC | RD-1/6U273J |
| R4 | Carbon film | 2.2k Ω | 1/6W | $\pm 5\%$ | N-0216ECC | RD-1/6U222J |
| R5 | Carbon film | 47 Ω | 1/6W | $\pm 5\%$ | N-0099ECC | RD-1/6U470J |
| R6 | Carbon film | 4.7k Ω | 1/6W | $\pm 5\%$ | N-0247ECC | RD-1/6U472J |
| R7 | Carbon film | 6.8k Ω | 1/4W | $\pm 5\%$ | N-0262EEC | ERD-25TJ682 |
| R8 | Carbon film | 2.2k Ω | 1/6W | $\pm 5\%$ | N-0216ECC | RD-1/6U222J |
| R9 | Carbon film | 2.2k Ω | 1/6W | $\pm 5\%$ | N-0216ECC | RD-1/6U222J |
| R10 | Carbon film | 1k Ω | 1/6W | $\pm 5\%$ | N-0196ECC | RD-1/6U102J |
| R11 | Carbon film | 680 Ω | 1/6W | $\pm 5\%$ | N-0183ECC | RD-1/6U681J |
| R12 | Carbon film | 220 Ω | 1/6W | $\pm 5\%$ | N-0149ECC | RD-1/6U221J |
| R13 | Carbon film | 22k Ω | 1/6W | $\pm 5\%$ | N-0311ECC | RD-1/6U223J |
| R14 | Carbon film | 100 Ω | 1/6W | $\pm 5\%$ | N-0132ECC | RD-1/6U101J |
| R15 | Carbon film | 1k Ω | 1/6W | $\pm 5\%$ | N-0196ECC | RD-1/6U102J |
| R16 | Carbon film | 220k Ω | 1/6W | $\pm 5\%$ | N-0396ECC | RD-1/6U224J |

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|----------|----------------------------|----------------|-------------------|
| R17 | Carbon film 470Ω 1/6W ±5% | N-0169ECC | RD-1/6P471J |
| R18 | Carbon film 1kΩ 1/6W ±5% | N-0196ECC | RD-1/6U102J |
| R19 | Carbon film 2.2kΩ 1/6W ±5% | N-0216ECC | RD-1/6U222J |
| R20 | Carbon film 2.2kΩ 1/6W ±5% | N-0216ECC | RD-1/6U222J |
| R21 | Carbon film 82kΩ 1/6W ±5% | N-0360ECC | RD-1/6U823J |
| R22 | Carbon film 470Ω 1/6W ±5% | N-0169ECC | RD-1/6U471J |
| R23 | Carbon film 220Ω 1/6W ±5% | N-0149ECC | RD-1/6U221J |
| R24 | Carbon film 220Ω 1/6W ±5% | N-0149ECC | RD-1/6U221J |
| R25 | Carbon film 220kΩ 1/6W ±5% | N-0396ECC | RD-1/6U224J |
| R26 | Carbon film 27kΩ 1/6W ±5% | N-0316ECC | RD-1/6U273J |
| R27 | Carbon film 220Ω 1/6W ±5% | N-0149ECC | RD-1/6U221J |
| R28 | Carbon film 100Ω 1/6W ±5% | N-0132ECC | RD-1/6U101J |
| R29 | Carbon film 220Ω 1/6W ±5% | N-0149ECC | RD-1/6U221J |
| R30 | Carbon film 18kΩ 1/6W ±5% | N-0303ECC | RD-1/6U183J |
| R31 | Carbon film 1kΩ 1/6W ±5% | N-0196ECC | RD-1/6U102J |
| R32 | Carbon film 100kΩ 1/6W ±5% | N-0371ECC | RD-1/6U104J |
| R33 | Carbon film 10kΩ 1/6W ±5% | N-0281ECC | RD-1/6U103J |
| R34 | Carbon film 10kΩ 1/6W ±5% | N-0281ECC | RD-1/6U103J |
| R35 | Carbon film 10kΩ 1/6W ±5% | N-0281ECC | RD-1/6U103J |
| R36 | Carbon film 1kΩ 1/6W ±5% | N-0196ECC | RD-1/6U102J |
| R37 | Carbon film 22kΩ 1/6W ±5% | N-0311ECC | RD-1/6U223J |
| R38 | Chip 33kΩ 1/8W ±5% | ND-0324EBB | ERJ-8GCVJ333 |
| R39 | Chip 120Ω 1/8W ±5% | ND-0136EBB | ERJ-8GCVJ121 |
| R40 | Chip 2.2kΩ 1/8W ±5% | ND-0216EBB | ERJ-8GCVJ222 |
| R41 | Carbon film 4.7kΩ 1/6W ±5% | N-0247ECC | RD-1/6U472J |
| R42 | Chip 2.2kΩ 1/8W ±5% | ND-0216EBB | ERJ-8GCVJ222 |
| R43 | Carbon film 27kΩ 1/6W ±5% | N-0316ECC | RD-1/6P273J |
| R44 | Carbon film 22kΩ 1/6W ±5% | N-0311ECC | RD-1/6U223J |
| R45 | Carbon film 3.3kΩ 1/4W ±5% | N-0230EEC | ERD-25TJ332 |
| R46 | Carbon film 10kΩ 1/6W ±5% | N-0281ECC | RD-1/6U103J |
| R47 | Carbon film 100Ω 1/6W ±5% | N-0132ECC | RD-1/6U101J |
| R48 | Carbon film 330kΩ 1/6W ±5% | N-0410ECC | RD-1/6U334J |
| R49 | Carbon film 22kΩ 1/6W ±5% | N-0311ECC | RD-1/6U223J |
| R50 | Carbon film 33kΩ 1/6W ±5% | N-0324ECC | RD-1/6U333J |
| R51 | Carbon film 1kΩ 1/6W ±5% | N-0196ECC | RD-1/6U102J |
| R52 | Carbon film 2.2kΩ 1/6W ±5% | N-0216ECC | RD-1/6U222J |
| R53 | Carbon film 2.2kΩ 1/6W ±5% | N-0216ECC | RD-1/6U222J |
| R54 | Carbon film 470Ω 1/6W ±5% | N-0169ECC | RD-1/6P471J |
| R55 | Chip 10kΩ 1/8W ±5% | ND-0281EBB | ERJ-8GCVJ103 |
| R56 | Carbon film 56kΩ 1/4W ±5% | N-0345EEC | ERD-25TJ563 |
| R57 | Chip 4.7kΩ 1/8W ±5% | ND-0247EBB | ERJ-8GCVJ472 |
| R58 | Carbon film 1kΩ 1/6W ±5% | N-0196ECC | RD-1/6U102J |
| R59 | Carbon film 3.9kΩ 1/6W ±5% | N-0237ECC | RD-1/6U392J |
| R60 | Carbon film 100Ω 1/6W ±5% | N-0132ECC | RD-1/6U101J |
| R61 | Carbon film 330Ω 1/6W ±5% | N-0159ECC | RD-1/6U331J |
| R62 | Carbon film 33kΩ 1/6W ±5% | N-0324ECC | RD-1/6U333J |
| R63 | Carbon film 120kΩ 1/6W ±5% | N-0375ECC | RD-1/6U124J |
| R64 | Carbon film 18kΩ 1/6W ±5% | N-0303ECC | RD-1/6U183J |
| R65 | Chip 270Ω 1/8W ±5% | ND-0155EBB | ERJ-8GCVJ271 |
| R66 | Carbon film 27kΩ 1/6W ±5% | N-0316ECC | RD-1/6U273J |
| R67 | Carbon film 10kΩ 1/6W ±5% | N-0281ECC | RD-1/6U103J |
| R68 | Carbon film 4.7kΩ 1/6W ±5% | N-0247ECC | RD-1/6U472J |
| R69 | Carbon film 68kΩ 1/6W ±5% | N-0354ECC | RD-1/6U683J |
| R70 | Carbon film 33kΩ 1/6W ±5% | N-0324ECC | RD-1/6U333J |

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|----------|---|----------------|-------------------|
| R71 | Carbon film 820k Ω 1/6W \pm 5% | N-0440ECC | RD-1/6U824J |
| R72 | Carbon film 4.7k Ω 1/6W \pm 5% | N-0247ECC | RD-1/6U472J |
| R73 | Carbon film 22 Ω 1/6W \pm 5% | N-0078ECC | RD-1/6U220J |
| R74 | Carbon film 100 Ω 1/6W \pm 5% | N-0132ECC | RD-1/6U101J |
| R75 | Carbon film 2.2 Ω 1/6W \pm 5% | N-0032ECC | RD-1/6U2R2J |
| R76 | Carbon film 1k Ω 1/6W \pm 5% | N-0196ECC | RD-1/6U102J |
| R77 | Metal film 22 Ω 1W \pm 5% | N-0078EGC | ERG-1ANJ220 |
| R78 | Carbon film 6.8k Ω 1/6W \pm 5% | N-0262ECC | RD-1/6U682J |
| R79 | Carbon film 270 Ω 1/6W \pm 5% | N-0155ECC | RD-1/6U271J |
| R80 | Carbon film 12k Ω 1/6W \pm 5% | N-0288ECC | RD-1/6U123J |
| R81 | Carbon film 100 Ω 1/6W \pm 5% | N-0132ECC | RD-1/6U101J |
| R82 | Carbon film 18k Ω 1/6W \pm 5% | N-0303ECC | RD-1/6U183J |
| R83 | Carbon film 1k Ω 1/6W \pm 5% | N-0196ECC | RD-1/6U102J |
| R84 | Chip 22 Ω 1/8W \pm 5% | ND-0078EBB | ERJ-8GCYJ220 |
| R85 | Not used | | |
| R86 | Carbon film 22 Ω 1/6W \pm 5% | N-0078ECC | RD-1/6U220J |
| R87 | Carbon film 220 Ω 1/6W \pm 5% | N-0149ECC | RD-1/6U221J |
| R88 | Carbon film 10 Ω 1/6W \pm 5% | N-0063ECC | RD-1/6U100J |
| R89 | Carbon film 220 Ω 1/6W \pm 5% | N-0149ECC | RD-1/6U221J |
| R90 | Chip 4.7 Ω 1/8W \pm 5% | ND-0047EBB | ERJ-8GCZJ4R7 |
| R91 | Carbon film 100 Ω 1/2W \pm 5% | N-0132EEC | ERD-50TJ101 |
| R92 | Carbon film 47 Ω 1/6W \pm 5% | N-0099ECC | RD-1/6U470J |
| R93 | Chip 220 Ω 1/8W \pm 5% | ND-0149EBB | ERJ-8GCYJ221 |
| R94 | Chip 10 Ω 1/8W \pm 5% | ND-0063EBB | ERJ-8GCYJ100 |
| R95 | Carbon film 1k Ω 1/2W \pm 5% | N-0196EEC | ERD-50TJ102 |
| R96 | Carbon film 1k Ω 1/4W \pm 5% | N-0196EEC | ERD-25TJ102 |
| R97 | Carbon film 330 Ω 1/6W \pm 5% | N-0169ECC | RD1/6M331J |
| R98 | Carbon film 22k Ω 1/6W \pm 5% | N-0311ECC | RD-1/6U223J |
| R99 | Carbon film 22k Ω 1/6W \pm 5% | N-0311ECC | RD-1/6U223J |
| R100 | Carbon film 8.2k Ω 1/6W \pm 5% | N-0271ECC | RD-1/6U822J |
| R101 | Carbon film 4.7k Ω 1/4W \pm 5% | N-0247EEC | ERD-25TJ472 |
| R102 | Carbon film 4.7k Ω 1/6W \pm 5% | N-0247ECC | RD1/6M472J |
| R103 | Carbon film 2.2k Ω 1/6W \pm 5% | N-0216ECC | RD-1/6U222J |
| R104 | Carbon film 2.2k Ω 1/4W \pm 5% | N-0216EEC | ERD-25TJ222 |
| R105 | Carbon film 10k Ω 1/6W \pm 5% | N-0281ECC | RD-1/6U103J |
| R106 | Carbon film 10k Ω 1/6W \pm 5% | N-0281ECC | RD-1/6U103J |
| R107 | Carbon film 10k Ω 1/6W \pm 5% | N-0281ECC | RD-1/6U103J |
| R201 | Chip 1.2k Ω 1/8W \pm 5% | ND-0199EBB | ERJ-8GCYJ122 |
| R202 | Chip 82k Ω 1/8W \pm 5% | ND-0360EBB | ERJ-8GCYJ823 |
| R203 | Chip 82k Ω 1/8W \pm 5% | ND-0360EBB | ERJ-8GCYJ823 |
| R204 | Chip 1.2k Ω 1/8W \pm 5% | ND-0199EBB | ERJ-8GCYJ122 |
| R205 | Chip 100 Ω 1/8W \pm 5% | — | ERJ-8GCYJ101 |
| R206 | Not used | | |
| R207 | Chip 560k Ω 1/8W \pm 5% | | ERJ-8GCYJ564 |
| R208 | Chip 330k Ω 1/8W \pm 5% | ND-0410EBB | ERJ-8GCYJ334 |
| R209 | Chip 10k Ω 1/8W \pm 5% | ND-0281EBB | ERJ-8GCYJ103 |
| R210 | Chip 330 Ω 1/8W \pm 5% | ND-0159EBB | ERJ-8GCYJ331 |
| R211 | Chip 10k Ω 1/8W \pm 5% | ND-0281EBB | ERJ-8GCYJ103 |
| R212 | Chip 120 Ω 1/8W \pm 5% | ND-0132EBB | ERJ-8GCYJ121 |
| RA201 | Array resistor, metal film 1M Ω x 9 \pm 5% | RX-0001 | EXBF10E-105J |
| RA202 | Array resistor, metal film 1M Ω x 7 \pm 5% | RX-0002 | EXBF8E-105J |
| RA203 | Array resistor, metal film 1M Ω x 5 \pm 5% | RX-0003 | EXBF6E-105J |

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|---------------------------|--------------------------------|----------------|---------------------------|
| SWITCHES | | | |
| SW1 | LAMP | S-0002 | KHC-10901 |
| SW2 | POWER HI/LOW | J-5022 | XQ6469 |
| SW3/VR5 | POWER/POT VOLUME | P-0008 | V12M41S(SJ) 15FHA50K |
| SW4 | TALK | S-2973 | AH1210 |
| SW5/J4 | Jack, MIC (DIN5P) | J-6532 | D5-705B-10 |
| SW201 | Channel | S-1581 | SRS-202U |
| COILS | | | |
| T1 | Coil RF (27 MHz) | CA-3964 | GR-N555(U) |
| T2 | Coil Mixer (27 MHz) | CA-3433 | 1624B(U) |
| T3 | Coil IF (455 kHz) | CA-8183 | GR-P352203(U) |
| T4 | Coil IF (455 kHz) | CA-7844 | GR-P4202 |
| T5 | Coil VCO (13/16 MHz) | CA-0003 | GR-C732 |
| T6 | Coil Buffer (16 MHz) | CA-0004 | GR-C731 |
| T7 | Coil BPF (27 MHz) | CA-4966 | GR-N549(U) |
| T8 | Coil BPF (27 MHz) | CA-4966 | GR-N549(U) |
| T9 | Coil BPF (27 MHz) | CA-4966 | GR-N549(U) |
| T10 | Transformer (Mod.) | TA-0002 | E4006C |
| TRIMMER CAPACITOR | | | |
| TC1 | Capacitor Trimmer 20pF | C-1351 | ECR-GA020E30 |
| THERMISTOR | | | |
| TH1 | Thermistor 10k Ω | T-0001 | TD5-C310D |
| VARIABLE RESISTORS | | | |
| VR1 | Trimmer 20k Ω | P-8008 | V6EK-PV(1S)B20K |
| VR2 | Trimmer 50k Ω | P-0007 | V6EK-PH(1S)B50K |
| VR3 | Trimmer 50k Ω | P-0007 | V6EK-PH(1S)B50K |
| VR4 | Trimmer 100 Ω | P-0006 | V6CK-PV(1S)B100 |
| VR5 | Volume Control 50k Ω A | P-0008 | V12M4-1S(SJ) 15FHA 50K |
| VR6 | Squelch Control 50k Ω C | P-0009 | V12M4-1N15FH C50K |
| CRYSTAL | | | |
| X1 | 10.240 MHz | MX-1043 | 10.240 MHz |
| MISCELLANEOUS | | | |
| | Case, shield | | GE-84D-5177 |
| | Case, shield, bottom | | GE-83D-3958 |
| | Case, shield, top | | GE-84D-5143 |
| | Connector, socket 3P | J-0003 | 3024-03CH |
| | Connector, socket 16P | J-5072 | 3024-16CH |
| | Connector, wafer 3P | J-0001 | 3022-03B |
| | Connector, wafer 16P | J-0002 | 3022-16B |

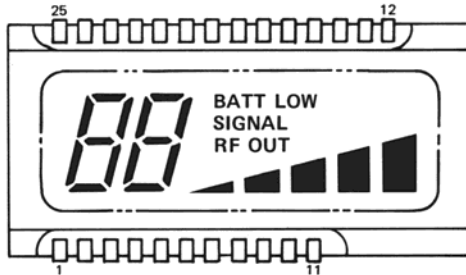
| Ref. No. | Description | RS Part Number | MFR's Part Number |
|------------------------------------|------------------------|---|-------------------|
| J1 J2/J3 | ① Heat sink (IC3) | J-0840 J-5022 L-0010 M-2352 SP-0003 | GE-84D-5142 |
| | ② Heat sink (Q21, 22) | | GE-84D-4914 |
| | ③ Jack, speaker | | SG-8022 |
| | ④ Jack, board, PWR/CHG | | XQ6469 |
| | Lamp | | BP26V30mAW25 |
| | ⑤ Microphone | | WM-034CY |
| | ⑥ Speaker (8Ω, 0.3W) | | SP-505 |
| | ⑦ Fiber, heat sink | | GE-84D-5184 |
| ⑧ Fiber, PLL shield cover (Bottom) | GE-83D-3959 | | |

MECHANICAL PARTS LIST

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|----------|---|----------------|-------------------|
| ⑨ | Antenna | A-0001 | T-4143 |
| | Accessories | | |
| | Battery, dummy | CS-0045 | GE-21D-5915 |
| | Case, carrying | Z-0012 | GE-84B-5138 |
| ⑩ | Bracket, antenna | A-4520 | GE-82D-3329 |
| ⑪ | Bracket, MIC jack | | GE-82D-3553 |
| ⑫ | Bracket, TALK/LAMP PCB | | GE-84D-5250 |
| ⑬ | Buckle | HC-0065 | GE-84D-5077 |
| | Case assembly, front (Non-repairable) | Z-0014 | GA-84D-4955 |
| ⑭ | Case, front | | GE-84B-4945 |
| ⑮ | Window, LCD | | GE-84D-4946 |
| | Case, rear, assembly for USA (Non-repairable) | Z-0015 | GA-84D-4956 |
| ⑯ | Case, battery | | GE-84B-4948 |
| ⑰ | Case, rear | | GE-84B-4947 |
| ⑱ | Terminal, battery | | GE-82D-3314 |
| ⑲ | Spring, battery (L) | RB-0004 | GE-82D-3315 |
| ⑳ | Spring, battery (S) | RB-0005 | GE-82D-3316 |
| ㉑ | Strap | | GE-84D-5076 |
| ㉒ | Nut, push 3m/m | | CS TYPE 3mm |
| | Case, rear, assembly for CANADA (Non-repairable) | | GA-84D-5232 |
| ⑯ | Case, battery | | GE-84B-4948 |
| ⑰ | Case, rear | | GE-84B-4947 |
| | Label, model | | GE-84D-5225 |
| ⑱ | Terminal, battery | | GE-82D-3314 |
| ⑲ | Spring, battery (L) | RB-0004 | GE-82D-3315 |
| ⑳ | Spring, battery (S) | RB-0005 | GE-82D-3316 |
| ㉑ | Strap | | GE-84D-5076 |
| ㉒ | Nut, push 3m/m | | CS TYPE 3mm |
| | Case, rear, assembly for AUSTRALIA (Non-repairable) | | GA-84D-5233 |
| ⑯ | Case, battery | | GE-84B-4948 |
| ⑰ | Case, rear | | GE-84B-4947 |
| | Label, model | | GE-84D-5222 |
| ⑱ | Terminal, battery | | GE-82D-3314 |
| ⑲ | Spring, battery (L) | RB-0004 | GE-82D-3315 |
| ⑳ | Spring, battery (S) | RB-0005 | GE-82D-3316 |
| ㉑ | Strap | | GE-84D-5076 |
| ㉒ | Nut push 3m/m | | CS TYPE 3mm |

| Ref. No. | Description | RS Part Number | MFR's Part Number |
|----------|-------------------------------|----------------|-------------------|
| ②③ | Cap, jack board | HB-2565 | GE-83D-3661 |
| ②④ | Cap, MIC/SP jack | HB-0002 | GE-84D-4943 |
| ②⑤ | Cover, battery | DB-0001 | GE-84C-4951 |
| | Frame ass'y (Non-repairable) | Z-0013 | GA-84D-4954 |
| ②⑥ | Escutcheon | — | GE-84B-4940 |
| ②⑦ | Frame | — | GE-84B-4939 |
| ②⑧ | Grommet, antenna | A-4018 | GE-13C-0907 |
| ④ | Jack board (Non-repairable) | J-5022 | XQ6469 |
| | Jack, ANT | | |
| | Jack, CHG | | |
| | Switch, POWER HI/LO | | |
| | Jack, PWR | | |
| ② | Heat sink (Q21, 22) | — | GE-84D-4914 |
| ②⑨ | Knob, channel | K-0013 | GE-84D-4942 |
| ③⑩ | Knob, SQUELCH, VOLUME | K-5492 | GE-82D-3439 |
| ③① | Knob, talk | K-0014 | GE-84D-5140 |
| ③② | PCB ass'y, CHG/PWR | XB-0673 | GA-84D-5211 |
| ③③ | PCB ass'y, TALK/LAMP switch | XB-0671 | GA-84D-5212 |
| ③④ | PCB ass'y, LCD | XB-0670 | GA-84D-5209 |
| ③⑤ | PCB ass'y, main | XB-0669 | GA-84D-5208 |
| ③⑥ | PCB ass'y, POWER HI/LOW | XB-0672 | GA-84D-5210 |
| | Reflector, Lamp | | GE-84D-5157 |
| | Screws | | |
| | 2x10 countersunk head | HD-0008 | |
| | 2x25 countersunk head (black) | | |
| | 2x30 pan head (black) | | |
| | 3x5 pan head | HD-2059 | |
| | 3x6 pan head | | |
| | 3x6 pan head P type | | |
| | 3x6 pan head polysulphane | | |
| | 3x8 countersunk head | HD-0007 | |
| ③⑦ | Shield plate | | GE-84D-5251 |
| ③⑧ | Shield, VCO bottom | | GE-83D-3958 |
| ③⑨ | Shield, VCO case | | GE-84D-5177 |
| ④⑩ | Shield, VCO top | | GE-84D-5143 |
| ④① | Spacer, Lamp switch | | GE-84D-5279 |
| ④② | Spacer, Talk switch | | GE-84D-5278 |

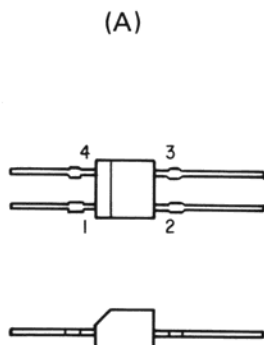
LCD PIN CONFIGURATION



| Pin No. | Segment | Pin No. | Segment |
|---------|---------|---------|---------|
| 1 | 1e | 15 | SIGNAL |
| 2 | 1d | 16 | RF |
| 3 | 1c | 17 | OUT |
| 4 | 2e | 18 | 2b |
| 5 | 2d | 19 | 2a |
| 6 | 2c | 20 | 2f |
| 7 | L1 | 21 | 2g |
| 8 | L2 | 22 | 1b |
| 9 | L3 | 23 | 1a |
| 10 | L4 | 24 | 1f |
| 11 | L5 | 25 | 1g |
| 12 | COM | | |
| 13 | LOW | | |
| 14 | BATT | | |

SEMICONDUCTOR LEAD IDENTIFICATION

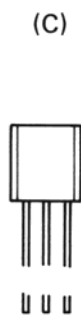
- (A): 3SK77(GR-LB)
 (B): 2SC2712(GR)
 (C): 2SC1815(O), 2SC1815(GR), 2SC1923(O), JA101(Q), JC501(Q)
 (D): 2SC2314(E,F)
 (E): 2SC2078(E)



1. SOURCE
2. DRAIN
3. GATE 2
4. GATE 1



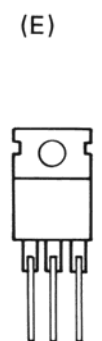
1. EMITTER
2. COLLECTOR
3. BASE



1. EMITTER
2. COLLECTOR
3. BASE



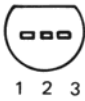
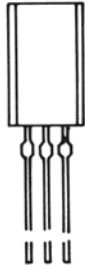
1. EMITTER
2. COLLECTOR
3. BASE



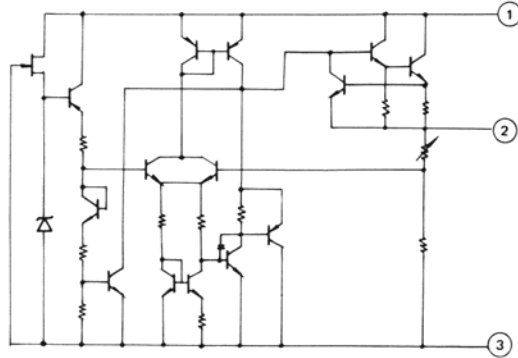
1. BASE
2. COLLECTOR
3. EMITTER

IC PIN CONFIGURATIONS

IC 1 AN78L06, TA78L006AP 6V REGULATOR



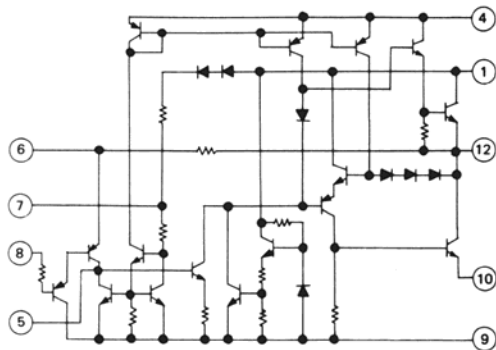
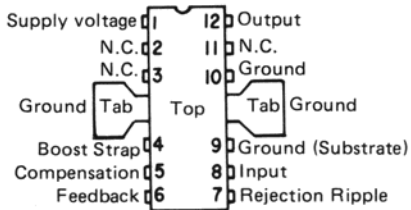
- 1. INPUT
- 2. OUTPUT
- 3. COMMON



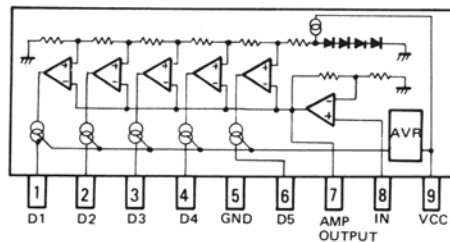
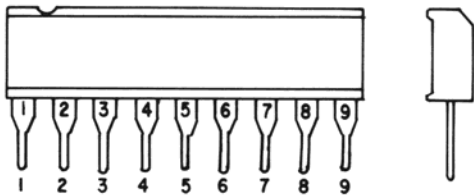
IC 2 TC9109BP PLL

For pin configuration, see page 5.

IC 3 TBA810S AF POWER AMPLIFIER



IC 201 BA6124 LCD METER DRIVER



EXPLODED VIEW

