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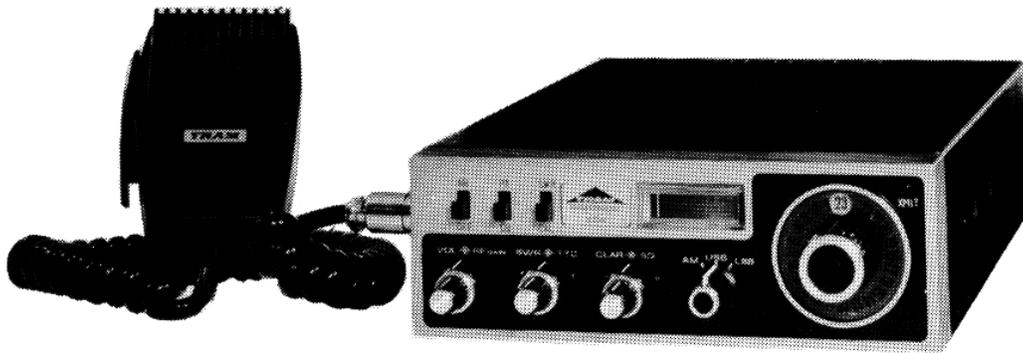
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## **CITIZEN'S BAND TRANSCEIVER**

*A PRODUCT OF  
TRAM / DIAMOND  
CORPORATION*

●  
LOWER BAY ROAD  
WINNISQUAM, N. H. 03289

## TABLE OF CONTENTS

	Page
WARRANTY .....	1
LICENSE AND REGULATION INFORMATION .....	2
GENERAL INFORMATION .....	3
ANTENNAS AND COAXIAL CABLES .....	3
INSTALLATION .....	3
OPERATION .....	5
CONTROL FUNCTION.....	5
RF Gain .....	5
SWR .....	5
TTC.....	5
Clarifier .....	5
Squelch .....	6
Mode .....	6
Channel Selector .....	6
Noise Blanker .....	6
PA-CB Switch .....	6
SWR-CAL.....	6
Meter .....	6
Transmission Indicator .....	6
Mic Jack.....	6
OPERATION PROCEDURE TO RECEIVE.....	7
OPERATION PROCEDURE TO TRANSMIT .....	7
SPECIFICATIONS.....	8
GENERAL.....	8
TRANSMITTER .....	8
RECEIVER .....	9
REPLACEMENT PARTS LIST .....	10

## **LIMITED WARRANTY**

TRAM/DIAMOND CORPORATION, hereinafter referred to as Tram, warrants that, for a period of ninety (90) days from the date of first sale to the original retail purchaser, this product will be free of defect in materials and workmanship. Tram's obligation is limited to repairing or, at Tram's option, replacing those equipments or parts which are returned transportation and insurance prepaid, to the factory (or the dealership where purchased) without alteration or further damage and in Trarm's judgment, were originally defective or became defective in normal use.

This equipment was designed under the direction of Tram/Diamond Corporation and is manufactured for Tram/Diamond in Japan by one of the world's foremost makers of fine electronic products.

## **LICENSE AND REGULATION INFORMATION**

The Federal Communications Commission has made it possible for any citizen over eighteen (18) years of age to obtain a license to operate two way radios in the Citizen's Band. It is not legal to operate this equipment without a license.

Operating and equipment requirements are covered in Part 95 of the Federal Communications Commission's Rules and Regulations. Note the proper use of channel 9 (27.065 MHz). This channel has been reserved for communications concerned with the immediate safety of life of individuals, the immediate protection of property or the emergency assistance to a motorist. No other use of this channel is authorized. All use of this equipment must conform to F.C.C. requirements. Tram Corporation certifies that this equipment is designed and manufactured to fully comply with the F.C.C. technical requirements for Class D Citizens Radio Service operation.

To obtain your license, you must first fill out the F.C.C. application form #505. Read the application form carefully and fill out the work sheet, transfer this information to the application form, sign and mail the application with \$20 for application fee to: FEDERAL COMMUNICATIONS COMMISSION, GETTYSBURG PENNSYLVANIA . . 17325. When approved the F.C.C. will issue your license. You will be assigned a number to be used as your station call letters.

Keep your license close to your equipment at all times. Fill out a transmitter identification card, F.C.C. form #452-C and attach it to the side of the two-way radio. **DO NOT MAKE TRANSMISSIONS WITH YOUR EQUIPMENT UNLESS YOU HAVE YOUR LICENSE.** Read Part 95 of the F.C.C. RULES AND REGULATIONS thoroughly. Make your transmissions short and to the point. Listen to the channel before transmitting to see that it is not in use.

## **GENERAL INFORMATION**

The TRAM DIAMOND 60 is a compact mobile transceiver designed to provide 23 channel operation in either SSB or AM modes in the class "D" citizen's band service. This versatile unit can also be used for public address paging and can be installed in either positive or negative ground systems.

The advanced solid state circuitry employs 32 transistors, 61 diodes, 2 ICs and 1 FET. An additional 14 transistors are used in control and protective circuits such as the exclusive transmitter tone control (TTC), compressor, RF gain control, voltage regulator and a special fail safe transmitter protection circuit which protects the transmitter from damage if operating into a badly mis-matched antenna system.

The double conversion receiver uses a highly selective crystal filter in the SSB mode and a separate ceramic filter for AM operation.

The switch controlled RF noise blanker is very effective in reducing pulse or ignition type noises. A built-in rugged speaker, dynamic microphone and tamper deterrant mounting hardware complete this communications package of unusually high quality.

## **ANTENNA AND COAXIAL CABLE (not provided)**

The Diamond 60 is designed to work into a 50 ohm unbalanced antenna system. Many suitable antennas are commercially available ranging from full 1/4 wave length whips to base or top loaded antennas designed for cowl or roof top mounting.

The loaded antennas are physically shorter and perform almost as well as the full whip. For those who want optimum results, a full 11 meter 1/4 wave whip is recommended. Most of these antennas are designed for use with 52 ohm coaxial cable such as RG-58/U.

## **INSTALLATION**

Having decided where to mount the Diamond 60, position the unit and bracket in place and see that it does not interfere with the vehicle's controls and that all of the Diamond 60's controls are easily accessible.

Mark the bracket location carefully and use the bracket as a drilling template for the mounting holes.

**Note:** The screws provided for attaching the radio to the mounting bracket have a hex socket head and require the use of the allen wrench also provided. These screws without the allen wrench, are virtually tamper proof and would discourage theft. We recommend using round headed screws for attaching the mounting bracket under the car dash. Usually there will not be room for a thief to remove these screws using standard tools.

When installing the power cable supplied, it is necessary that the red wire be connected to the positive side of the vehicle's electrical system and the black wire be connected to the negative side of the system. Reversing these connections will cause the 3A line fuse to blow.

Connect the antenna cable to the coaxial connector on the rear panel of the unit using a matching PL-259 UHF connector.

Connect the microphone plug to the microphone jack located on the left side of the unit.

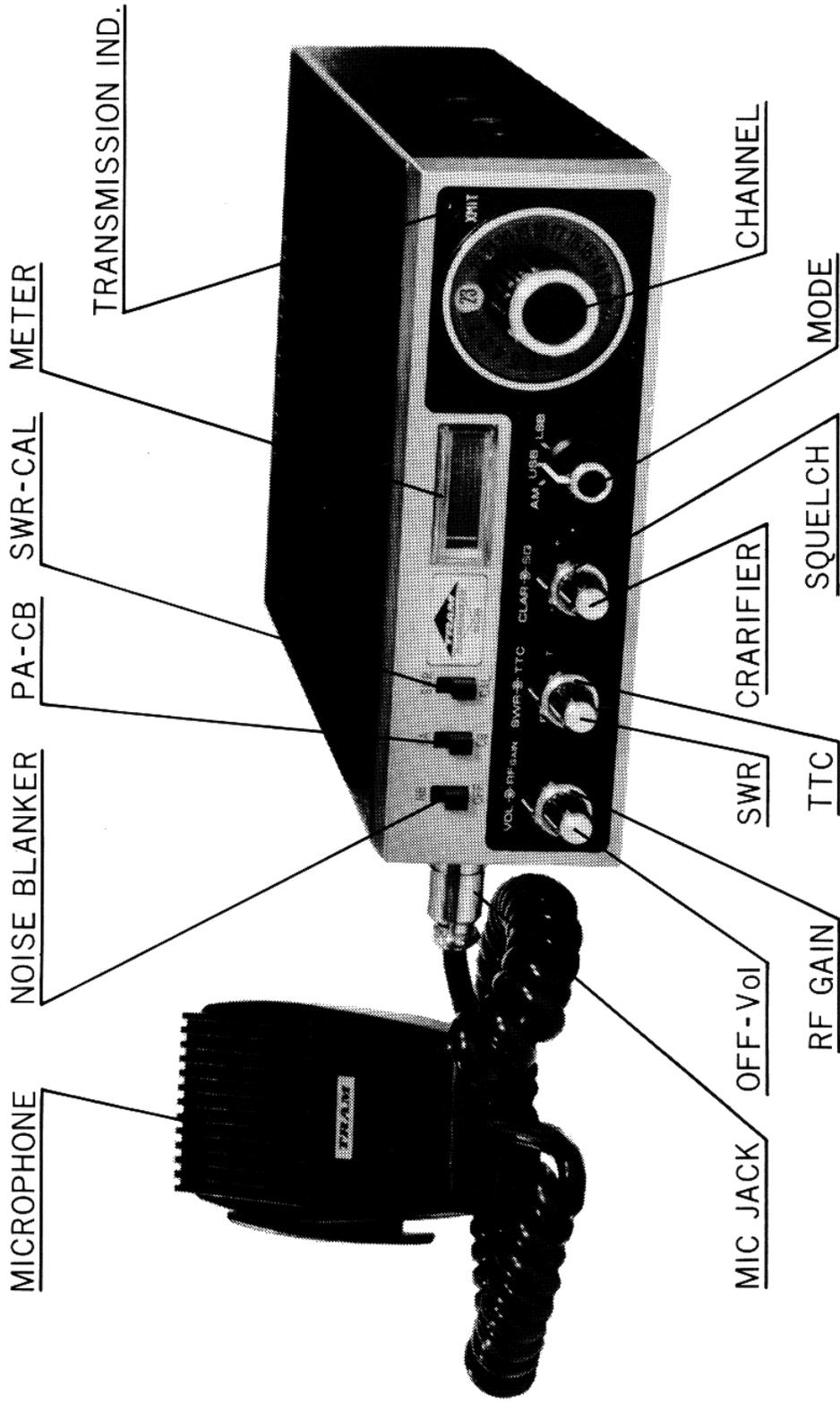


Figure 1

## OPERATION

### A. Control Function

- 1. OFF-Vol (small knob).** The volume control is combined with the DC power switch. At the extreme CCW (counter clockwise) position of the knob, the DC power to the unit is switched off. Advancing the control CW (clockwise) from this position turns on the power. To increase the loudness of the receiver audio, turn the control in a CW direction.
- 2. RF GAIN (large knob).** The RF gain control varies the gain of the RF amplifier. Maximum sensitivity will be obtained with the control at extreme CW position, the normal position for AM reception.

When copying strong signals under noisy or crowded conditions, it may be found desirable to reduce the RF gain setting. To do this, set the volume control for nearly maximum and control the audio level with the RF gain control. This procedure is particularly recommended when receiving SSB signals.

**Important:** Remember that the "S" meter was calibrated with the RF gain control fully CW.

- 3. SWR (small knob).** This control is used in conjunction with the SWR-CAL meter switch directly above. With the switch in the "CAL" position, key the transmitter and rotate the small SWR knob so that the meter pointer is on the SWR-CAL mark. Now the SWR meter is calibrated. Return switch to SWR to read SWR from meter scale.

**Note:** The SWR reading will not necessarily be the same on all channels.

- 4. TTC (large knob).** The transmitter tone control varies the frequency response of the microphone amplifier. As the control is rotated CCW ("B" position) the bass response is increased. When turned CW, the bass response is reduced and the treble is favored. This provides a means of tailoring the transmit audio to suit individual voice characteristics. This control is also effective in the PA mode.
- 5. CLARIFIER (small knob).** Allows variation of both the transmitter and receiver operating frequencies above and below the assigned frequency. Satisfactory reception on SSB signals requires very careful tuning. Although this clarifier control is intended primarily to tune in SSB signals, it may be used to optimize AM signals.

- 6. SQUELCH (large knob).** This control, if turned CW, will quiet the receiver audio. If it is set just beyond the point where the receiver background noise disappears, any signal greater in strength than the noise level will restore the receiver to operation. The control may also be advanced to higher settings so that only relatively strong signals will open the squelch. This can be particularly useful if the band is open with skip signals that are weaker than the stations in your local area. The squelch can then be set to open only on the strong local signals.
- 7. MODE.** The position of this switch determines what type of signal will be received and also what type of signal will be transmitted.
- 8. CHANNEL SELECTOR.** Diamond 60 is supplied equipped for 23 channel operation. The desired channel is selected by rotating the channel selector knob so that the number of the channel appears in the window. There is no stop on the switch so the knob can be continuously rotated in either direction allowing quick channel change.
- 9. NOISE BLANKER.** The NB switch is used to turn the RF noise blanker ON and OFF. This control functions in AM and SSB.
- 10. PA-CB SWITCH.** This switch is used for selecting normal CB communications or public address paging. In the PA position, it disables the transceiver and the internal speaker unit, and connects the audio amplifier output circuit to an external loud speaker unit (8 ohms -- not supplied) for paging.
- 11. SWR-CAL.** The CAL position switches the meter to read relative forward power for calibrating the SWR bridge. The SWR position switches the meter to read SWR. This reading is accurate ONLY when the bridge is first calibrated in the CAL position.
- 12. METER.** Indicates signal strength of received signal in S units, relative power output and SWR.
- 13. TRANSMISSION INDICATOR:** When the transmitter is keyed (on) in SSB or AM, this lamp will glow at reduced brilliance. As you speak into the microphone the lamp will vary in brilliance to show modulation.
- 14. MIC JACK.** The microphone is connected to this jack. A matching four (4) pin connector is supplied attached to the microphone.

## B. Operating Procedure to Receive

1. Be sure that power source and antenna are connected to the proper connectors before going to the next step.
2. Set PA-CB switch to the CB position and turn unit on by turning VOL control CW.
3. Set the RF gain control full CW for maximum RF gain.
4. Set the MODE switch to the desired mode. (AM-USB or LSB)
5. Set the CHANNEL selector switch to the desired channel.
6. Set the VOLUME for a comfortable listening level.
7. Listen to the background noise from the speaker. Turn the SQUELCH control slowly CW until the noise JUST disappears (no signal should be present). The SQUELCH is now properly adjusted. The receiver will remain quiet until a signal is actually received. Do not advance the control too far, or some of the weaker signals will not be heard.
8. Adjust the CLARIFIER control to clarify the SSB signals or to optimize AM signals.

## C. Operating Procedure to Transmit

**Caution:** Be sure the antenna is properly connected to the unit before attempting to transmit. Transmitting without an antenna or into a poor or broken antenna with a high SWR (5:1 or over) will cause the automatic transmitter protection circuitry to reduce the power output until the situation is corrected.

1. Select the desired channel.
2. If transmitting for the first time, set the transmit tone control (TTC) to about center position.
3. If the channel is clear, push the press-to-talk switch on the microphone, hold the microphone close to, but to the side of your mouth and speak in a normal voice. The transmit lamp will light and flash as you speak, indicating modulation.
4. A short "on-the-air" test with another station, while adjusting the transmit tone control (TTC) will allow the other station to tell you which position of the control best suits your voice.

## SPECIFICATIONS

### GENERAL

Channels:	23AM, 23LSB, 23USB
Frequency Range:	26.965 to 27.255 MHz
Frequency Tolerance:	0.005%
Frequency Stability:	0.001%
Operating Temperature Range:	-30°C to +50°C
Microphone:	Dynamic with push-to-talk switch and coiled cord
Supply Voltage:	13.8V DC (positive or negative ground)
Current Drain:	Receive: 1.3A @ maximum audio output 0.5A standby (no signal) Transmit: AM full mod - - - - - 2.0A SSB 7W PEP - - - - - 2.2A
Meter:	Illuminated, indicates receiving signal strength, relative power output and SWR
Size:	2-23/64"(h) × 6-57/64"(w) × 9-23/32"(d)
Weight:	6.5 pounds

### TRANSMITTER

AM Mode, Full Carrier:	3.75 watts
Modulation Capability:	95% to 100%
SSB Suppressed Carrier:	Peak envelope power output - - 8 watts
Harmonic Suppression and Spurious Emissions:	Better than FCC requirement
Frequency Response:	AM and SSB - - - 500 to 2000 Hz
Fine Tune:	± 800 Hz

## RECEIVER

Sensitivity:	AM - $.3\mu\text{V}$ provides more than 1 watt audio. with gain control full and noise blanker off. Signal mod. 30% @ 1kHz sine wave. SSB - $.1\mu\text{V}$ provides more than 1 watt audio output.
Signal to Noise Ratio:	AM - $.3\mu\text{V}$ for 10db S+N/N, signal mod. 30% @ 1kHz sine wave. SSB - $.1\mu\text{V}$ for 10db S+N/N carrier on and off.
Selectivity:	AM - 6db @ 4kHz, 50db @ 20kHz. SSB - 6db @ 2.2kHz, 50db @ 5.5kHz.
AGC:	Change in audio output less than 12db from $10\mu\text{V}$ to .5 volts.
Squelch:	Adjustable. Threshold less than .5uV. Tight more than 200 uV.
Audio Frequency Response:	500 to 2000Hz.
Distortion:	Less than 10% at 5.0 watts output.
Image Rejection:	More than 50db.
IF Rejection:	More than 80 db at 455kHz, 60db @ 7.8MHz.
Adjacent Channel Rejection:	More than 60db @ $.3\mu\text{V}$ .
Cross Modulation:	More than 55db.
IF Frequency:	AM - - - 7.8MHz, 455kHz. SSB - - - 7.8MHz.
Clarifier Range:	AM - - - $\pm 1.5\text{kHz}$ . SSB - - - $\pm 800\text{Hz}$ .
Noise Blanker:	RF parallel gate type (hybrid IC).

# REPLACEMENT PARTS LIST

NOTE: UNLESS OTHERWISE MARKED.

## CAPACITORS

All ceramic capacitors are 10%, 50V DC.

All mylar-film capacitors are 20%, 50V DC.

All electrolytic capacitors are +100, -10%, 50V DC.

All tantalum capacitors are 20%, 3V DC.

Schematic symbol	Description	Stock No.
C1,3,301,303,305,307,309,311, 313,315,317,319	Ceramic NPO 33pF	260-36-033
C5,81,95,101,112,114	Ceramic SL 150pF	260-36-025
C6,83,94	Ceramic N220 100pF	260-36-037
C7, 10~13, 16, 18~20, 22~26, 32,33,38,52,54,56,58,64,71,74 ~76,79,82,86,89~93,96~98, 100,123,126,127,129,134,138~ 140,144,146,155,157,160,163, 166~168,171,173,176~179, 181~187,190~192,324,328, 329,334,337	Ceramic Y5R 4700pF $\pm 20\%$	260-34-021
C8,9,17,27~29,31,36,37,41,42, 44~46,48,49,51,72,87,106,107, 109,117,118,120,188,189,340, 341	Ceramic Y5R 2200pF $\pm 20\%$	260-34-020
C14	Ceramic N750 10pF	260-36-027
C30	Ceramic SL 15pF	260-36-028
C34	Ceramic NPO 2pF	260-36-013
C35,50,57,330	Ceramic NPO 1pF	260-36-012
C47	Ceramic NPO 7pF	260-36-019
C53,323	Ceramic NPO 5pF	260-36-015
C80,104	Ceramic SL 5pF	260-36-004
C84,105	Ceramic SL 22pF	260-36-005
C102,103	Ceramic SL 120pF	260-36-039
C108	Ceramic SL 10pF	260-36-030
C113,321	Ceramic N220 68pF	260-36-036
C162	Ceramic Y5R 1000pF	260-34-026
C119	Ceramic SL 47pF	260-36-021
C322,335,339	Ceramic N220 47pF	260-36-035
C327,331,333	Ceramic NPO 10pF	260-36-016

Schematic symbol	Description	Stock No.
C332,344	Ceramic SL 100pF	260-36-006
C335,336,	Ceramic NPO 3pF	260-36-014
C342	Ceramic N470 33pF	260-36-034
C2, 4, 15, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320	Ceramic variable 20pF	260-30-002
C43, 55, 60 ~ 63, 66, 136	Mylar-film .033 $\mu$ F	260-37-001
C59, 131, 147	Mylar-film .01 $\mu$ F	260-37-005
C132	Mylar-film .1 $\mu$ F	260-37-003
C325	Polysteren 330pF	260-38-005
C326	Polysteren 220pF	260-38-004
C111, 154, 170, 180	Electrolytic 33 $\mu$ F 16V	260-43-040
C110, 124, 133, 135, 143, 145, 149, 151 ~ 153, 156, 158, 159, 161	Electrolytic 1 $\mu$ F 50V	260-43-027
C128, 130, 137, 148, 343	Electrolytic 10 $\mu$ F 16V	260-43-030
C172	Electrolytic 100 $\mu$ F 16V	260-43-035
C174	Electrolytic 100 $\mu$ F 10V	260-43-036
C175	Electrolytic 470 $\mu$ F 25V	260-43-043
C73	Electrolytic 4.7 $\mu$ F 35V	260-43-044
C65	Electrolytic (Non-polar) 3.3 $\mu$ F 6V	260-43-023
C67	Electrolytic (Non-polar) 1 $\mu$ F 6V	260-43-024
C125, 150	Tantalum 100 $\mu$ F	260-40-002
C165	Tantalum 33 $\mu$ F	260-40-001

## RESISTORS

All resistors are 1/4 watt, 10% carbon fixed type.

R1, 3, 6, 13, 22, 27, 57, 110, 125, 128, 130, 133, 147	2.2K $\Omega$	260-54-068
R2, 47, 52, 67	3.3K $\Omega$	260-54-070
R4, 36, 41, 97, 100, 146, 174, 196, 309	47 $\Omega$	260-54-055
R5, 9, 12, 21, 23, 26, 28, 46, 60, 61, 63, 68, 104, 109, 111, 122, 137, 142, 152, 165	1K $\Omega$	260-54-060
R7, 8, 18, 19, 144, 153, 166, 305, 310, 312, 314, 329, 330	220 $\Omega$	260-54-042
R14, 15, 56, 71, 92, 95, 119, 198, 304, 308, 317, 326	470 $\Omega$	260-54-065
R24, 25, 66, 83, 85, 90, 113, 114, 124, 127, 136, 151, 167, 171, 180, 193	4.7K $\Omega$	260-54-071

Schematic symbol	Description	Stock No.
R29,37,42,43,70,82,84,93,135, 141,143,168,170,172,189,191, 192,331	10K $\Omega$	260-54-074
R30,35,39,158,328	330 $\Omega$	260-54-056
R31,318	150 $\Omega$	260-54-064
R32,40,58,65,94,140,194,303, 316	100 $\Omega$	260-54-048
R38,44,91,302,307,320	22K $\Omega$	260-54-076
R45,173	150K $\Omega$	260-54-081
R51,54,55,64,131,139,145,150, 160,161	470K $\Omega$	260-54-084
R59,89,132	680 $\Omega$	260-54-066
R69,156	100K $\Omega$	260-54-080
R73,76,77,129,138,313,321,322	47K $\Omega$	260-54-078
R74,301,306,319	33K $\Omega$	260-54-077
R75	56K $\Omega$	260-54-086
R120,121	82 $\Omega$	260-54-085
R99,164	68K $\Omega$	260-54-079
R86,87,101	120 $\Omega$	260-54-051
R103,178	.5 $\Omega$	260-54-035
R106,115	33 $\Omega$	260-54-059
R107	15 $\Omega$	260-54-063
R116,197	22 $\Omega$	260-54-054
R149,187	6.8K $\Omega$	260-54-073
R154,163	15K $\Omega$	260-54-075
R155	330K $\Omega$	260-54-083
R157,311	220K $\Omega$	260-54-082
R175,315	68 $\Omega$	260-54-057
R176,177	2.7K $\Omega$	260-54-069
R179	470 $\Omega$ ~ 2.2K $\Omega$ (Typically 1K $\Omega$ )	(260-54-060)
R185	2.2K $\Omega$ ~ 22K $\Omega$ (Typically 5.6K $\Omega$ )	(260-54-072)
R102	Solid type 120 $\Omega$ 1/2W	260-56-002
R105	Solid type 82 $\Omega$ 1W	260-56-013
R117	Solid type 1K $\Omega$ 1/2W	260-54-010
R195	Solid type 10 $\Omega$ 1/4W	260-54-011
R181	Wire wound 2.2 $\Omega$ 3W	260-68-007
R182	Wire wound 16 $\Omega$ 3W	260-68-006
R20	Semi-fixed (Pot.) 5K $\Omega$	260-61-064
R72,118,159	Semi-fixed 20K $\Omega$	260-61-079
R78	Semi-fixed (Pot.) 100K $\Omega$	260-61-066
R81,112	Semi-fixed (Pot.) 1K $\Omega$	260-61-068

Schematic symbol	Description	Stock No.
R98	Semi-fixed 1K $\Omega$	260-61-067
R108	Semi-fixed 100 $\Omega$	260-61-063
R186	Semi-fixed 10K $\Omega$	260-61-070
R323	Semi-fixed (Pot.) 200K $\Omega$	260-61-074
R325	Semi-fixed (Pot.) 30K $\Omega$	260-61-072
R327	Semi-fixed (Pot.) 500 $\Omega$	260-61-073
R53,169	Variable, 20K $\Omega$ 50K $\Omega$ with 1C-2P switch	260-61-044
R123,134	Variable, 50K $\Omega$ 100K $\Omega$ with 1C-2P switch	260-61-075
R190,324	Variable, 20K $\Omega$ 20K $\Omega$	260-61-043
R188	Thermistor D33A	260-69-002

## DIODES, TRANSISTORS AND ICS

CD1 ~7,12 ~23,25,28,29,34,36, 40,44,46,47,50,51,56,57,303 ~ 305	1S1555	260-10-011
CD8 ~11	1N60P	260-10-048
CD24,26,27,37,38,41 ~43,45	1N60	260-10-025
CD30,31	M8513A	260-10-049
CD33,35	1S1553	260-10-047
CD39,48,49,52,53,55	1S1885	260-10-033
CD54	02Z8.2A	260-10-044
CD301	1S1658	260-10-031
CD302	02Z6.2A	260-10-046
IC1	TA7061AP	260-10-036
IC2 (hybrid IC)	MH-5-015-D	260-10-050
Q1 ~8,11 ~16,27 ~29,33,38,39, 301 ~303,305,306	2SC372	260-10-020
Q9	2SK19	260-10-006
Q10	2SC785	260-10-051
Q17,22	2SC1166	260-10-052
Q18	2SC1237	260-10-053
Q19,20	2SC1173	260-10-054
Q21	2SC1377 or 2SC1307	260-10-055
Q23,24	2SA562	260-10-039
Q25,26	2SC732	260-10-023
Q30,31,307	2SA495	260-10-016
Q32	2SC733	260-10-042
Q34	2SC735	260-10-021
Q35 ~37,40	2SD235	260-10-024
Q304	2SC387A	260-10-056

## COILS, CHOKES AND TRANSFORMERS

Schematic symbol	Description	Stock No.
L1	RF choke L1122	260-20-001
L3	RF choke L1846	260-25-060
L2,6	RF coil L1792	260-25-050
L4	RF choke L1845	260-25-061
L5	RF coil L1793	260-25-051
L7	AF choke	260-25-062
L301	RF coil L1844	260-25-063
T1	RF transformer L1839	260-25-054
T2	RF transformer L1787	260-25-055
T3	RF transformer L1785	260-25-044
T4,5,9	RF transformer L1641	260-25-037
T6	RF transformer L1505	260-25-031
T7	RF transformer L1790	260-25-045
T8	RF transformer L1789	260-25-046
T10,11	RF transformer L1788	260-25-047
T12,13	IF transformer DI0753	260-27-008
T14	RF transformer L1791	260-25-048
T15	AF driver transformer	260-22-010
T16	AF output transformer	260-23-014
T301	RF transformer L1840	260-25-056
T302	RF transformer L1841	260-25-057
T303,304	RF transformer L1842	260-25-058
T305	RF transformer L1843	260-25-059

## SWITCHES

S1	Rotary switch 24 steps	260-14-063
S2	Rotary switch 4C-3P	260-14-044
S3~5	Slide switch 4C-2P	260-14-065

## CRYSTALS

X1	7.7985MHz	260-15-215
X2	7.8015MHz	260-15-216
X3	7.3450MHz	260-15-217
X301	15.965MHz	260-15-208
X302	16.015MHz	260-15-209
X303	16.065MHz	260-15-210
X304	16.115MHz	260-15-211
X305	16.165MHz	260-15-212

Schematic symbol	Description	Stock No.
X306	16.215MHz	260-15-213
X307	6.000MHz	260-15-204
X308	6.010MHz	260-15-205
X309	6.020MHz	260-15-206
X310	6.040MHz	260-15-207
X311	12.800MHz	260-15-214

## MISCELLANEOUS

F1	Fuse 3A	260-14-045
FS1	Fuse holder	260-16-027
J1	Antenna jack SO239	260-16-024
J2	Microphone jack	260-16-044
J3,4	SP jack	260-16-047
K1	Relay 4C-2P DC 12V	260-14-032
K2	Relay 4C-2P DC 6V	260-14-049
M1	DC Ammeter 200 $\mu$ A	260-19-025
PL1,2,3	Indicator lamp	260-11-010
SP1	Speaker 6.3" $\times$ 2.35"	260-15-175
U1	Crystal filter	260-15-174
U2	Ceramic filter CFU455GA	260-19-004
U3	Ceramic filter CFU455HA	260-19-007
MK1	Dynamic microphone	260-15-229
P1	Microphone plug	260-16-045
	Knob for CH SW	260-86-052
	Knob for mode SW	260-86-053
	Knob for RF gain, TTC and SQ	260-86-054
	Knob for VOL, SWR and CLAR	260-86-055
	Meter stopper	260-74-088
	Dial (CH Ind.)	260-82-004