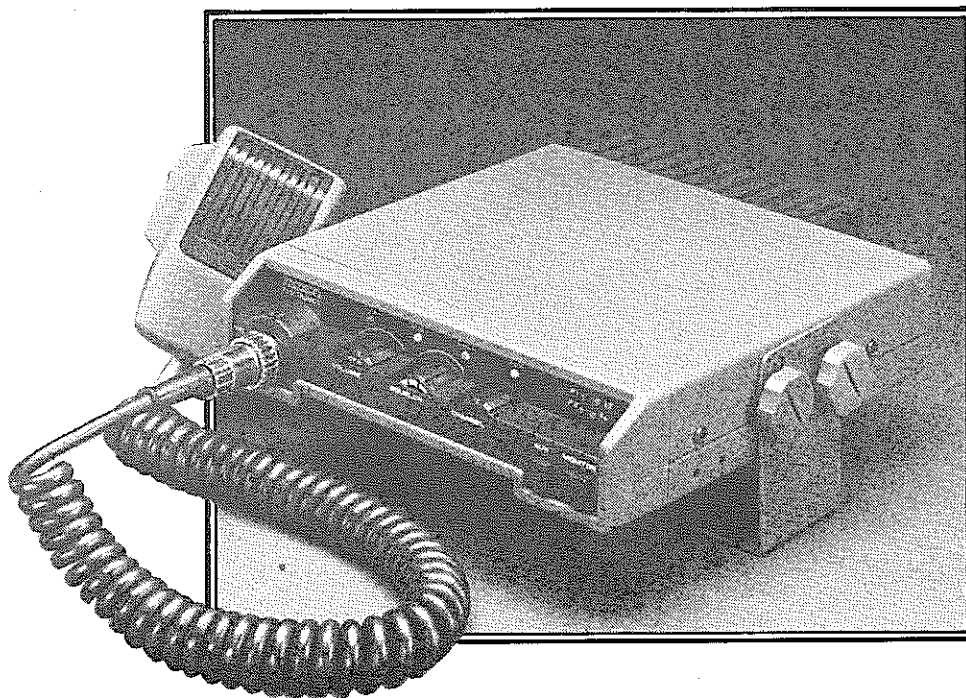


maxon®

UHF MOBILE TRANSCEIVER MODEL CM-4020-A



SERVICE MANUAL

(FOR SERIAL NUMBERS 20,000 & UP)

maxon[®]

**UHF
MOBILE TRANSCEIVER
MODEL CM-4020-A**

SERVICE MANUAL

(FOR SERIAL NUMBERS 20,000 & UP)

MAXON CM-4020-A UHF MOBILE

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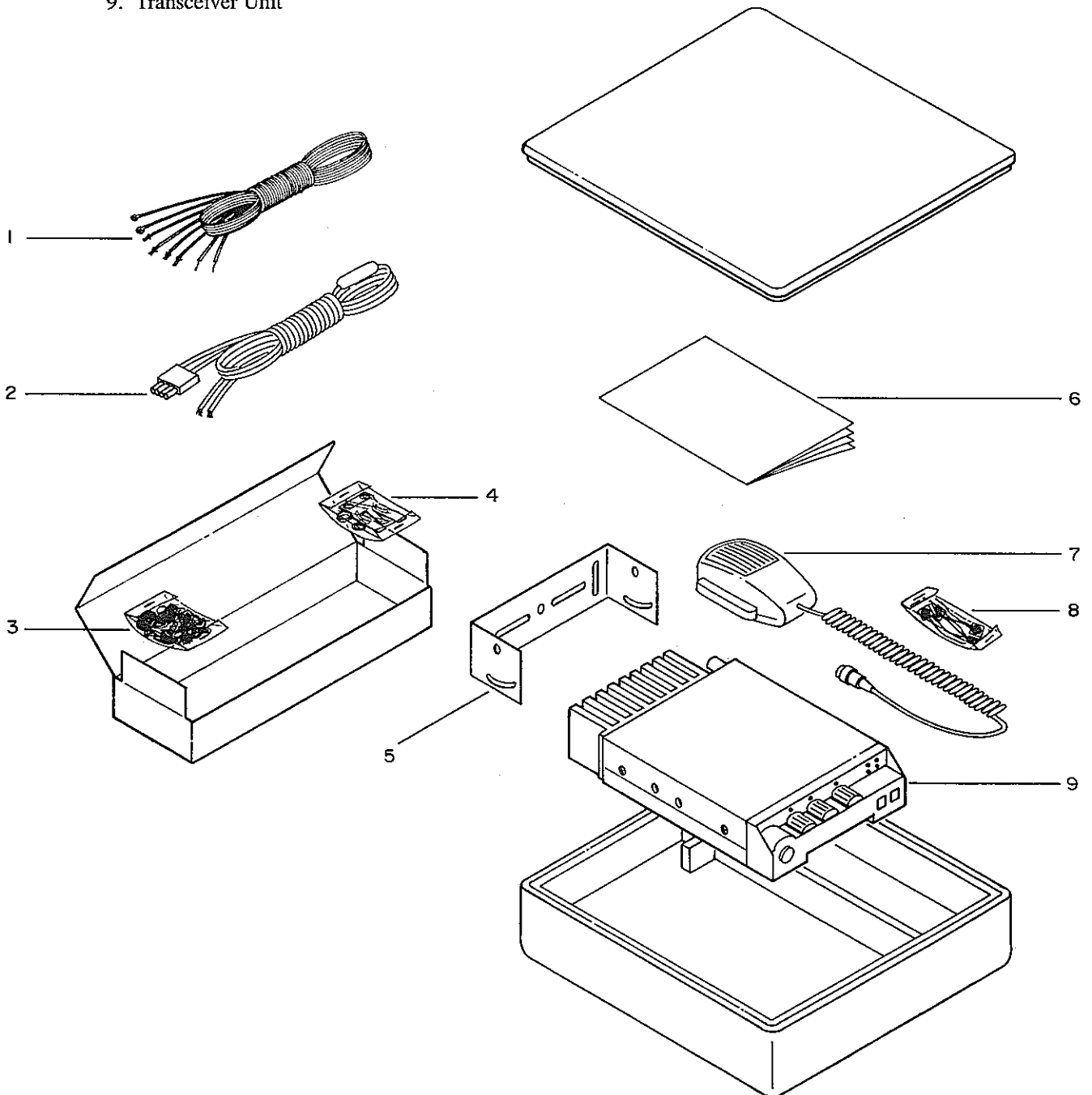
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MAXON CM-4020-A UHF MOBILE General Information

UNPACKING

Check the carton and packing material carefully for the following items:

1. Accessory Wiring
2. DC Power Cord
3. Assembly Hardware
4. Microphone Mounting Bracket
5. Mobile Mounting Bracket
6. Operating Guide
7. Microphone
8. Crystal Heaters
9. Transceiver Unit



MAXON CM-4020-A UHF MOBILE

General Information

ACCESSORIES

The CM-4020-A transceiver is designed to accept a number of accessory functions. Accessories manufactured by MAXON and others may be used with the CM-4020-A. Please consult your authorized MAXON dealer for additional accessory availability and information. (See Option Section for information on installation of optional Maxon accessories.)

INSTALLATION

The MAXON series transceivers are designed for mobile installation in any vehicle that has a 12 volt DC negative ground system.

NOTICE

Because of differences between individual vehicles and the special requirements of two-way antennas, it is recommended that the radio be installed only by a qualified electronic technician experienced in two-way radio installation.

MAINTENANCE

Periodic maintenance is minimal and easily performed using common test equipment and tools. Equipment service is minimized by utilization of state-of-the-art materials, components, circuit design techniques and high quality manufacturing processes.

GENERAL DESCRIPTION—MEDIUM POWER UHF TRANSCEIVER

The CM-4020-A transceiver is a 30 watt output FM transceiver operating in the 450 to 470 MHz frequency band. The unit incorporates provision for use with Continuous Tone Coded Squelch System (CTCSS) and/or Selective Call System. Space and interconnect wiring is provided internal to the unit for installation of optional accessories. A channel busy indicator plus auto-disable of the CTCSS via the microphone hanger is included to make it convenient to monitor for channel activity. (See Option Section.)

The CM-4020-A transceiver is approved by the DOC, Canada, RSS-119, Issue 2 and USA Type Accepted and Certified under FCC parts 15, 21, 81, 90, and 95.

MAXON CM-4020-A UHF MOBILE Specifications

GENERAL SPECIFICATIONS

Nominal Operating Voltage	13.8 VDC (Negative Ground) (10-16 VDC Range)
Temperature Range	-30°C to + 60°C
Antenna Impedance	50 ohms unbalanced
Microphone	Dynamic Element
Speaker Impedance (External)	4 ohms
Frequency Control	Quartz Crystal
Frequencies of Operation	450-470 MHz
Performance Bandwidth (Without Adjustment)	5.0 MHz
Frequency Tolerance and Stability	0.0005%
Duty Cycle	Intermittent
Channel Capability	Up to 4 Transmit/Receive

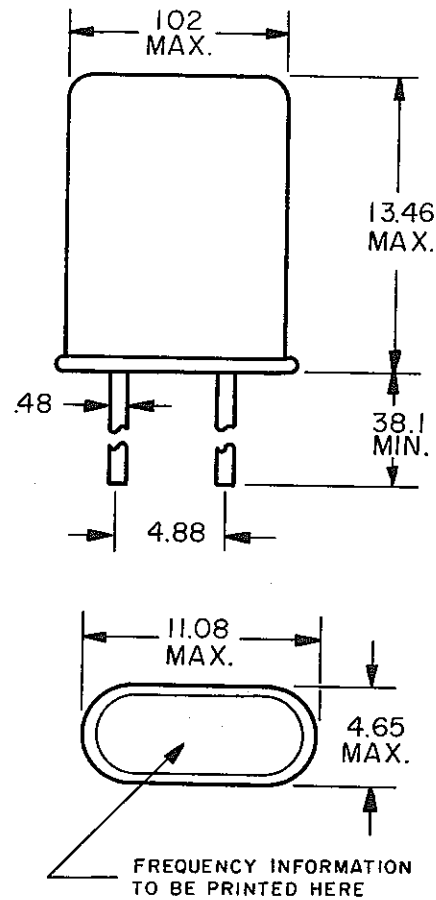
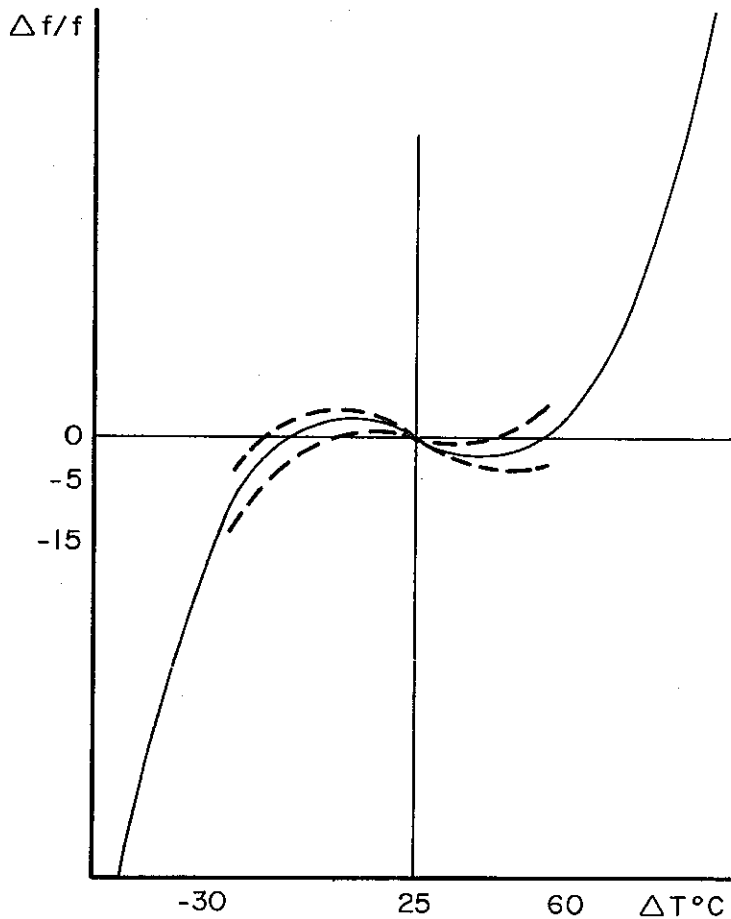
RECEIVER PERFORMANCE SPECIFICATIONS

Sensitivity-20dB NQ	0.50 μ V @ 50 ohms
12 dB SINAD	0.35 μ V @ 50 ohms
Squelch Sensitivity-Threshold	0.2 μ V Max or 6dB SINAD
-Tight	10 to 20dB above threshold
Modulation Acceptance Bandwidth	7.0 kHz Min.
Adjacent Channel Two Signal Selectivity and Desensitization	80dB @ \pm 25 kHz
Spurious Response Attenuation	70dB
Intermodulation Spurious Response Attn. (Measured at usable Sensitivity)	70dB
Audio Power Output	5 watts @ 10% THD @ 4 ohms
Audio Frequency Response	300-3000 Hz

TRANSMITTER PERFORMANCE SPECIFICATIONS

Carrier Power Output	30 Watts Min.
Modulation System	FM
Audio Frequency Response	300-3000 Hz
Audio Frequency Harmonic Distortion	6% @ 1 kHz for \pm 3 kHz deviation
System Deviation	5 kHz Max.
Modulation Limiting	Instantaneous peak clipping with low pass audio filter
Hum and Noise	50dB below 1 kHz @ \pm 3 kHz deviation
Occupied Bandwidth	Less than 25 μ W adjacent power \pm 25 kHz (60dB below carrier power)
Transmitter Carrier Attack Time	100ms Max. for 50% rated power
Conducted Spurious Emissions	Less than 25 μ W, 1 MHz, to 1000 MHz

MAXON CM-4020-A UHF MOBILE Crystal Specifications



Receive

1. Holder Type HC-18/U Wire Lead
2. Operating Temperature -30°C to + 80°C
3. Temperature Stability -30°C to + 60°C
Within Chart Limits.
4. Characteristics at 25°C ± 2°C unless otherwise specified.
 - 4.1 Frequency (MHz) (F-21.4)/9
 - 4.2 Frequency Tolerance . . . (± %) 0.0005
 - 4.3 Load Capacitance (pF) 32
 - 4.4 Equivalent Resistance . . (ohm) 35
 - 4.5 Drive Level (mW) 2
 - 4.6 Shunt Capacitance (pF) 7 Max.
 - 4.7 Oscillation Mode 3rd Overtone
 - 4.8 Test Circuit RFL5950A/460A
 - 4.9 Motional Capacity 0.0025 pF ± 10%
 - 4.10 Long Term Drift ± .0002%

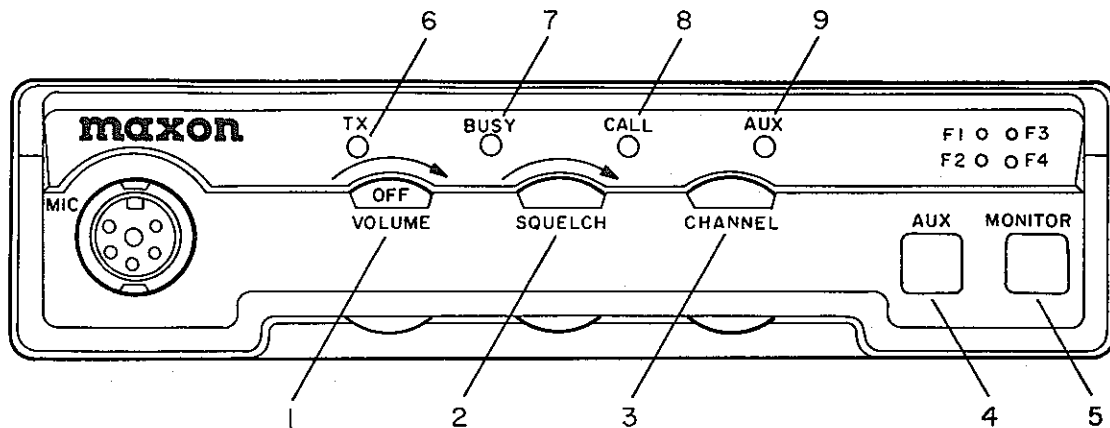
Transmit

1. Holder Type HC-18/U Wire Lead
2. Operating Temperature -30°C to + 80°C
3. Temperature Stability -30°C to + 60°C
Within Chart Limits.
4. Characteristics at 25°C ± 2°C unless otherwise specified.
 - 4.1 Frequency (MHz) F/27
 - 4.2 Frequency Tolerance . . . (± %) 0.0005
 - 4.3 Load Capacitance (pF) 32
 - 4.4 Equivalent Resistance . . (ohm) 20 Max.
 - 4.5 Drive Level (mW) 2
 - 4.6 Shunt Capacitance (pF) 7 Max.
 - 4.7 Oscillation Mode Fund
 - 4.8 Test Circuit RFL5950A/460A
 - 4.9 Motional Capacity 0.025 pF ± 10%
 - 4.10 Long Term Drift ± .0002%

MAXON CM-4020-A UHF MOBILE

Description of Controls

DESCRIPTION OF CONTROLS—FRONT PANEL



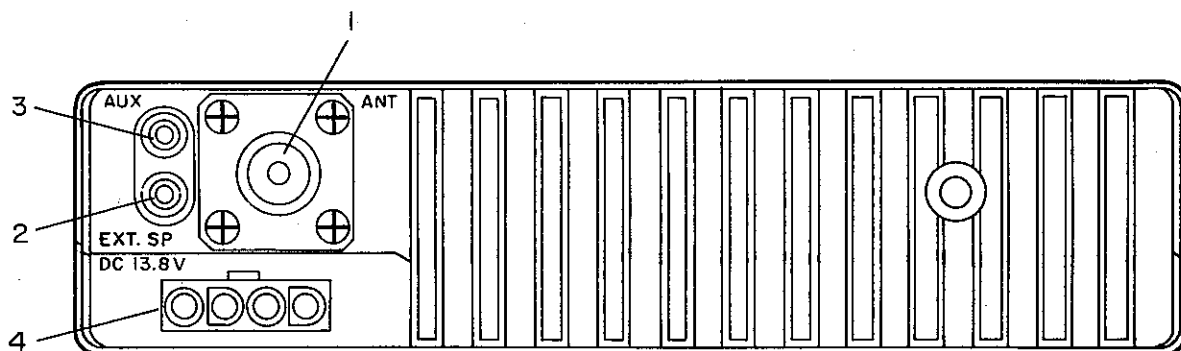
Controls and Switches

- (1) ON/OFF VOLUME CONTROL—This is the main power switch and volume control.
- (2) SQUELCH CONTROL—The squelch control will silence the receiver when no signal is being received.
- (3) CHANNEL SELECT SWITCH—Selects either channel F₁, F₂, F₃ or F₄.
- (4) AUX SWITCH—Silences internal speaker and connects the Auxiliary Speaker.
- (5) MONITOR SWITCH—This is a Tone coded squelch system defeat switch.

Indicators

- (6) TX INDICATOR—A red Light Emitting Diode (LED) indicator, glows when transmitting.
- (7) BUSY CHANNEL INDICATOR—A yellow LED, glows when there is activity on channel.
- (8) CALL LIGHT INDICATOR—Functions only when a two-tone or five-tone decoder is installed. The green LED will glow only when a signal addressed to the mobile has been received.
- (9) AUX INDICATOR—The yellow LED will light when the Auxiliary Speaker Switch is engaged.

DESCRIPTION OF CONNECTORS—BACK

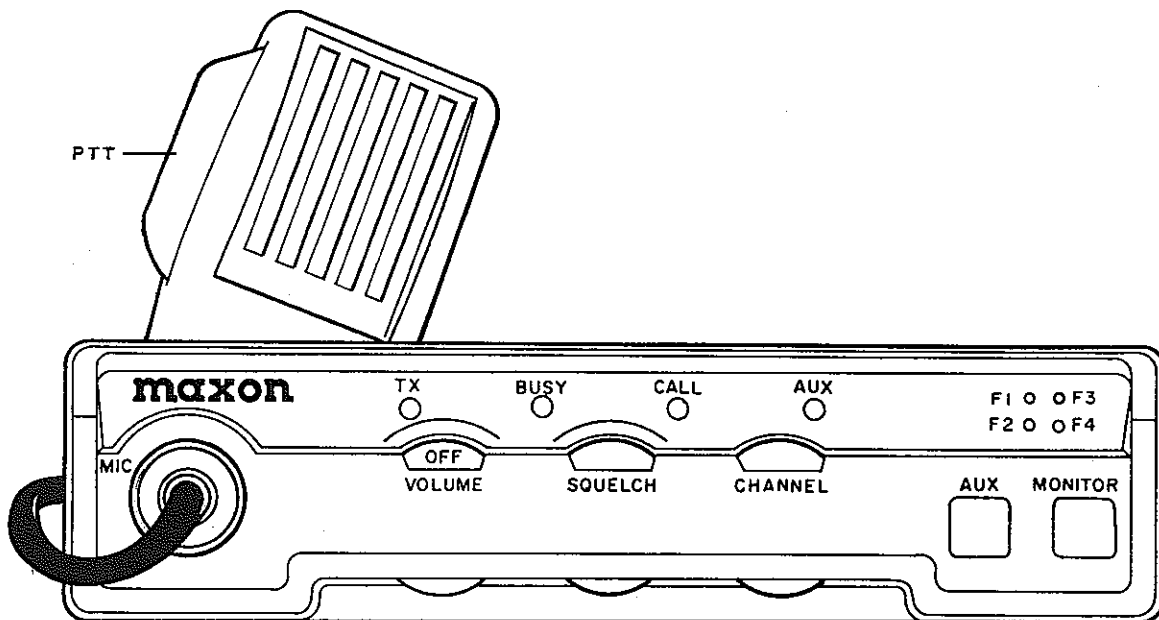


Connectors

- (1) ANTENNA CONNECTOR—SO-239 type connector, must be connected to a properly installed 50 ohm antenna.
- (2) EXTERNAL SPEAKER CONNECTOR—A 3.5mm diameter jack is provided for a 4 ohm external speaker. The internal speaker is silenced when the external speaker is connected.
- (3) AUX SPEAKER CONNECTOR—A 3.5mm diameter jack for a 4 ohm Auxiliary Speaker.
- (4) DC 13.8V—Polarized plug: 13.8 volt DC input for NEGATIVE GROUND SYSTEMS ONLY.

MAXON CM-4020-A UHF MOBILE

Operation



OPERATION

Turn the radio ON by rotating the On-Off/VOLUME control clockwise (to the right), adjust the volume for a comfortable listening level. Turn the SQUELCH control clockwise (to the right) until the squelch noise (the rushing sound) disappears. This is the Threshold setting. This setting should keep the receiver quiet when there is no signal present on the channel. Select the desired channel using the CHANNEL Selector Switch. For units with only one channel installed, the CHANNEL Selector switch should be in the Channel One or "A" position.

To transmit a message, press the Push-To-Talk (PTT) button on the microphone and speak directly into the microphone (speak clearly and in a normal tone of voice directly into the grill work on the face of the microphone). The transmitter indicator (TX) LED will light to indicate that the transmitter is operating.

NOTE:

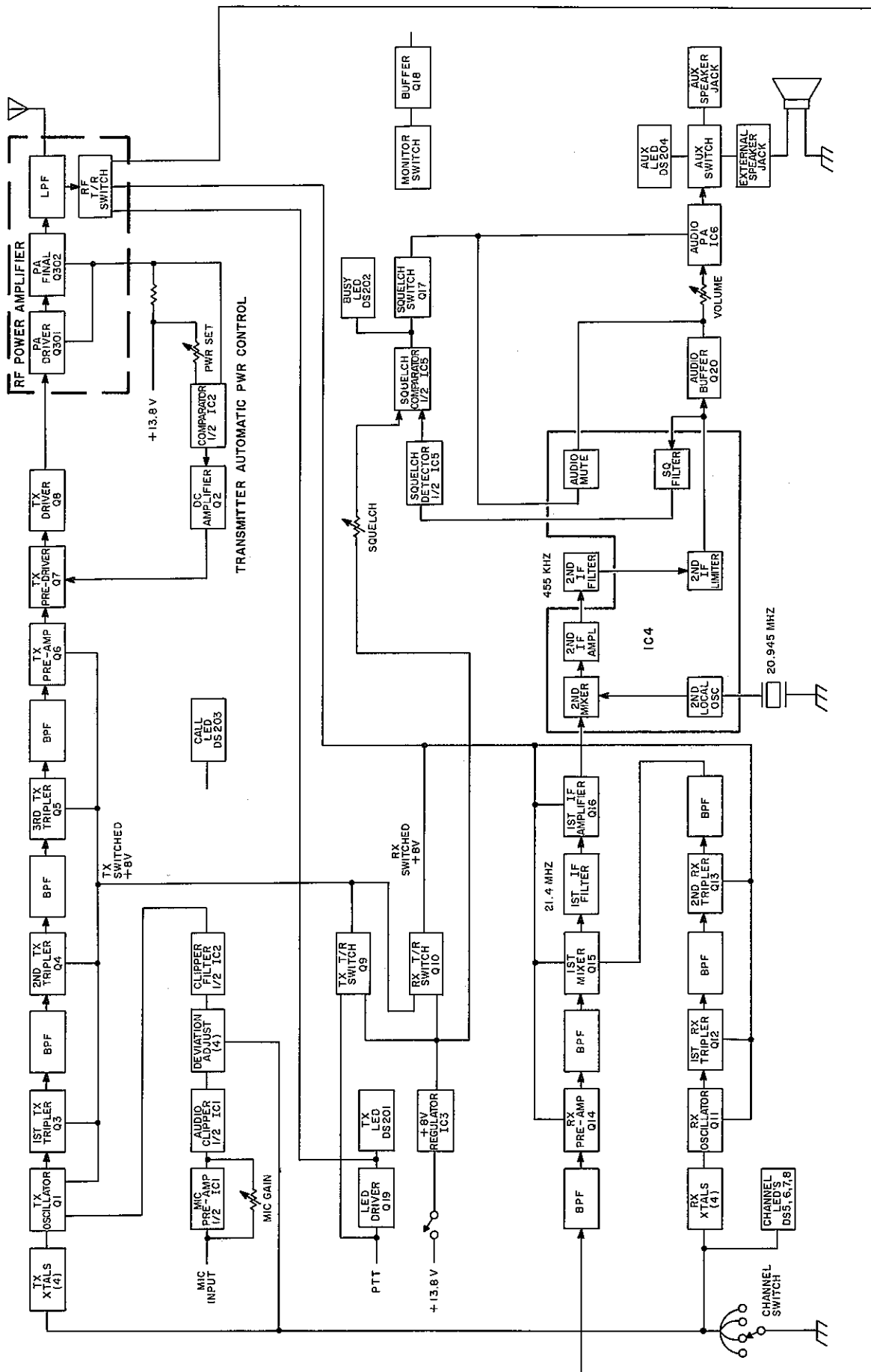
Some repeater systems (when using sub-audible tone control) require as much as 250 milliseconds for tone recognition. Rapid operation of the PTT may cause the first syllables of words to be clipped.

CAUTION



If the yellow (BUSY) LED is on, there is activity on the channel and transmitting may interfere with others. It is recommended that the channel be checked for activity before transmitting your message.

MAXON CM-4020-A UHF MOBILE Block Diagram



MAXON CM-4020-A UHF MOBILE

Theory of Operation

RECEIVER

RF Amplifier

Incoming signals from the Antenna Jack are routed through PIN diode D302 to the RX input on the main PC Board. The received signal is filtered by helical resonator filter FL2 and then amplified by RF amplifier Q14. The amplified signal is filtered again by helical resonator filter FL3. This stage is the major factor in determining the sensitivity of the radio.

Local Oscillator Chain

Q11 in conjunction with the selected receive crystal acts as a third overtone Colpitts oscillator. The output of Q11 is coupled to Q12 through C92. Q12 acts as a frequency multiplier. Resonators L17 and L18 with C94, C96, C98, and C99 form a narrow bandpass filter centered on the third harmonic of Q11's output causing Q12 to act as a frequency tripler. Q13 along with FL6 behaves as an additional frequency tripler. Because of the two triplers, the frequency of the signal at the output of FL6 is nine times the crystal frequency.

First Mixer and First IF Amplifier

The mixer Q15 acts as a frequency converter. Its output frequencies are primarily the sum and the difference of the RF input frequency at Q15's source and the local oscillator frequency at Q15's gate. The difference frequency is filtered by the 21.4 MHz 4 pole crystal filter FL4 and FL5 before being amplified by Q16. Because of the frequency conversion action of the mixer, the local oscillator frequency is chosen to be 21.4 MHz below the desired receive frequency.

Second Mixer, Second IF, and FM Detector

The output of Q16 is applied to the input (pin 18) of IC4. IC4 is a single conversion FM receiver on one integrated circuit chip. The signal at the input is routed straight to a mixer which converts the incoming signal to the second IF frequency of 455 kHz. The second local oscillator is formed with crystal Y9 and circuitry within IC4. The output of the second mixer is at pin 3 which is connected to a ceramic bandpass filter FL7 centered at 455 kHz. This filter along with FL4 and FL5 determine the adjacent channel selectivity of the radio. The output of FL7 drives a high gain IF amplifier chain internal to IC4 which in turn drives the quadrature detector. The output of the detector is amplified and exits IC4 at pin 10. The audio output of IC4 drives the de-emphasis network formed by R116 and C131.

Audio Power Amplifier

The de-emphasized audio is routed to IC6 which is a five watt audio power amplifier integrated circuit. The output at pin 9 is routed either to the internal speaker, an external speaker, or the AUX output of the radio.

Squelch Operation

The squelch circuit in the CM-4020 is designed such that squelch operation is based upon the signal to noise ratio of the incoming signal rather than its actual level. This provides superior squelch operation. Due to the limiting action of the IF amplifiers, the noise out of the FM detector decreases when a signal is being received. An active filter based around an amplifier internal to IC4 is used as a bandpass filter centered at 7 kHz which senses noise at a frequency within the IF passband but above the normal voice audio range. This noise is amplified and rectified by one half of IC5 while the other half of IC5 acts as a comparator. The output of the comparator drives an audio switch inside of IC4. When no signal is being received, the noise level at 7 kHz is such that the comparator forces the audio switch inside of IC4 to remain open resulting in no audio output.

MAXON CM-4020-A UHF MOBILE

Theory of Operation

TRANSMITTER

Audio

Microphone audio is amplified by the first half of IC1. The amplified audio passes through the pre-emphasis network R5 and C5 before being clipped in the clipper amplifier formed around the second half of IC1. The clipped audio passes through the deviation adjustment potentiometer and is then filtered by a third order active low pass filter formed around the first half of IC2. This filter prevents the RF output spectrum from extending beyond the channel bandwidth limits even under full voice modulation. Due to variations in the modulation sensitivity of different transmit crystals, separate deviation adjustment potentiometers are provided for each transmit channel.

Crystal Oscillator and Modulator

Q1 along with C17, C18, L7, the selected transmit crystal, and the varactor diode CR9 form a Colpitts oscillator circuit. Transmit audio from the clipper filter is applied to CR9. CR9 frequency modulates the oscillator since it behaves as a voltage controlled capacitance when it is reverse biased.

Multiplier Chain

The multiplier chain consists of three tripler sections, therefore, the crystal oscillator frequency is multiplied by a factor of twenty-seven. Each multiplier transistor (Q3, Q4, and Q5) is biased such that its output is rich in harmonic energy. The three section bandpass filter following each multiplier transistor serves to pass only the third harmonic and greatly suppress all other harmonics of the transistor's input frequency.

Driver

Transistors Q6, Q7, Q8, and their associated circuitry form the driver amplifier which amplifies the signal out of the last multiplier from a 0 dBm level to the 3 watt level needed to drive the RF power amplifier.

RF Power Amplifier

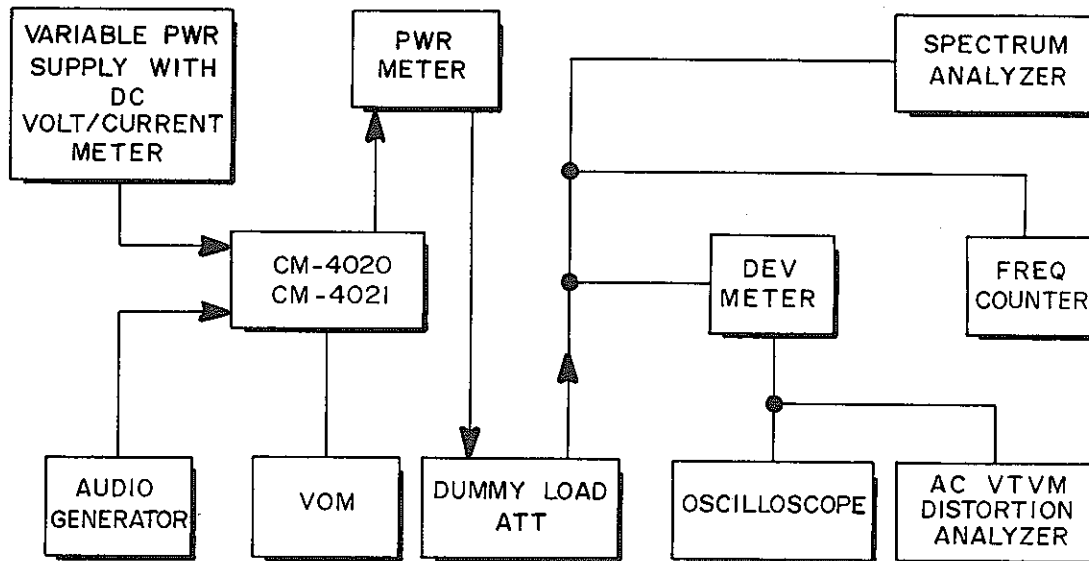
The RF power amplifier is housed in its own compartment at the rear of the radio. Its two class C amplifier sections amplify the incoming signal to about 35 watts. Included on the RF power amplifier PC board is the RF switching circuitry which routes the antenna signal to the receiver when the radio is in the receive mode.

Automatic Power Control

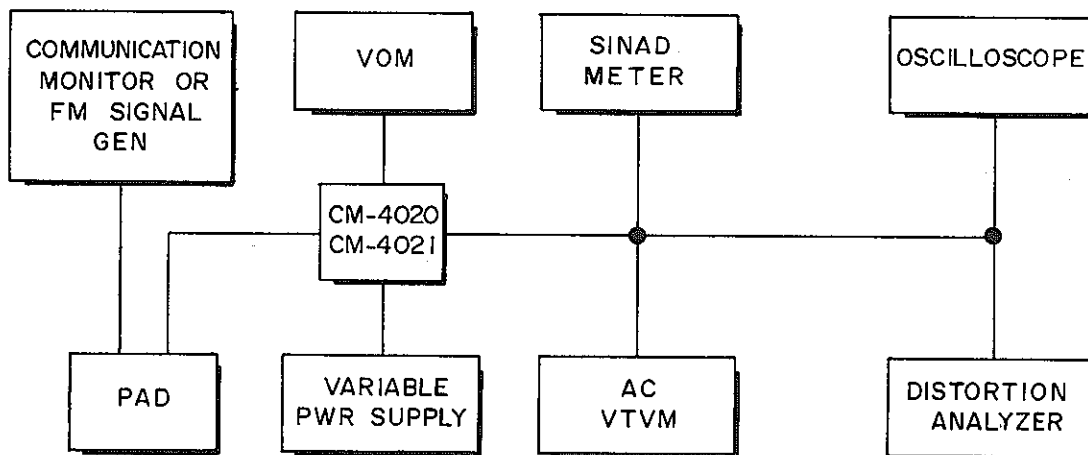
This radio includes circuitry to control and maintain constant RF output power over time and through variations in supply voltage, temperature, and component values. This is accomplished by sensing the DC current into the RF power amplifier and controlling the output power of the driver (RF power amplifier input drive level) to maintain constant RF power amplifier current. The output of the driver is controlled by adjusting the supply voltage on Q7. The RF power amplifier current is sensed by R41. The second half of IC2 is an error amplifier which drives Q2 which in turn controls Q7's supply voltage.

MAXON CM-4020-A UHF MOBILE Test Equipment

TRANSMITTER



RECEIVER



MAXON CM-4020-A UHF MOBILE Alignment Instructions/Performance Tests

WARNING



Any repairs or adjustments should be made under the supervision of a qualified radiotelephone technician.

SUGGESTED TEST EQUIPMENT

The following equipment, or its equivalent, is required for proper alignment of Maxon Radios:

1. Terminal Wattmeter or Through-line Wattmeter with termination into 50 ohm dummy load.
2. AC/DC VOM with a minimum of 1 Megohm input impedance.
3. SINAD Meter.
4. FM Communications Monitor with spectrum analyzer.
5. Regulated Power Supply capable of 9 volts to 16 volts adjustable; at least 10 ampere capability.
6. Oscilloscope.
7. Audio Distortion Meter.

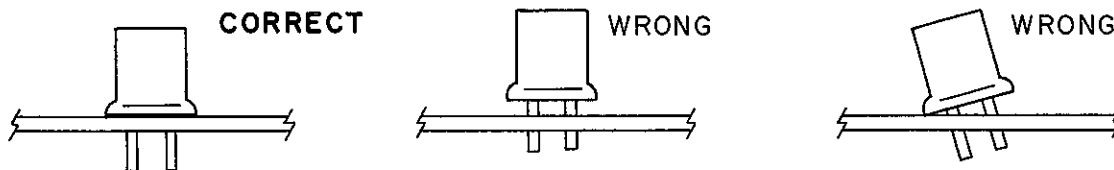
Pre-Alignment Note:

1. The CM-4020-A UHF Mobile radio covers the 450-470 MHz band with no component changes.
2. All voltage measurements are made in reference to ground (negative battery lead).
3. Avoid excessive supply voltages. Optimum voltage for test is 13.8 VDC. Power supply voltage should never exceed 16 VDC.

RECEIVER

1. Crystal Installation

Properly install crystals in channel locations. Crystals must be flush with the printed circuit board. Soldering must be accomplished quickly, before clipping leads, to avoid damage to the crystal. SEE EXAMPLE BELOW:



2. Multiplier Tuning

Insure that the proper channel has been selected before proceeding with the alignment procedure.

- A. Apply power (13.8 VDC)
- B. Connect a VOM (0-3 VDC Range) to TP4.
- C. Adjust L17 and L18 for maximum voltage at TP4.
- D. Disconnect VOM.

3. Oscillator Tuning

- A. Connect a frequency counter to TP5. Note: The signal level at this point is low (0 dBm); connect directly to TP5, do not use a 10X probe.

MAXON CM-4020-A UHF MOBILE

Alignment Instructions/Performance Tests

- B. Adjust the slugs in FL6, if necessary, until a frequency is displayed on the frequency counter.
- C. The correct frequency at TP5 is the desired receive frequency minus 21.4 MHz with an error of ± 250 Hz. Adjust the appropriate receive crystal trimmer capacitor until the correct frequency is displayed. (See Channel Component Chart on Page 16.)

4. IF Tuning

- A. Connect the FM Signal Generator or the Communications Service Monitor to the antenna jack.
- B. Connect the SINAD meter and an Oscilloscope across the speaker leads.
- C. Turn the SQUELCH control fully counterclockwise for maximum noise.
- D. Adjust the VOLUME control to approximately mid-range.
- E. Set the Signal Generator/Service Monitor to the receive frequency. The modulation should be set for 3 kHz deviation of a 1 kHz tone.
- F. Increase the RF level until a signal can be heard. Adjust L20 for maximum audio output level as displayed on the Oscilloscope.
- G. Adjust the Signal Generator/Service Monitor RF level until the SINAD meter indicates 20 dB or more.
- H. Connect a distortion analyzer to the speaker leads and adjust T1 and T2 for minimum distortion. Note: If a distortion analyzer is not available, adjust for cleanest sine wave as viewed on the Oscilloscope.

5. Front End Tuning

- A. Adjust FL2, FL3, T1, and FL6 for best SINAD reducing the Signal Generator/Service Monitor RF level as necessary to keep the SINAD reading below 20 dB.

RECEIVER PERFORMANCE TEST

1. SINAD Sensitivity

- A. Connect the FM Signal Generator or Communication Service Monitor to the antenna jack.
- B. Connect a SINAD Meter across the speaker leads.
- C. Turn the SQUELCH control fully counterclockwise for maximum noise.
- D. Adjust the VOLUME control to approximately mid-range.
- E. Set the FM Signal Generator/Service Monitor to the receive frequency. The modulation should be set for 3 kHz deviation of a 1 kHz tone.
- F. Adjust the generator RF level so that the SINAD Meter reads 12 dB. The Signal Generator RF level should be 0.35 μ V or less.

2. Noise Quieting Sensitivity

- A. Connect a VOM to the speaker leads.
- B. Turn the SQUELCH control fully counterclockwise for maximum noise.
- C. With no RF Signal Generator or Communication Service Monitor connected to the radio, adjust the VOLUME control to obtain a noise reading of 1 volt RMS on the VOM.
- D. Connect the RF Signal Generator/Service Monitor to the radio. Set the RF frequency to the receive frequency of the radio and remove any modulation.
- E. Adjust the signal generator RF level for a noise reading on the VOM of 0.1 volt RMS. This is the 20 dB noise quieting point. The RF level should be 0.5 μ V or less.

MAXON CM-4020-A UHF MOBILE

Alignment Instructions/Performance Tests

3. Squelch Sensitivity

- A. Set the RF Signal Generator/Service Monitor to the receive frequency. Set the modulation to 3 kHz deviation of a 1 kHz audio tone.
- B. Reduce the Signal Generator RF output to zero.
- C. Rotate the SQUELCH control clockwise to the point where the speaker noise just goes away.
- D. Increase the Signal Generator/Service Monitor RF level until speaker noise returns. This is the threshold squelch setting. The generator output level should not exceed 0.25 uV.
- E. Turn the SQUELCH control to maximum clockwise rotation.
- F. Increase the generator output level until the squelch opens (busy LED is on). The output level should be between 10 and 20 dB (3 to 10 times) above the threshold setting.

4. Audio Output

- A. Increase the RF Signal Generator/Service Monitor RF level to 1000 uV.
- B. Connect a 4 ohm audio dummy load to the AUXILIARY speaker jack.
- C. Connect a true RMS audio voltmeter (the audio distortion analyzer may include this function) to the speaker leads.
- D. With 3 kHz deviation of a 1 kHz tone modulation applied to the signal generator, rotate the VOLUME control clockwise until the audio is 10% or until the VOLUME control reaches its stop, whichever comes first.
- E. The audio voltmeter should read 4.0 volts or greater.

TRANSMITTER

1. Crystal Installation

Install crystals at the proper channel locations following the installation procedures as outlined in Crystal Installation under "RECEIVER."

2. Power Supply Voltage

The optimum voltage for testing is 13.8 VDC. Use short leads from the power supply to the radio with number 14 gauge or larger.

3. Transmitter Alignment

Insure that the proper channel has been selected before proceeding with the alignment procedure.

- A. Connect an RF Wattmeter and RF dummy load (50 watt rating) to the antenna jack.
- B. Connect the positive lead of a VOM (0–3 VDC range) to TP1 and the negative lead to ground.
 1. Press the PTT (push-to-talk) switch.
 2. Adjust L1, L2, and L3 for maximum voltage at TP1.
 3. Release the PTT switch.
 4. Disconnect the meter.
- C. Connect the positive lead of the VOM to TP2 and the negative lead to ground.
 1. Press the PTT switch.
 2. Adjust L4, L5, and L6 for maximum voltage at TP2.
 3. Release the PTT switch.
 4. Disconnect the meter.

MAXON CM-4020-A UHF MOBILE

Alignment Instructions/Performance Tests

- D. Rotate the POWER SET potentiometer (R42) fully clockwise. While observing the RF Wattmeter:
1. Press the PTT switch.
 2. Adjust FL1, C61, and C65 for maximum output power.
 3. Release the PTT switch.
- E. While observing the RF Wattmeter:
1. Press the PTT switch.
 2. Rotate R42 counterclockwise until the output power just decreases or until the output power drops to 37 watts, whichever results in the lower output power.
 3. Release the PTT switch.
- F. Connect the positive lead of the VOM (0–15 VDC scale) to TP3 and the negative lead to ground.
1. Press the PTT switch.
 2. Adjust FL1, C61, and C65 for minimum voltage at TP3.
 3. Release the PTT switch.
 4. Disconnect the meter.

Note:

If the above adjustments do not seem to cause any change in the voltage at TP3, rotate R42 counterclockwise until power drops again and repeat adjustments. Then readjust R42 for desired power output.

4. Frequency Setting

- A. Connect a Frequency Counter or Communication Service Monitor to the RF output of the radio through a power attenuator.
- B. Press the PTT switch.
- C. Adjust the appropriate transmit crystal trimmer capacitor such that the output frequency is equal to the channel frequency with an error of ± 0 Hz, ± 500 Hz. (See Channel Component Chart on Page 16.)
- D. Release the PTT switch.
- E. Repeat for each channel.

5. Deviation Adjustment

- A. Connect an Audio Generator to the radio's microphone jack. The audio frequency should be set at 1 kHz.
- B. Connect a Communication Service Monitor to the RF output of the radio through a power attenuator. Set the Monitor to read average peak FM deviation.
- C. Press the PTT switch.
- D. Adjust the Audio Generator level to produce 3 kHz of deviation. Note the generator level.
- E. Increase the Audio Generator level by 20 dB.
- F. Adjust the appropriate DEVIATION potentiometer for ± 4.9 kHz deviation. (See Channel Component Chart on Page 16.)
- G. Sweep the Audio Generator across a frequency band of 300 Hz to 3 kHz. Set the DEVIATION potentiometer such that the deviation never exceeds ± 5 kHz.
- H. Release the PTT switch.
- I. Repeat for each channel.

MAXON CM-4020-A UHF MOBILE

Alignment Instructions/Performance Tests

6. Microphone Gain Adjustment

- A. On any channel, set the Audio Generator level to 6 mV at a frequency of 1 kHz.
- B. Press the PTT switch.
- C. Adjust the MIC GAIN potentiometer (R3) for a deviation of ± 3 kHz.

TRANSMITTER PERFORMANCE TESTS

1. Power Output

- A. Set the Power Supply voltage to 13.8 VDC.
- B. Connect an RF Wattmeter and dummy load to the antenna receptacle.
- C. Press the PTT switch.
- D. Verify that the output is at least 30 watts.
- E. Reduce the Power Supply voltage to 11 volts.
- F. Verify that the output is at least 15 watts.
- G. Release the PTT switch.

2. Audio Response

- A. Connect an Audio Generator to the microphone jack on the radio. Set the generator for a frequency of 1 kHz.
- B. Connect a Communication Service Monitor to the RF output of the radio through a power attenuator. Set the monitor to read average peak FM deviation.
- C. Press the PTT switch.
- D. Adjust the Audio Generator level to produce 1 kHz deviation.
- E. Set the Audio Generator frequency to 500 Hz. The transmitter deviation should decrease to approximately 500 Hz.
- F. Set the Audio Generator frequency to 2 kHz. The transmitter deviation should be approximately 2 kHz.
- G. As the Audio Generator frequency is varied from 300 Hz to 10 kHz, the deviation should increase until it reaches a maximum at an audio frequency of 2.5 kHz to 2.9 kHz. At higher frequencies, the deviation should decrease. The deviation at an audio frequency of 6 kHz should be less than 1 kHz.
- H. Release the PTT switch.

3. Limiting Test

- A. Set the Audio Generator frequency to 1 kHz.
- B. Press the PTT switch and adjust the generator level to produce 1 kHz deviation. Note the generator level.
- C. Increase the Audio Generator level by 20 dB (10 times).
- D. Sweep the Audio Generator over a frequency range of 300 Hz to 3 kHz. The deviation should not exceed ± 5 kHz within this range.
- E. Release the PTT switch.

4. Spectrum Test

- A. Connect a Spectrum Analyzer to a sampled RF output of the radio.
- B. Press the PTT switch. Observe the output spectrum on the Spectrum Analyzer.
- C. All spurious and harmonics should be at least 60 dB below the carrier level.
- D. Release the PTT switch.

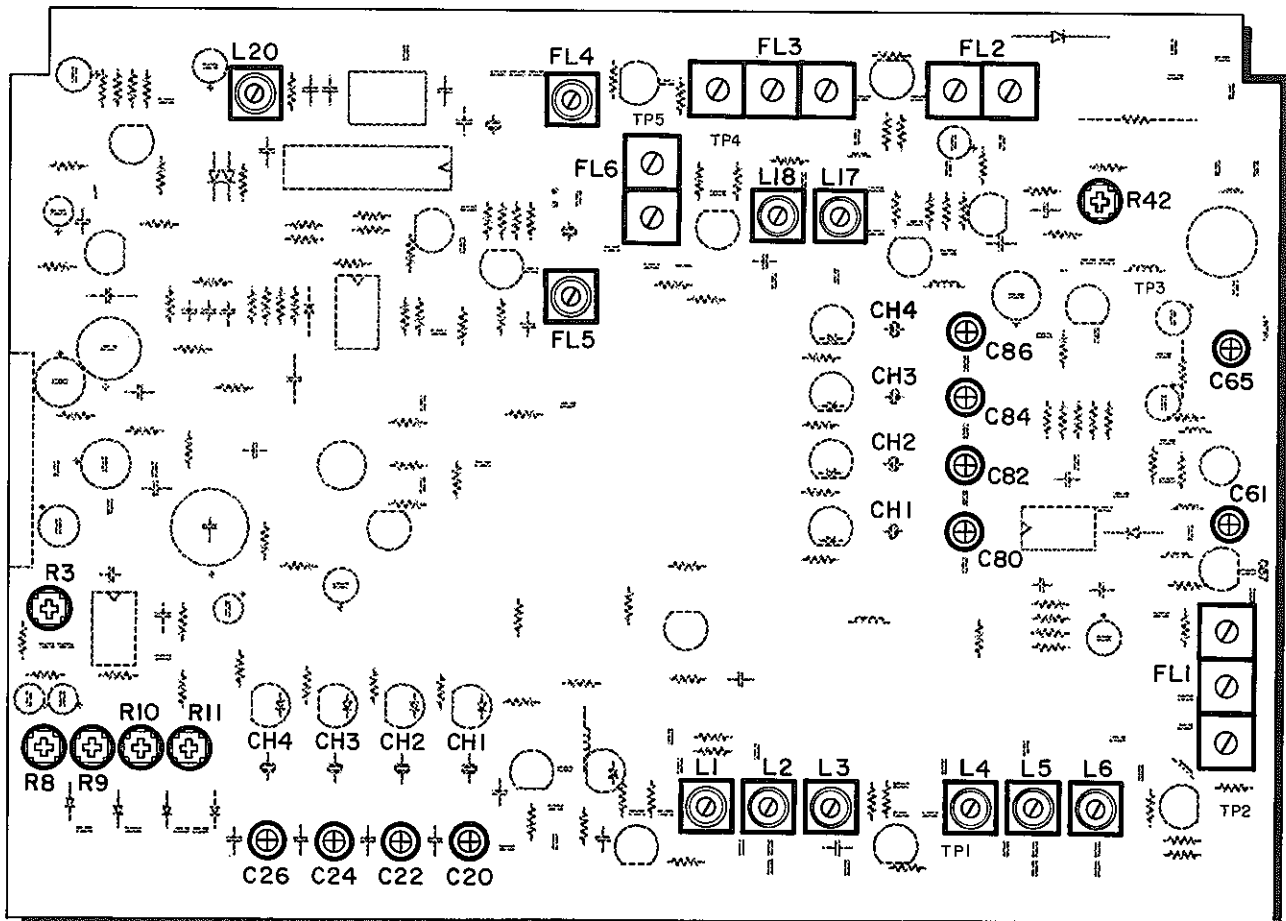
MAXON CM-4020-A UHF MOBILE

Alignment Instructions/Performance Tests

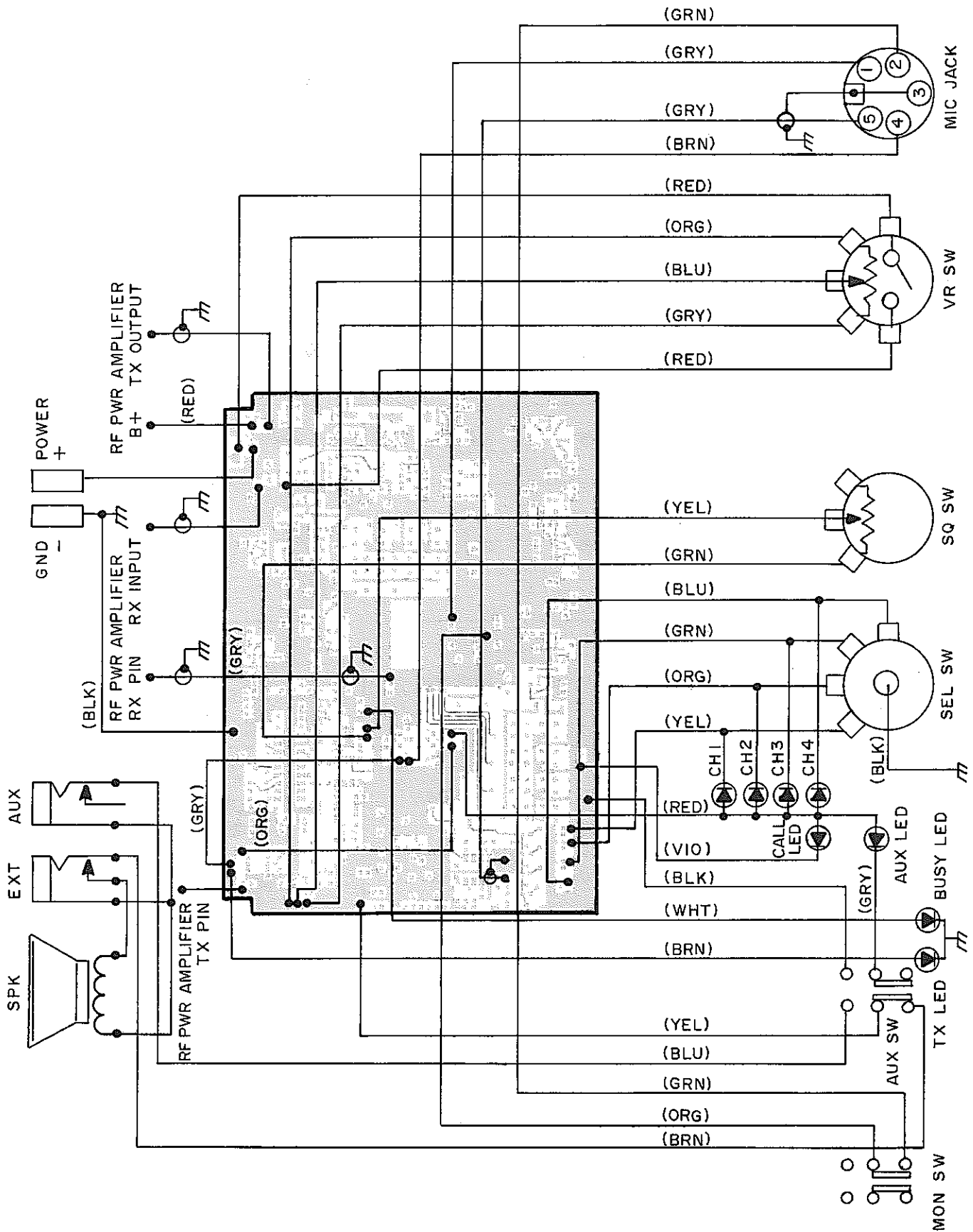
CHANNEL COMPONENTS CHART

Channel	RX XTAL	RX XTAL TRIMMER	TX XTAL	TX XTAL TRIMMER	Deviation Potentiometer
1	Y5	C80	Y4	C20	R11
2	Y6	C82	Y3	C22	R10
3	Y7	C84	Y2	C24	R9
4	Y8	C86	Y1	C26	R8

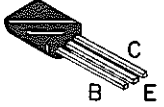
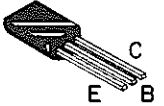
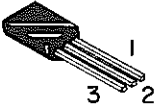
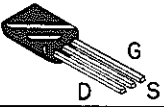

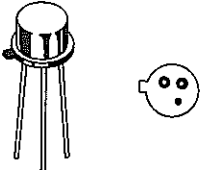
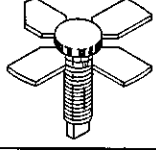
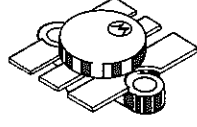

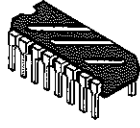
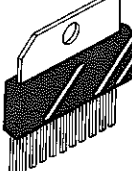
Alignment Points



MAXON CM-4020-A UHF MOBILE Wiring Diagram

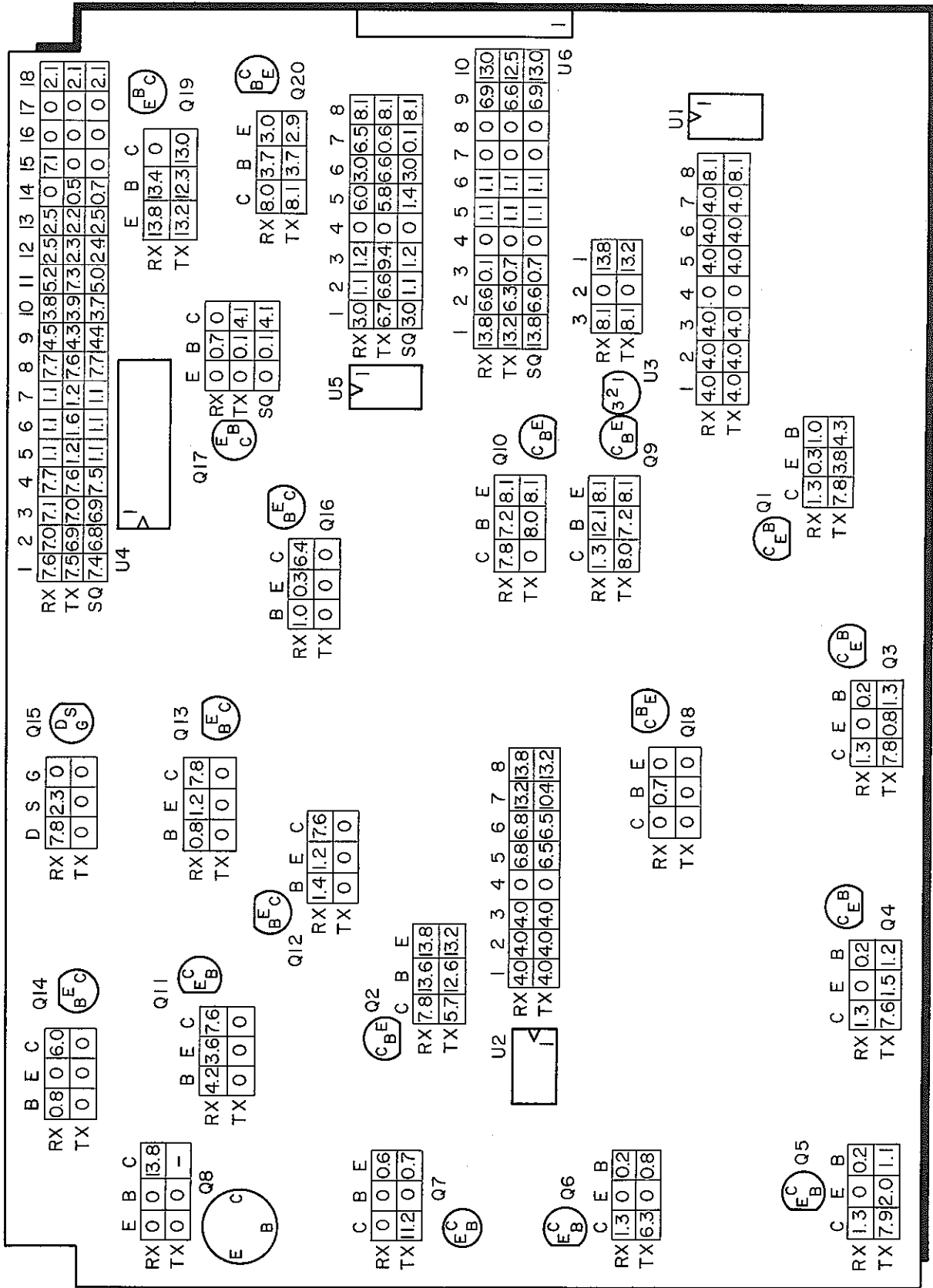


MAXON CM-4020-A UHF MOBILE Transistor & IC Pinout Information

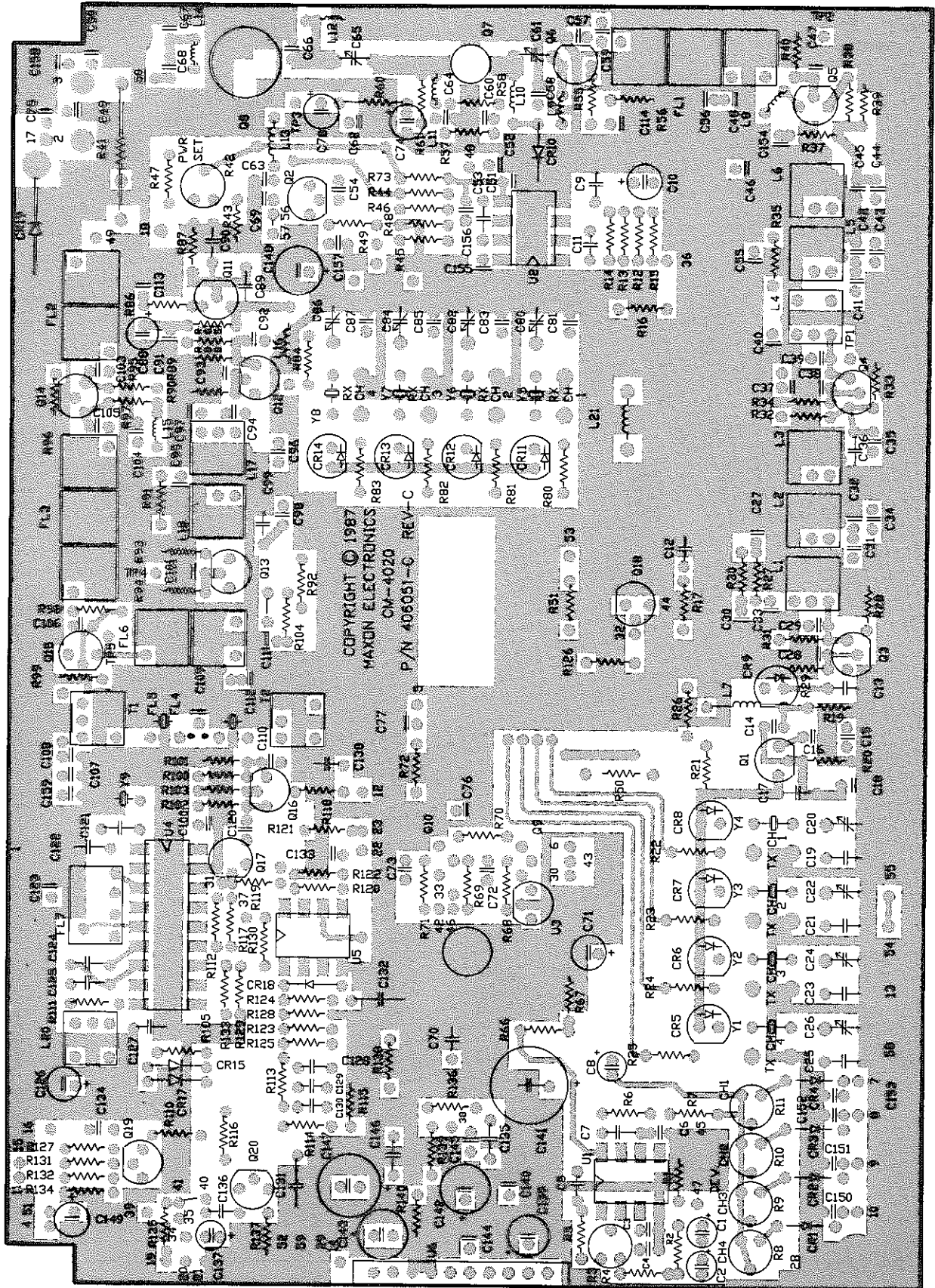
SCHEMATIC REF. NUMBER	MAXON PART NUMBER	MANUFACTURERS PART NUMBER	BASE DIAGRAM
Q4,Q5,Q6,Q13 Q14 Q1,Q3,Q11,Q12,Q16	203-040-3 203-065-6 203-005-2	LP1001 LP1983 MPS9426(C)	
Q17,Q18,Q20 Q9,Q10,Q19 Q2	203-006-3 203-009-6 203-054-6	9600(H) 9681 LSP966	
IC3	223-015-7	MC78L08	
Q15	203-086-5	J310	
Q7	203-055-7	MRF 581	
Q8	203-066-7	MRF 630	
Q301	203-067-8	MRF 654	
Q302	203-068-9	MRF 646	
IC5 IC1, IC2	228-008-6 223-134-3	LM 358 MC 4558	
IC4	223-010-2	MC 3359	
IC6	222-008-6	KIA 7222 AP	

MAXON CM-4020-A UHF MOBILE

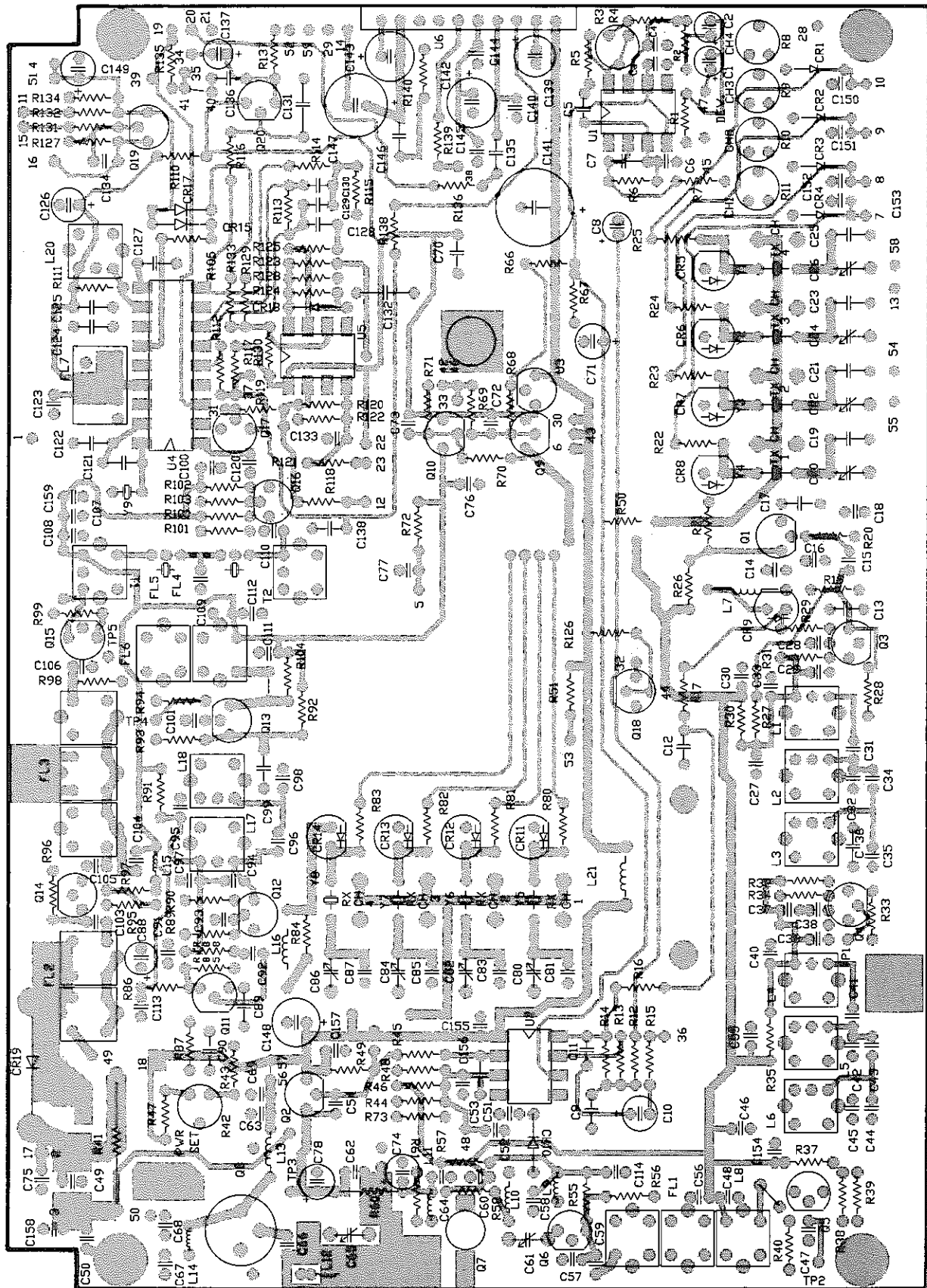
Voltage Chart



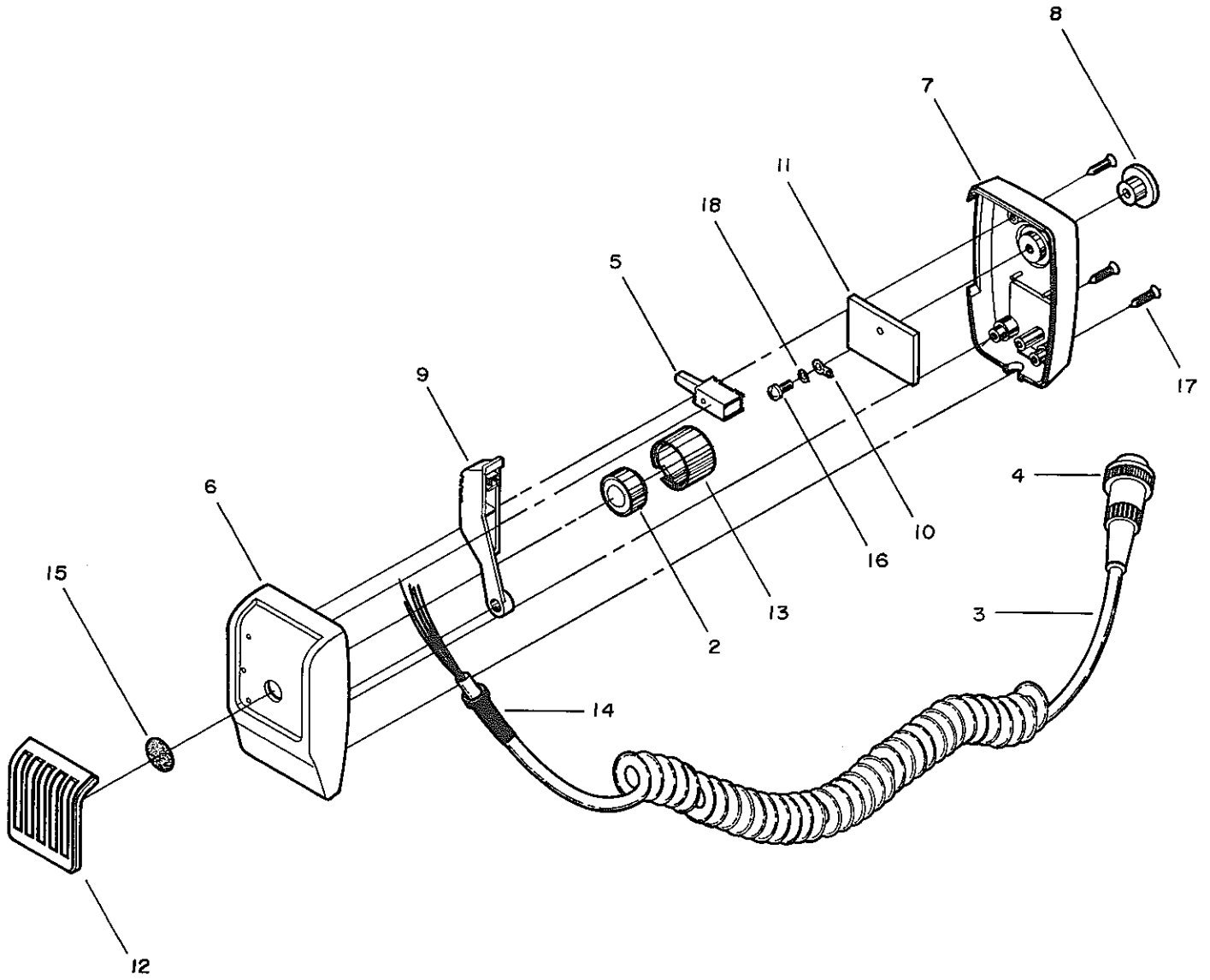
MAXON CM-4020-A UHF MOBILE P.C.B. Top View



MAXON CM-4020-A UHF MOBILE P.C.B. Bottom View



MAXON CM-4020-A UHF MOBILE Exploded View Microphone

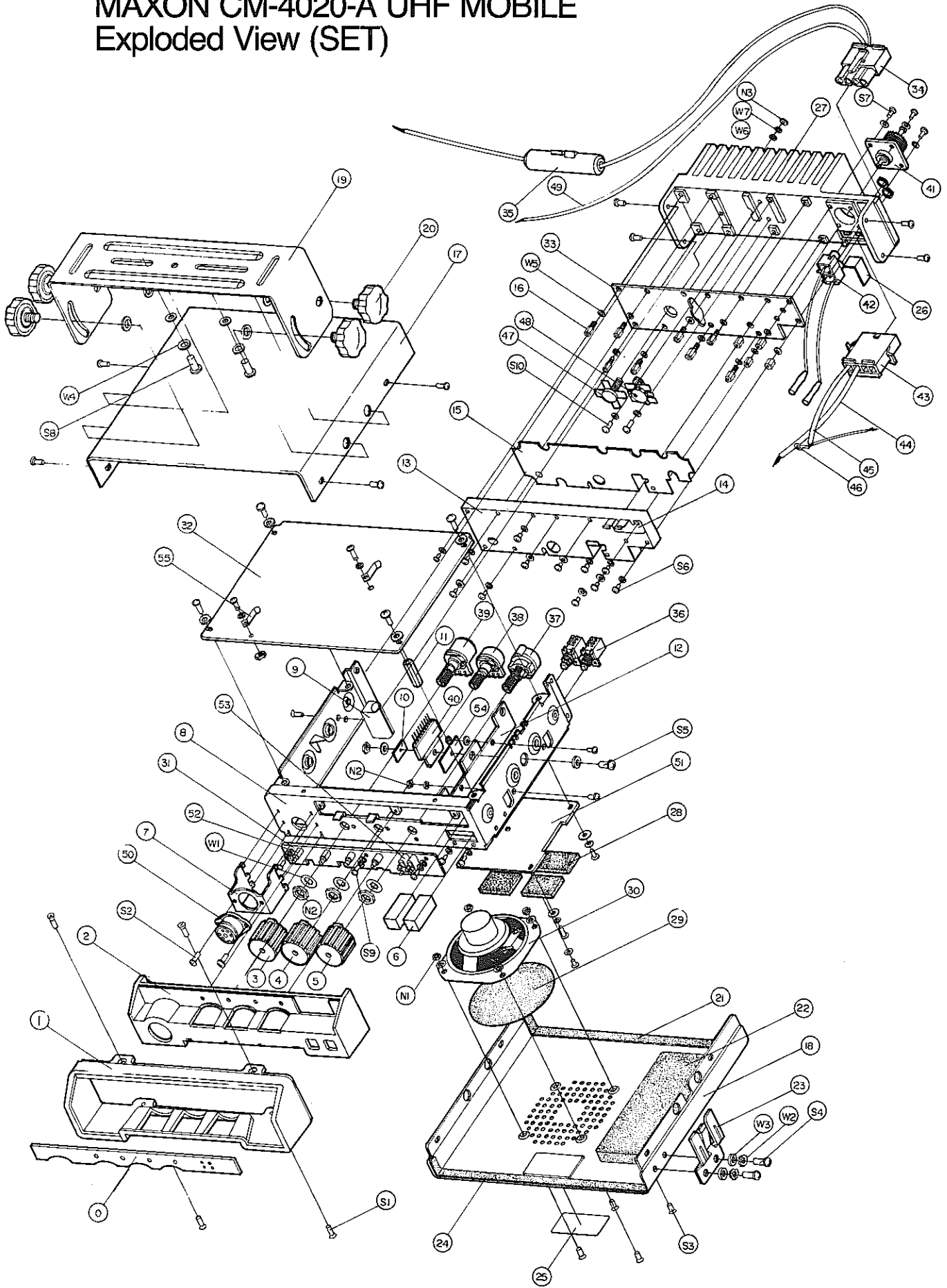


MAXON CM-4020-A UHF MOBILE

Exploded View Parts List

IDENTIFIER	PART NO.	DESCRIPTION
1	MA-3470 5611-M-A 791501	Mobile Microphone Microphone Assembly Name Plate Capacitor Ceramic (See C-103 & C-104)
2	4202169	Mic Cartridge
3	4203100	Curl Cord
4	4210171	5 Pin Plug
5	4320036	Push Switch
6	713500	Upper Cover
7	713511	Bottom Cover
8	741890	Holder (Mic Hangup)
9	740331	PTT Lever
	880740	Spring
10	751330	Solder Terminal
11	791570	Weight Plate
12	830340	Bezel
13	830470	Cap (Mic Cartridge)
14	870036	Wire Clamp (Cord)
	880740	Spring
15	903800	Felt
16	613332	Machine Screw (B.H) M3x10 Zn-Plat
17	642026	Wood Screw
18	662305	Washer (Spring) M3

MAXON CM-4020-A UHF MOBILE Exploded View (SET)



MAXON CM-4020-A UHF MOBILE

Exploded View Parts List

IDENTIFIER	PART NO.	DESCRIPTION
0	812812	Lens
1	800781	Escutcheon
2	714620	Front Cover
3	822970	Knob (Volume)
4	822981	Knob (Squelch)
5	822980	Knob (Channel)
6	822990	Knob (Push)
7	722460	Bracket (Mic Jack M.T.G)
8	701101	Main Body
9	761101	Heat Sink
10	660314	Washer (Square)
11	852795	Post
12	761070	Heat Sink (Audio I.C M.T.G)
13	770620	Shield Plate (Pwr Pack M.T.G)
14	751510	Terminal (Ground)
15	903660	Insulation Plate (Pwr Pack M.T.G)
16	852020	Post
17	714633	Upper Cover
18	714640	Bottom Cover
19	722470	Bracket (Set M.T.G)
20	600016	Securing Screw
21	903750	Felt (200x10x1t)
22	891810	Sponge (80x70x10t)
23	720049	Bracket (Mic M.T.G)
24	903770	Felt (210x6x4t)
25	791491	Name Plate
26	903790	Insulation Plate
27	761061	Heat Sink
28	892180	Rubber Sponge (60x17x3t)
29	900708	Felt (Speaker)
30	4201371	Speaker
31	406315B	P.C.B LED
32	406052B	Main P.C.B
33	406205B	Power P.C.B
34	4220132	Molex Connector
	4228017	Molex Pin
35	863092	Fuse Holder Fuse
36	4320329	Push Switch
37	4330053	Rotary Switch
38	4505082	Variable Resistor 20k (R208)
39	4505071	Variable Resistor 20k (R207)
40	2200086	I.C
41	4229070	Connector ANT
42	4207175	Jack Connector
43	4224097	Molex Connector
44	509435	Terminal Cord Assembly (White)
45	509444	Terminal Cord Assembly (Black)
46	750215	Lug Terminal
47	2030678	Transistor (M.R.F 654)
48	2030689	Transistor (M.R.F 646)

MAXON CM-4020-A UHF MOBILE

Exploded View Parts List

IDENTIFIER	PART NO.	DESCRIPTION
49	504107	Power Cord Assembly (2.5 Meter Length)
50	4215154	5 Pin Socket
51	406052B	Sub P.C.B
52	892060	Rubber Spacer
53	892050	Rubber Spacer
54	4400105	Mica
55	881305	Finger Stock
S1	613208	Machine Screw (F.H) M3x6 Ni-Plating
S2	633200	Tapping Screw (P.H) 3x6 Ni-Plating
S3	613540	Machine Screw (F.H) M3x8 Ni-Plating
S4	613323	Machine Screw (B.H) M3x8 Ni-Plating
S5	613466	Machine Screw (B.H) M3x10 Ni-Plating
S6	611230	Machine Screw (P.H) M2.6x4 Ni-Plating
S7	611270	Machine Screw (P.H) M2.6x16 Ni-Plating
S8	625025	Tapping Screw (T.H) 5x15-1.5 Ni-Plating
S9	611059	Machine Screw (P.H) M2.6x6 Ni-Plating
S10	613580	Machine Screw (P.H) M3x6 Ni-Plating
W1	664700	Washer (Lock) M7 "A" Type
W2	664305	Washer (Lock) M3 "A" Type
W3	662305	Washer (Spring) M3
W4	664518	Washer (Lock) M5 "B" Type
W5	662101	Washer (Spring) M2.6
W6	614160	Washer (Flat) M4
W7	662410	Washer (Spring) M4
N1	651079	Nut M3
N2	652010	Nut M7 (Vo. SN)
N3	650047	Nut VNC No. 8
N4	651100	Nut M2.6

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
C1	1510012	Capacitor Aluminum 1.0 uF 50V
C2	1510012	Capacitor Aluminum 1.0 uF 50V
C3	1339019	Capacitor Ceramic 39 pF 50V
C4	1339019	Capacitor Ceramic 39 pF 50V
C5	1110054	Capacitor Mylar 0.01 uF 50V
C6	1339019	Capacitor Ceramic 39 pF 50V
C7	1368051	Capacitor Ceramic 68 pF NPO
C8	1010127	Capacitor Elect 10 uF 16V
C9	1182042	Capacitor Mylar 0.0082 uF 50V
C10	1010062	Capacitor Elect 1.0 uF 50V
C11	1110010	Capacitor Mylar 0.001 uF 50V
C12	1122086	Capacitor Mylar 0.022 uF 25V
C13	1147092	Capacitor Mylar 0.0047 uF 50V
C14	1301106	Capacitor Ceramic 0.01 uF
C15	1322026	Capacitor Ceramic 22 pF NPO 50V
C16	1301106	Capacitor Ceramic 0.01 uF
C17	1318144	Capacitor Ceramic 180 pF NPO 50V
C18	1347098	Capacitor Ceramic 47 pF N750
C19	1339020	Capacitor Ceramic 39 pF NPO 50V
C20	1730041	Capacitor Trimmer 30 pF
C21	1339020	Capacitor Ceramic 39 pF NPO 50V
C22	1730041	Capacitor Trimmer 30 pF
C23	1339020	Capacitor Ceramic 39 pF NPO 50V
C24	1730041	Capacitor Trimmer 30 pF
C25	1339020	Capacitor Ceramic 39 pF
C26	1730041	Capacitor Trimmer 30 pF
C27	1301106	Capacitor Ceramic 0.01 uF
C28	1301106	Capacitor Ceramic 0.01 uF
C29	1330061	Capacitor Ceramic 3 pF NPO
C30	1301106	Capacitor Ceramic 0.01 uF
C31	1305027	Capacitor Ceramic 0.5 pF SL
C32	1330061	Capacitor Ceramic 3 pF NPO
C33	1301018	Capacitor Ceramic 0.001 uF 50V
C34	1305027	Capacitor Ceramic 0.5 pF SL
C35	1322026	Capacitor Ceramic 22 pF NPO 50V
C36	1368051	Capacitor Ceramic 68 pF NPO
C37	1301018	Capacitor Ceramic 0.001 uF 50V
C38	1322103	Capacitor Ceramic 220 pF 50V
C39	1340044	Capacitor Ceramic 4 pF NPO 50V
C40	1322103	Capacitor Ceramic 220 pF 50V SL
C41	1305027	Capacitor Ceramic 0.5 pF SL
C42	1340044	Capacitor Ceramic 4 pF NPO 50V
C43	1305027	Capacitor Ceramic 0.5 pF SL
C44	1315088	Capacitor Ceramic 15 pF NPO
C45	1322026	Capacitor Ceramic 22 pF NPO 50V
C46	1301018	Capacitor Ceramic 0.001 uF 50V
C47	1339019	Capacitor Ceramic 39 pF 50V
C48	1339019	Capacitor Ceramic 39 pF 50V
C49	1339019	Capacitor Ceramic 39 pF 50V
C50	1339019	Capacitor Ceramic 39 pF 50V
C51	1339019	Capacitor Ceramic 39 pF 50V

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
C52	1339019	Capacitor Ceramic 39 pF 50V
C53	1304053	Capacitor Ceramic 0.047 uF 50V
C54	1301106	Capacitor Ceramic 0.01 uF
C55	1301106	Capacitor Ceramic 0.01 uF
C56	1322103	Capacitor Ceramic 220 pF 50V SL
C57	1320088	Capacitor Ceramic 2 pF NPO
C58	1339019	Capacitor Ceramic 39 pF 50V
C59	1339019	Capacitor Ceramic 39 pF 50V
C60	1339019	Capacitor Ceramic 39 pF 50V
C61	1720080	Capacitor Trimmer 10 pF
C62	1301106	Capacitor Ceramic 0.01 uF
C63	1339019	Capacitor Ceramic 39 pF 50V
C64	1339019	Capacitor Ceramic 39 pF 50V
C65	1720080	Capacitor Trimmer 10 pF
C66	1315088	Capacitor Ceramic 15 pF NPO
C67	1360044	Capacitor Ceramic 6 pF NPO
C68	1322026	Capacitor Ceramic 22 pF NPO 50V
C69	1301106	Capacitor Ceramic 0.01 uF
C70	1301052	Capacitor Ceramic 0.01 uF 50V
C71	1010127	Capacitor Elect 10 uF 16V
C72	1339019	Capacitor Ceramic 39 pF 50V
C73	1339019	Capacitor Ceramic 39 pF 50V
C74	1410019	Capacitor Tantalum 1.0 uF 16V
C75	1301106	Capacitor Ceramic 0.01 uF
C76	1347010	Capacitor Ceramic 47 pF 50V
C77	1301106	Capacitor Ceramic 0.01 uF
C78	1410019	Capacitor Tantalum 1.0 uF 16V
C79	1320088	Capacitor Ceramic 2 pF NPO
C80	1720024	Capacitor Trimmer 20 pF
C81	1330061	Capacitor Ceramic 3 pF NPO
C82	1720024	Capacitor Trimmer 20 pF
C83	1330061	Capacitor Ceramic 3 pF NPO
C84	1720024	Capacitor Trimmer 20 pF
C85	1330061	Capacitor Ceramic 3 pF NPO
C86	1720024	Capacitor Trimmer 20 pF
C87	1330061	Capacitor Ceramic 3 pF NPO
C88	1510012	Capacitor Aluminum 1.0 uF 50V
C89	1368051	Capacitor Ceramic 68 pF NPO
C90	1347087	Capacitor Ceramic 47 pF NPO
C91	1301106	Capacitor Ceramic 0.01 uF
C92	1347010	Capacitor Ceramic 47 pF 50V
C93	1315077	Capacitor Ceramic 150 pF
C94	1360044	Capacitor Ceramic 6 pF NPO
C95	1301106	Capacitor Ceramic 0.01 uF
C96	1305027	Capacitor Ceramic 0.5 pF SL
C97	1322103	Capacitor Ceramic 220 pF 50V SL
C98	1315088	Capacitor Ceramic 15 pF NPO
C99	1347087	Capacitor Ceramic 47 pF NPO
C100	1301018	Capacitor Ceramic 0.001 uF 50V
C101	1347010	Capacitor Ceramic 470 pF 50V

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
C102	1320088	Capacitor Ceramic 2 pF NPO
C103	1339019	Capacitor Ceramic 39 pF 50V
C104	1339019	Capacitor Ceramic 39 pF 50V
C105	1339019	Capacitor Ceramic 39 pF 50V
C106	1339019	Capacitor Ceramic 39 pF 50V
C107	1301106	Capacitor Ceramic 0.01 uF
C108	1339019	Capacitor Ceramic 39 pF 50V
C109	1360044	Capacitor Ceramic 6 pF NPO
C110	1301106	Capacitor Ceramic 0.01 uF
C111	1339019	Capacitor Ceramic 39 pF NPO
C112	1347010	Capacitor Ceramic 47 pF 50V
C113	1339019	Capacitor Ceramic 39 pF 50V
C114	1301106	Capacitor Ceramic 0.01 uF
C115	1320088	Capacitor Ceramic 3 pF NPO
C116	NOT USED	
C117	NOT USED	
C118	NOT USED	
C119	NOT USED	
C120	1301106	Capacitor Ceramic 0.01 uF
C121	1382048	Capacitor Ceramic 82 pF 50V NPO
C122	1310159	Capacitor Ceramic 100 pF NPO 50V
C123	1301106	Capacitor Ceramic 0.01 uF
C124	1301052	Capacitor Ceramic 0.1 uF 50V
C125	1301052	Capacitor Ceramic 0.1 uF 50V
C126	1410019	Capacitor Tantalum 1.0 uF 16V
C127	1310159	Capacitor Ceramic 100 pF NPO 50V
C128	1110054	Capacitor Mylar 0.01 uF 50V
C129	1110010	Capacitor Mylar 0.001 uF 50V
C130	1110010	Capacitor Mylar 0.001 uF 50V
C131	1168033	Capacitor Mylar 0.068 uF 50V
C132	1168033	Capacitor Mylar 0.068 uF 50V
C133	1301106	Capacitor Ceramic 0.01 uF
C134	1339019	Capacitor Ceramic 39 pF 50V
C135	1122086	Capacitor Mylar 0.022 uF 25V
C136	1122086	Capacitor Mylar 0.022 uF 25V
C137	1510012	Capacitor Aluminum 1.0 uF 50V
C138	1122086	Capacitor Mylar 0.022 uF 25V
C139	1047033	Capacitor Elect 4.7 uF 16V
C140	1301018	Capacitor Ceramic 0.001 uF 50V
C141	1047242	Capacitor Elect 470 uF 25V
C142	1010468	Capacitor Elect 100 uF 16V
C143	1047121	Capacitor Elect 47 uF 16V
C144	1301106	Capacitor Ceramic 0.01 uF
C145	1347108	Capacitor Ceramic 470 pF SL
C146	1301052	Capacitor Ceramic 0.1 uF 50V
C147	1022423	Capacitor Elect 220 uF 16V
C148	1047132	Capacitor Elect 47 uF 25V
C149	1410019	Capacitor Tantalum 1.0 uF 16V
C150	1301106	Capacitor Ceramic 0.01 uF
C151	1301106	Capacitor Ceramic 0.01 uF

MAXON CM-4020-A UHF MOBILE Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
C152	1301106	Capacitor Ceramic 0.01 uF
C153	1301106	Capacitor Ceramic 0.01 uF
C154	1315077	Capacitor Ceramic 150 pF
C155	1339019	Capacitor Ceramic 39 pF 50V
C156	1339019	Capacitor Ceramic 39 pF 50V
C157	1301106	Capacitor Ceramic 0.01 uF
C158	1301106	Capacitor Ceramic 0.01 uF 50V
C159	1301106	Capacitor Ceramic 0.01 uF 50V
C160-C199	NOT USED	
C200	1347032	Capacitor Ceramic 470 pF 50V
C201	1347032	Capacitor Ceramic 470 pF 50V
C202	1347032	Capacitor Ceramic 470 pF 50V
C203	1347032	Capacitor Ceramic 470 pF 50V
C204	1347032	Capacitor Ceramic 470 pF 50V
C205	1347164	Capacitor Ceramic 47 pF
C206	1347164	Capacitor Ceramic 47 pF
C207	1347164	Capacitor Ceramic 47 pF
C208	1347164	Capacitor Ceramic 47 pF
C209-C300	NOT USED	
C301	1312065	Capacitor Ceramic Monolithic 12 pF
C302	1332019	Capacitor Ceramic Monolithic 32 pF
C303	1333172	Capacitor Porcelain Monolithic 33 pF
C304	1333172	Capacitor Porcelain Monolithic 33 pF
C305	1356085	Capacitor Ceramic Monolithic 56 pF
C306	1310258	Capacitor Ceramic Monolithic 1000 pF
C307	1322257	Capacitor Porcelain Monolithic 22 pF
C308	1315307	Capacitor Porcelain Monolithic 150 pF
C309	1010237	Capacitor Elect 10 uF 25V
C310	1301546	Capacitor Ceramic Monolithic 0.1 uF
C311	1333172	Capacitor Porcelain Monolithic 33 pF
C312	1310456	Capacitor Porcelain Monolithic 10 pF
C313	1410019	Capacitor Tantalum 1.0 uF 16V
C314	1333172	Capacitor Porcelain Monolithic 33 pF
C315	1327153	Capacitor Porcelain Monolithic 27 pF
C316	1356085	Capacitor Ceramic Monolithic 56 pF
C317	NOT USED	
C318	1310258	Capacitor Ceramic Monolithic 1000 pF
C319	1339130	Capacitor Porcelain Monolithic 3.9 pF
C320	1368187	Capacitor Porcelain Monolithic 6.8 pF
C321	1333260	Capacitor Porcelain Chip 330 pF
C322	1368187	Capacitor Porcelain Monolithic 6.8 pF
C323	1333172	Capacitor Porcelain Monolithic 33 pF
C324	1382158	Capacitor Porcelain Monolithic 8.2 pF
C325	1368187	Capacitor Porcelain Monolithic 6.8 pF
C326	1310258	Capacitor Ceramic Monolithic 1000 pF
C327	NOT USED	
C328	1310456	Capacitor Ceramic Monolithic 10 pF
C329	NOT USED	
C330	NOT USED	
C331	1347263	Capacitor Ceramic Monolithic 470 pF

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
CR1	2430087	Diode 1N4148
CR2	2430087	Diode 1N4148
CR3	2430087	Diode 1N4148
CR4	2430087	Diode 1N4148
CR5	2430153	Diode MPN3404
CR6	2430153	Diode MPN3404
CR7	2430153	Diode MPN3404
CR8	2430153	Diode MPN3404
CR9	2420059	Diode MV209
CR10	2430087	Diode 1N4148
CR11	3420153	Diode MPN3404
CR12	3420153	Diode MPN3404
CR13	3420153	Diode MPN3404
CR14	3420153	Diode MPN3404
CR15	2430087	Diode 1N4148
CR16	NOT USED	
CR17	2430087	Diode 1N4148
CR18	2430087	Diode 1N4148
CR19	2450087	Diode 2A100V
DS201	2510529	Led Lamp SLR34UR (RED)
DS202	2510530	Led Lamp SLR34YY3 (YEL)
DS203	2510277	Led Lamp SLR34GG3 (GRN)
DS204	2510530	Led Lamp SLR34YY3 (YEL)
DS205	2510419	Led Lamp SLC22UR3 (GRN)
DS206	2510429	Led Lamp SLC22GG3 (ORG)
DS207	2510695	Led Lamp SLC22YY3 (YEL)
DS208	2510705	Led Lamp SLC22DU3 (ORG)
FB1	3202531	Bead Core FC 3 x 2
FB2	3202531	Bead Core FC 3 x 2
FL1	3205060	Filter 3-Pole Helical
FL2	3203693	Filter 2-Pole Helical
FL3	3205060	Filter 3-Pole Helical
FL4	2710020	Filter 21.4 MHz Crystal Pair (21M15BU)
FL5	2710020	Filter 21.4 MHz Crystal Pair (21M15BU)
FL6	3203703	Filter 2-Pole Helical
FL7	2700092	Filter 455 KHz Ceramic (CFW-455E)
HR1	0965011	Heater 50 C XTAL
HR2	0965011	Heater 50 C XTAL
HR3	0965011	Heater 50 C XTAL
HR4	0965011	Heater 50 C XTAL
IC1	2231343	IC MC4558 CP (MOTOROLA ONLY)
IC2	2231343	IC MC4558 CP
IC3	2230157	IC MC78L08 CT
IC4	2230102	IC MC3359P
IC5	2280086	IC LM358
IC6	2220086	IC KIA7222 AP
J1	4215549	Socket Miniature
J2	4215549	Socket Miniature
J3	4215549	Socket Miniature
J4	4215549	Socket Miniature

MAXON CM-4020-A UHF MOBILE Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
J5	4215549	Socket Miniature
J6	4215549	Socket Miniature
J7	4215549	Socket Miniature
J8	4215549	Socket Miniature
L1	3202597	Inductor, RF Shielded
L2	3202597	Inductor, RF Shielded
L3	3202333	Inductor, RF Shielded
L4	3202618	Inductor, RF Shielded
L5	3202618	Inductor, RF Shielded
L6	3202290	Inductor, RF Shielded
L7	3102428	2.2 uH Molded Inductor
L8	NOT USED	
L9	3102439	Loop 7NH 1/2 Turn
L10	3100853	Inductor MK8
L11	3102439	Loop 7NH 1/2 Turn
L12	3100853	Inductor MK8
L13	3100853	Inductor MK4
L14	3102439	Loop 7NH 1/2 Turn
L15	3100929	Inductor MK4
L16	3102352	Inductor .68 uHMolded
L17	3202618	Inductor RF Shielded
L18	3202290	Inductor RF Shielded
L20	3204261	Coil 455 kHz Detector
L21	3000081	Transformer - Choke
L301	3101432	Inductor MK31-4T
L302	3101432	Inductor MK31-4T
L303	3101454	Inductor 0.47 uH
L304	3101454	Inductor 0.47 uH
L305	3101421	Inductor MK-30 (8T on 100 ohm, 1/2W Resistor)
L306	3101421	Inductor MK-30 (8T on 100 ohm, 1/2W Resistor)
Q1	2030052	Transistor MPS9426 (C)
Q2	2030546	Transistor LSP966
Q3	2030052	Transistor MPS9426 (C)
Q4	2030403	Transistor LP1001
Q5	2030403	Transistor LP1001
Q6	2030403	Transistor LP1001
Q7	2030557	Transistor MRF581
Q8	2030667	Transistor MRF630
Q9	2030096	Transistor MPS9681 (T)
Q10	2030096	Transistor MPS9681 (T)
Q11	2030052	Transistor MPS9426 (C)
Q12	2030052	Transistor MPS9426 (C)
Q13	2030403	Transistor LP1001
Q14	2030656	Transistor LP1983
Q15	2030865	FET J310
Q16	2030052	Transistor MPS9426 (C)
Q17	2030063	Transistor MPS9600 (H)
Q18	2030063	Transistor MPS9600 (H)
Q19	2030096	Transistor MPS9600 (T)
Q20	2030063	Transistor MPS9600 (H)
Q301	2030678	Transistor MRF654
Q302	2030689	Transistor MRF646

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
R1	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R2	0021821	Resistor, Carbon Film 1.8k ohm 1/16W +5%
R3	0711047	Resistor, SemiFixed 100k
R4	0025621	Resistor, Carbon Film 5.6k ohm 1/16W +5%
R5	0022729	Resistor, Carbon Film 2.7k ohm 1/16W +5%
R6	0022246	Resistor, Carbon Film 220k ohm 1/16W +5%
R7	0024723	Resistor, Carbon Film 4.7k ohm 1/16W +5%
R8	0714729	Resistor SemiFixed 4.7k
R9	0714729	Resistor SemiFixed 4.7k
R10	0714729	Resistor SemiFixed 4.7k
R11	0714729	Resistor SemiFixed 4.7k
R12	0021535	Resistor, Carbon Film 15k ohm 1/16W +5%
R13	0021238	Resistor, Carbon Film 12k ohm 1/16W +5%
R14	0021832	Resistor, Carbon Film 18k ohm 1/16W +5%
R15	0021041	Resistor, Carbon Film 100k ohm 1/16W +5%
R16	0021821	Resistor, Carbon Film 1.8k ohm 1/16W +5%
R17	0023320	Resistor, Carbon Film 3.3k ohm 1/16W +5%
R18	0025610	Resistor, Carbon Film 560 ohm 1/16W +5%
R19	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R20	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R21	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R22	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R23	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R24	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R25	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R26	0024701	Resistor, Carbon Film 47 ohm 1/16W +5%
R27	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R28	0024723	Resistor, Carbon Film 47k ohm 1/16W +5%
R29	0022213	Resistor, Carbon Film 220 ohm 1/16W +5%
R30	0024701	Resistor, Carbon Film 47 ohm 1/16W +5%
R31	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R32	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R33	0024723	Resistor, Carbon Film 4.7k ohm 1/16W +5%
R34	0022213	Resistor, Carbon Film 220 ohm 1/16W +5%
R35	0024701	Resistor, Carbon Film 47 ohm 1/16W +5%
R36	NOT USED	
R37	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R38	0022202	Resistor, Carbon Film 22 ohm 1/16W +5%
R39	0024723	Resistor, Carbon Film 4.7k ohm 1/16W +5%
R40	0022213	Resistor, Carbon Film 220 ohm 1/16W +5%
R41	0499055	Resistor, Wire Wound .05 ohm 2W
R42	0711025	Resistor, SemiFixed 1k
R43	0021535	Resistor, Carbon Film 15k ohm 1/16W +5%
R44	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R45	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R46	0022741	Resistor, Carbon Film 270k ohm 1/16W +5%
R47	0021535	Resistor, Carbon Film 15k ohm 1/16W +5%
R48	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R49	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R50	0041007	Resistor, Carbon Film 10 ohm 1/16W +5%

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
R51	0021007	Resistor, Carbon Film 10 ohm 1/16W +5%
R52 - R54	NOT USED	
R55	0021821	Resistor, Carbon Film 1.8k ohm 1/16W +5%
R56	0022718	Resistor, Carbon Film 270 ohm 1/16W +5%
R57	0024701	Resistor, Carbon Film 47 ohm 1/16W +5%
R58	0021024	Resistor, Carbon Film 1k ohm 1/16W +5%
R59	NOT USED	
R60	0041007	Resistor, Carbon Film 1k ohm 1/16W +5%
R61	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R62 - R65	NOT USED	
R66	0023331	Resistor, Carbon Film 33k ohm 1/16W +5%
R67	0023331	Resistor, Carbon Film 33k ohm 1/16W +5%
R68	0021929	Resistor, Carbon Film 10k ohm 1/16W +5%
R69	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R70	0023320	Resistor, Carbon Film 3.3k ohm 1/16W +5%
R71	0023320	Resistor, Carbon Film 3.3k ohm 1/16W +5%
R72	0022202	Resistor, Carbon Film 22 ohm 1/16W +5%
R73	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R74 - R79	NOT USED	
R80	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R81	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R82	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R83	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R84	0023320	Resistor, Carbon Film 3.3k ohm 1/16W +5%
R85	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R86	0022202	Resistor, Carbon Film 22 ohm 1/16W +5%
R87	0025610	Resistor, Carbon Film 560 ohm 1/16W +5%
R88	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R89	0025621	Resistor, Carbon Film 5.6k ohm 1/16W +5%
R90	0023319	Resistor, Carbon Film 330 ohm 1/16W +5%
R91	0027504	Resistor, Carbon Film 75 ohm 1/16W +5%
R92	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R93	0024723	Resistor, Carbon Film 4.7k ohm 1/16W +5%
R94	0021018	Resistor, Carbon Film 100 ohm 1/16W +5%
R95	0025621	Resistor, Carbon Film 5.6k ohm 1/16W +5%
R96	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R97	0021216	Resistor, Carbon Film 120 ohm 1/16W +5%
R98	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R99	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R100	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R101	0023320	Resistor, Carbon Film 3.3k ohm 1/16W +5%
R102	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R103	0021810	Resistor, Carbon Film 180 ohm 1/16W +5%
R104	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R105	0021041	Resistor, Carbon Film 100k ohm 1/16W +5%
R106 - R109	NOT USED	
R110	0021018	Resistor, Carbon Film 100 ohm 1/16W +5%
R111	0024734	Resistor, Carbon Film 47k ohm 1/16W +5%
R112	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%

MAXON CM-4020-A UHF MOBILE

Electrical Parts List

IDENTIFIER	PART NO.	DESCRIPTION
R113	0021843	Resistor, Carbon Film 180k ohm 1/16W +5%
R114	0029135	Resistor, Carbon Film 91k ohm 1/16W +5%
R115	0022729	Resistor, Carbon Film 2.7k ohm 1/16W +5%
R116	0021535	Resistor, Carbon Film 15k ohm 1/16W +5%
R117	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R118	0024723	Resistor, Carbon Film 560 ohm 1/16W +5%
R119	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R120	0022730	Resistor, Carbon Film 27k ohm 1/16W +5%
R121	0021821	Resistor, Carbon Film 1.8k ohm 1/16W +5%
R122	0025621	Resistor, Carbon Film 5.6k ohm 1/16W +5%
R123	0021041	Resistor, Carbon Film 100k ohm 1/16W +5%
R124	0026837	Resistor, Carbon Film 68k ohm 1/16W +5%
R125	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R126	0022235	Resistor, Carbon Film 22k ohm 1/16W +5%
R127	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R128	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R129	0021029	Resistor, Carbon Film 2.7k ohm 1/16W +5%
R130	0021535	Resistor, Carbon Film 15k ohm 1/16W +5%
R131	0022224	Resistor, Carbon Film 2.2k ohm 1/16W +5%
R132	0021524	Resistor, Carbon Film 1.5k ohm 1/16W +5%
R133	0028215	Resistor, Carbon Film 820 ohm 1/16W +5%
R134	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R135	0022730	Resistor, Carbon Film 27k ohm 1/16W +5%
R136	0021030	Resistor, Carbon Film 10k ohm 1/16W +5%
R137	0024723	Resistor, Carbon Film 4.7k ohm 1/16W +5%
R138	0024734	Resistor, Carbon Film 47k ohm 1/16W +5%
R139	0024734	Resistor, Carbon Film 47k ohm 1/16W +5%
R140	0022796	Resistor, Carbon Film 2.7 ohm 1/16W +5%
R141-R200	NOT USED	
R201	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R202	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R203	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R204	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R205	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R206	0021029	Resistor, Carbon Film 1k ohm 1/16W +5%
R207-R300	NOT USED	
R301	0461021	Resistor, Carbon 1/2W +5%
R302	0465195	Resistor, Carbon 1/2W +5%
R303	0461021	Resistor, Carbon 1/2W +5%
R306	0122216	Resistor, Carbon Film 220 ohm 1/2W +5%
R309	0122216	Resistor, Carbon Film 220 ohm 1/2W +5%
T1	3205071	Coil, RX IFT 21.4 MHz (B)
T2	3203659	Coil, RX IFT 21.4 MHz (A)
X9	2608281	Crystal Unit 20.945 MHz UM-1 CL:43 pF

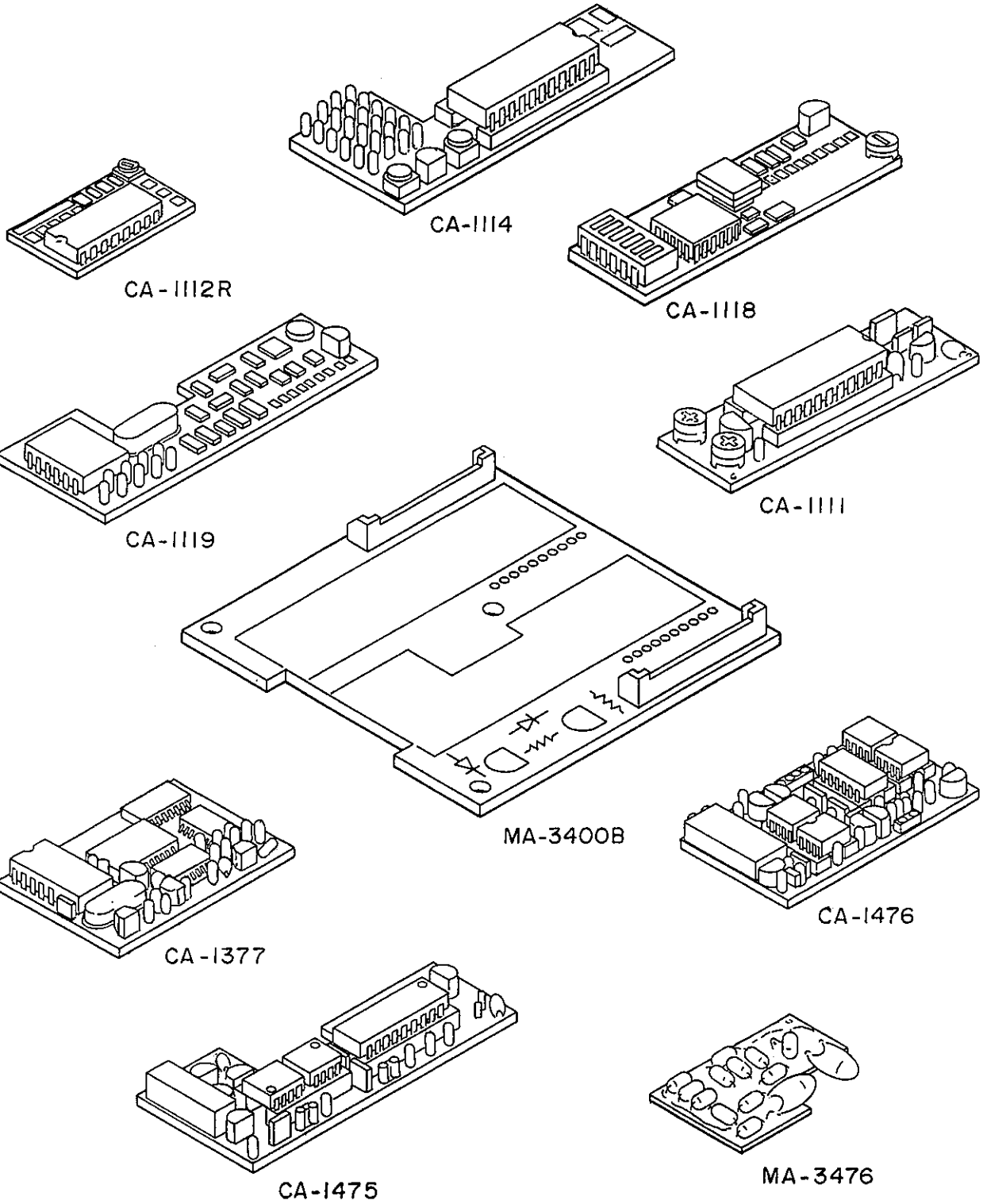
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MAXON CM-4020-A UHF MOBILE

Option Section

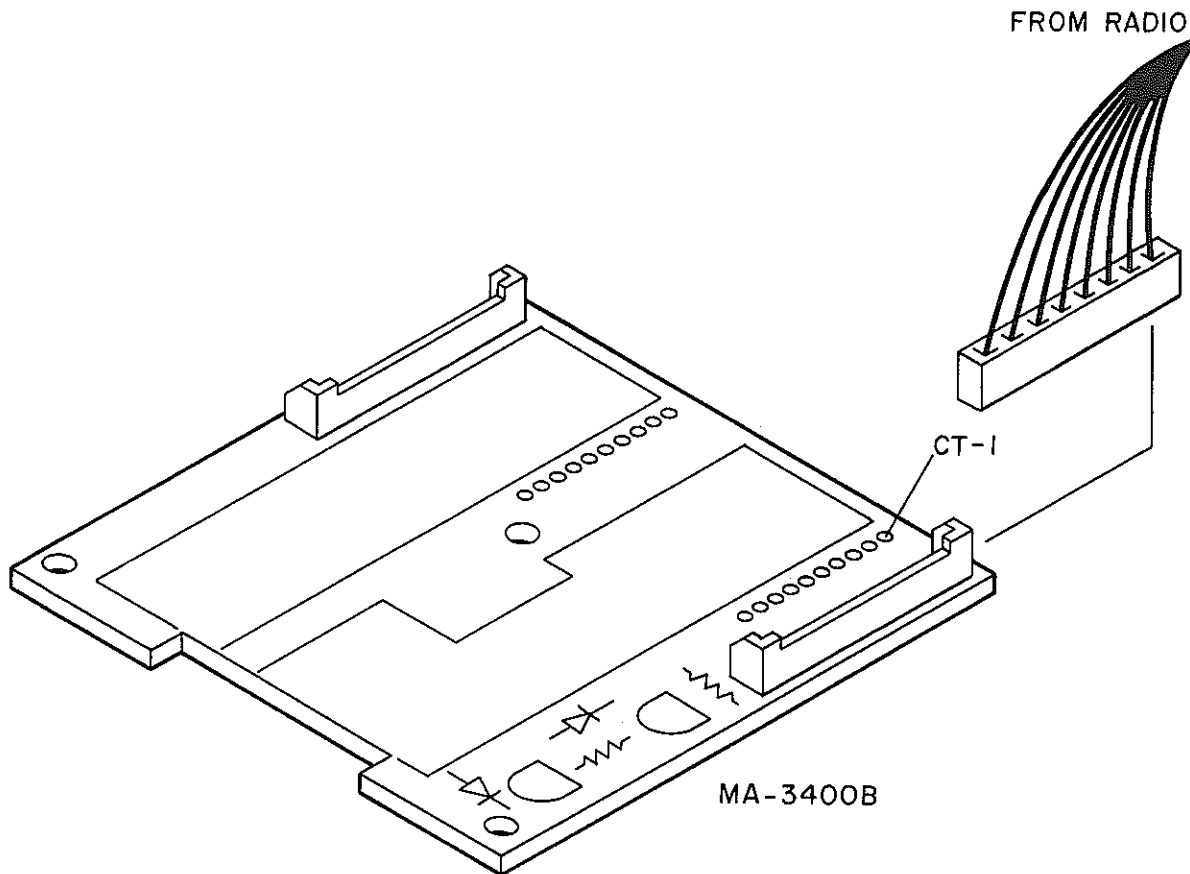


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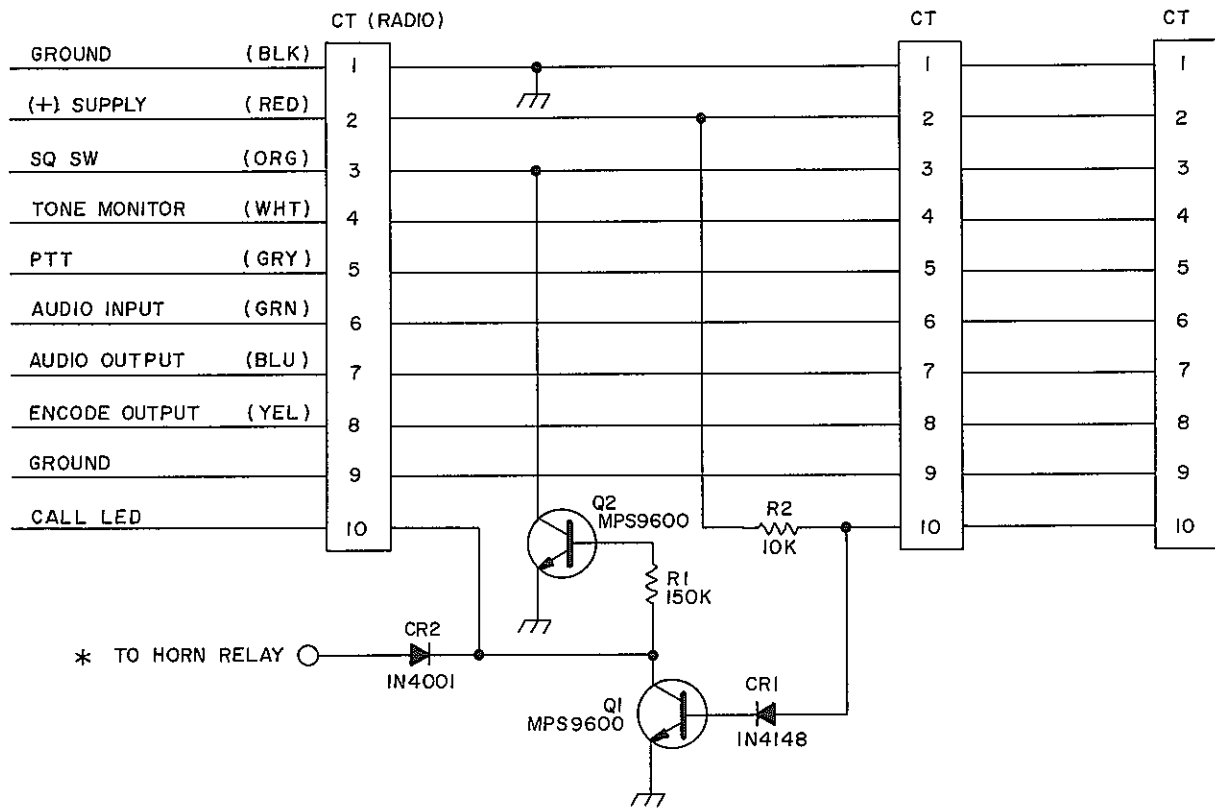
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MAXON CM-4020-A UHF MOBILE MA-3400B Accessory Board



MA-3400B CONNECTION POINTS	MA-3400B FUNCTION	MA-3400B WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	SQUELCH SWITCHING	ORANGE
CT-4	TONE MONITOR SWITCH	WHITE
CT-5	PTT SWITCH	GRY OR BRN
CT-6	AUDIO INPUT	GREEN
CT-7	AUDIO OUTPUT	BLUE
CT-8	ENCODE OUTPUT	YELLOW
CT-9	—	
CT-10	—	

MAXON CM-4020-A UHF MOBILE MA-3400B Schematic Diagram



* May be wired to spare sockets in Power Supply Connector with spare pins provided in Accessory Pack.

MAXON CM-4020-A UHF MOBILE MA-3400B Parts List

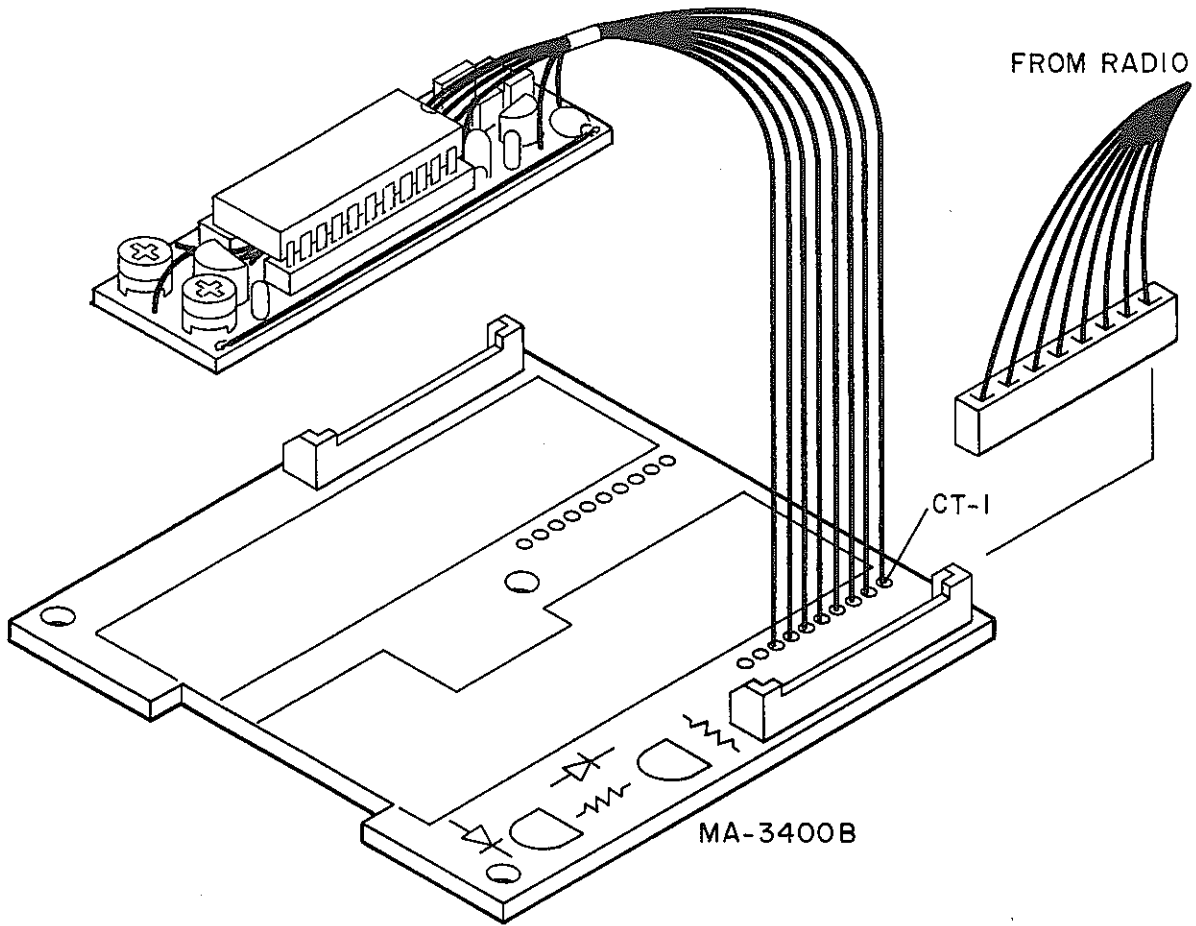
IDENTIFIER	PART NO.	DESCRIPTION
CR1	2430087	Diode 1N4148
CR2	2450131	Diode 1N4001
Q1	2030063	Transistor MPS 9600
Q2	2030063	Transistor MPS 9600
R1	0021546	Resistor 150k ohm
R2	0021030	Resistor 10k ohm

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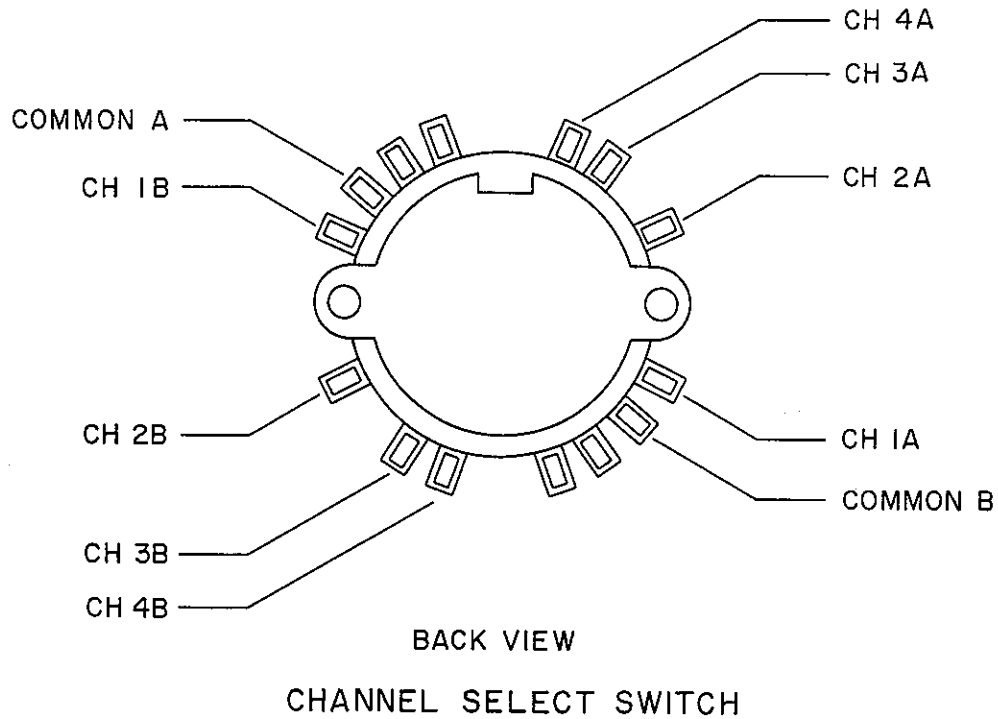
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MAXON CM-4020-A UHF MOBILE CA-1111 Sub-Audible Tone Encoder/Decoder

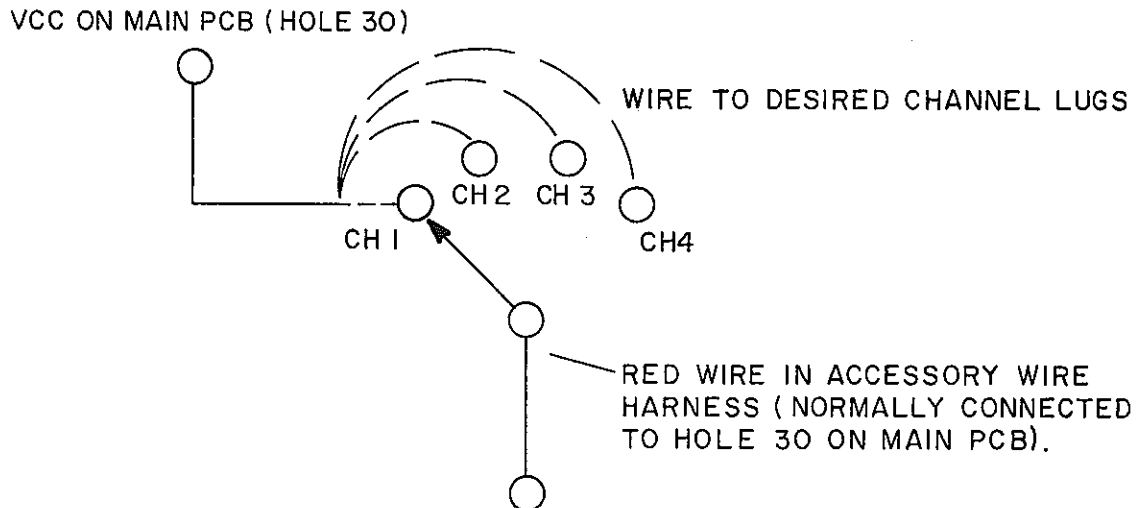


MA-3400B CONNECTION POINTS	CA-1111 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	SQUELCH SWITCHING	ORANGE
CT-4	TONE MONITOR	WHITE
CT-5	PTT SW	GRAY
CT-6	AUDIO INPUT	GREEN
CT-7	AUDIO OUTPUT	BLUE
CT-8	ENCODE OUTPUT	YELLOW
CT-9	—	
CT-10	—	

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1111 Sub-Audible Tone Encoder/Decoder

GENERAL DESCRIPTION

The CA-1111 provides the capability for CTCSS sub-audible tone squelch on the CM-4020-A. Up to four different tones may be selected by programming the four channels per the program truth table. The channel desired is selected by pulling the desired channel select line (A,B,C, or D) to ground.

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

THEORY OF OPERATION

In the transmit mode, audio of the programmed frequency is digitally generated in a step generation of a sine wave. This results in a signal virtually identical to one of analog origin; the unfiltered distortion is less than 1.5%. In the receive mode, the detected tone is first processed by a programmable fourth-order bandpass filter; then again by a digital decoder which has a logic level output that switches high on detection of the desired CTCSS tone. The tone detect bandwidth is 3.2%, resulting in alternate CTCSS tone frequencies being rejected by 60 dB.

MAXON CM-4020-A UHF MOBILE Program Truth Table

CA-1111/CA-1114

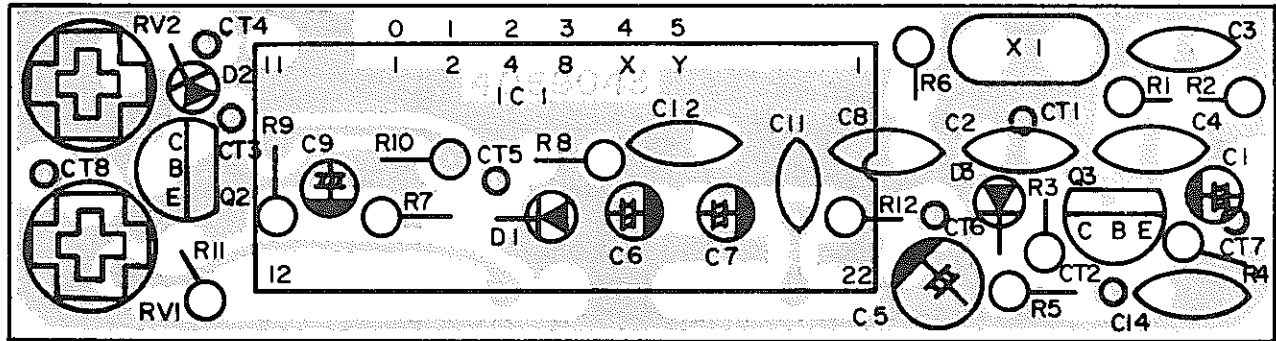
0 = GROUND

1 = OPEN (No Connector)

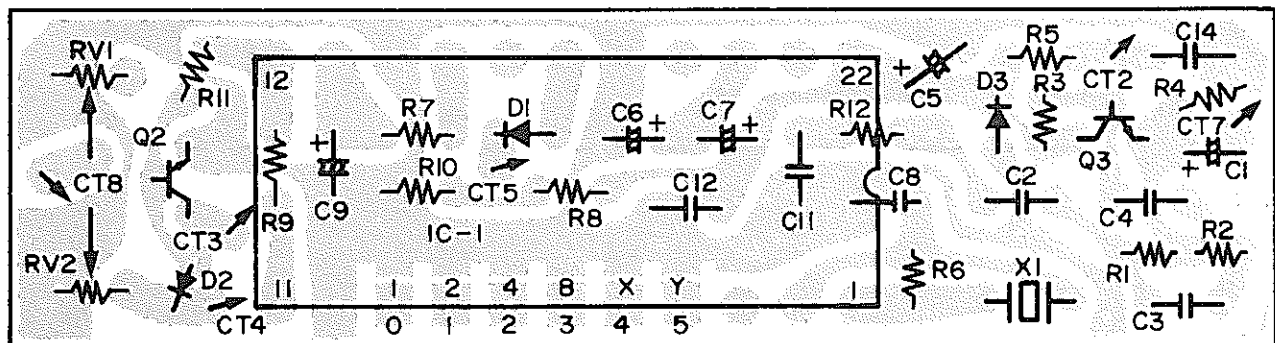
Frequency (Hz)	Call sign	Program lines					
		CA-1111 & CA-1114					
		MX-335 PIN NUMBERS					
		4	5	6	7	8	9
		Y	X	8	4	2	1
67.0	XZ	1	1	1	1	1	1
71.9	XA	0	1	1	1	1	1
74.4	UA	1	1	1	1	1	0
77.0	XB	0	0	1	1	1	1
79.7	SP	1	1	1	1	0	1
82.5	YZ	0	1	1	1	1	0
85.4	YA	1	1	1	1	0	0
88.5	YB	0	0	1	1	1	0
91.5	ZZ	1	1	1	0	1	1
94.8	ZA	0	1	1	1	0	1
97.4		1	1	1	0	1	0
100.0	1Z	0	0	1	1	0	1
103.5	1A	0	1	1	1	0	0
107.2	1B	0	0	1	1	0	0
110.9	2Z	0	1	1	0	1	1
114.8	2A	0	0	1	0	1	1
118.8	2B	0	1	1	0	1	0
123.0	3Z	0	0	1	0	1	0
127.3	3A	0	1	1	0	0	1
131.8	3B	0	0	1	0	0	1
136.5	4Z	0	1	1	0	0	0
141.3	4A	0	0	1	0	0	0
146.2	4B	0	1	0	1	1	1
151.4	5Z	0	0	0	1	1	1
156.7	5A	0	1	0	1	1	0
162.2	5B	0	0	0	1	1	0
167.9	6Z	0	1	0	1	0	1
173.8	6A	0	0	0	1	0	1
179.9	6B	0	1	0	1	0	0
186.2	7Z	0	0	0	1	0	0
192.8	7A	0	1	0	0	1	1
203.5	M1	0	0	0	0	1	1
210.7		0	1	0	0	1	0
218.1		0	0	0	0	1	0
225.7		0	1	0	0	0	1
233.6		0	0	0	0	0	1
241.8		0	1	0	0	0	0
250.3		0	0	0	0	0	0

MAXON CM-4020-A UHF MOBILE CA-1111 Sub-Audible Tone Encoder/Decoder

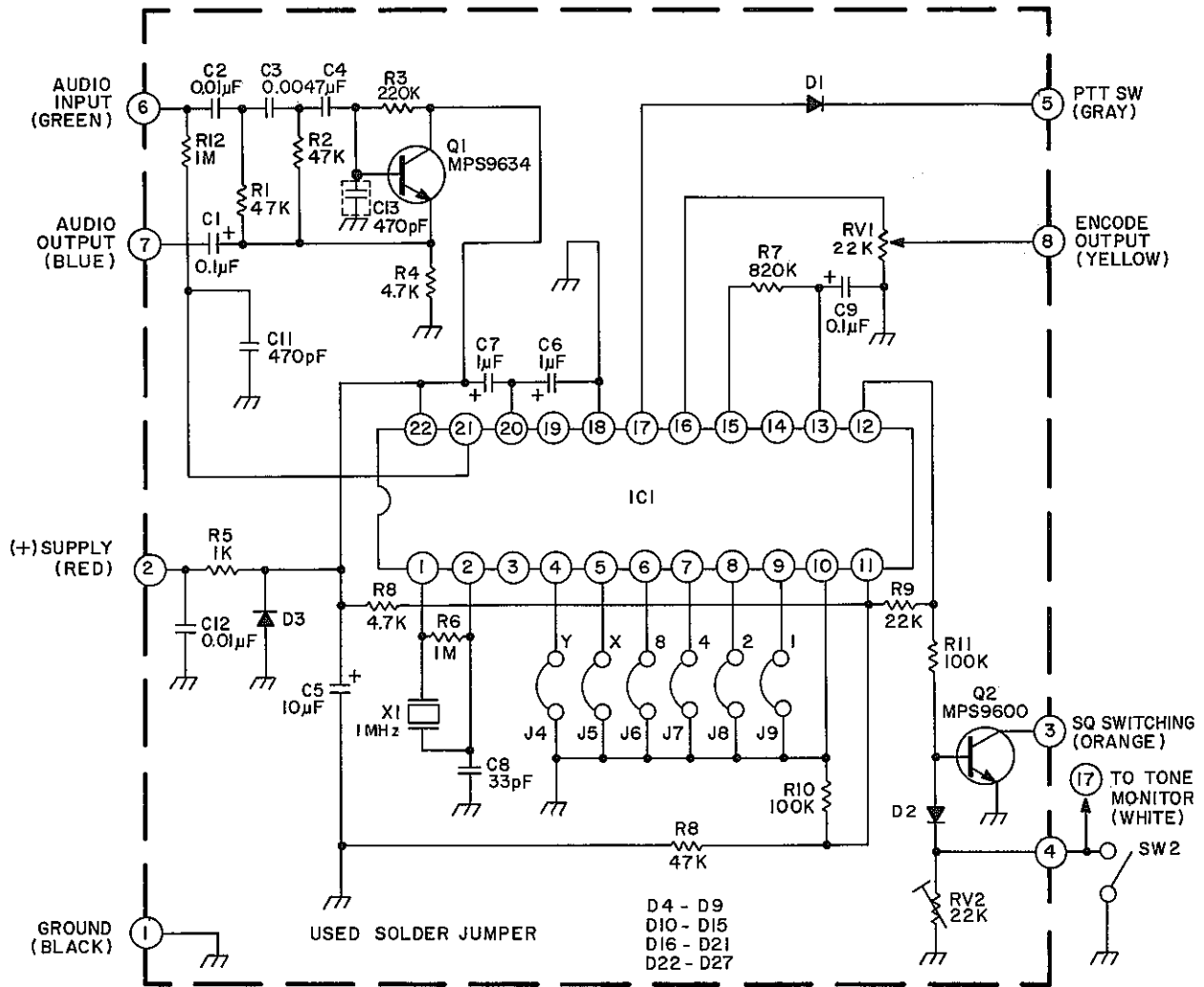
Top View



Bottom View



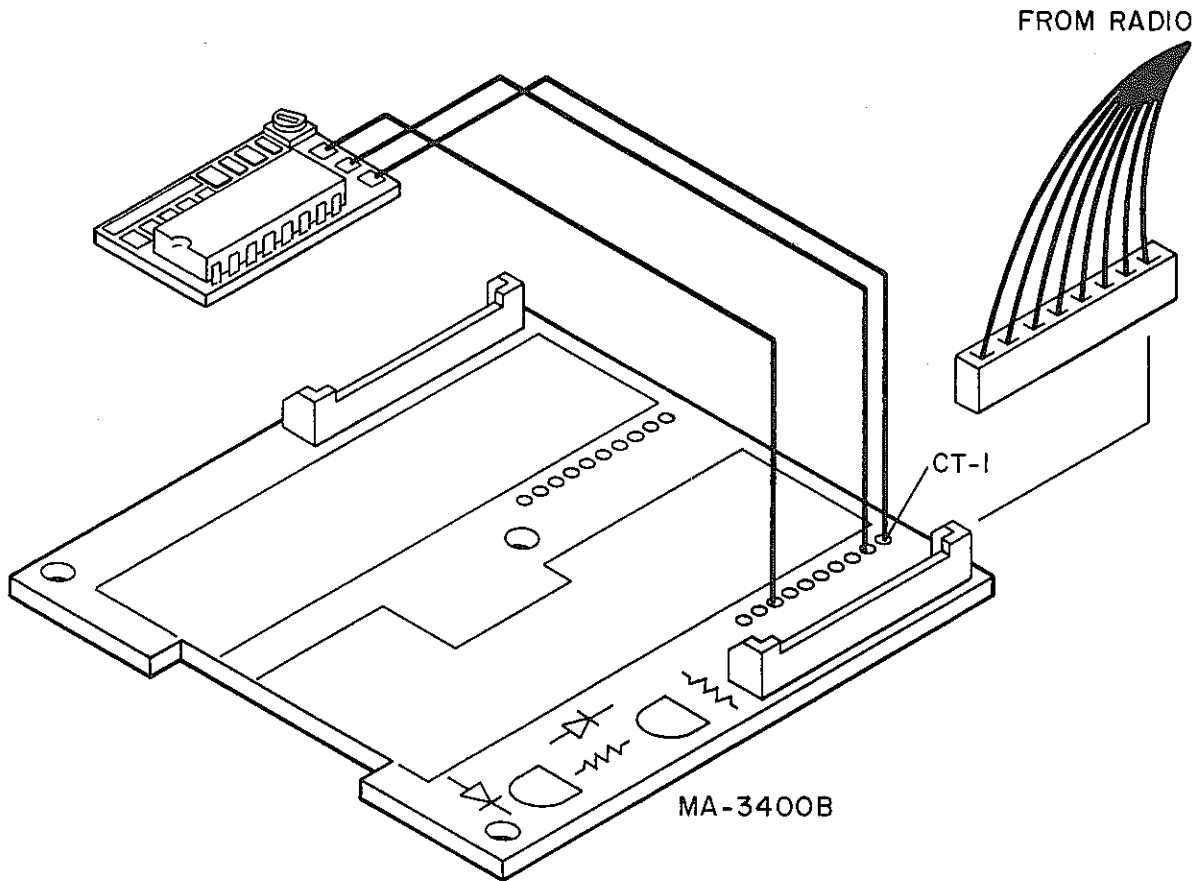
MAXON CM-4020-A UHF MOBILE CA-1111 Schematic Diagram



MAXON CM-4020-A UHF MOBILE CA-1111 Parts List

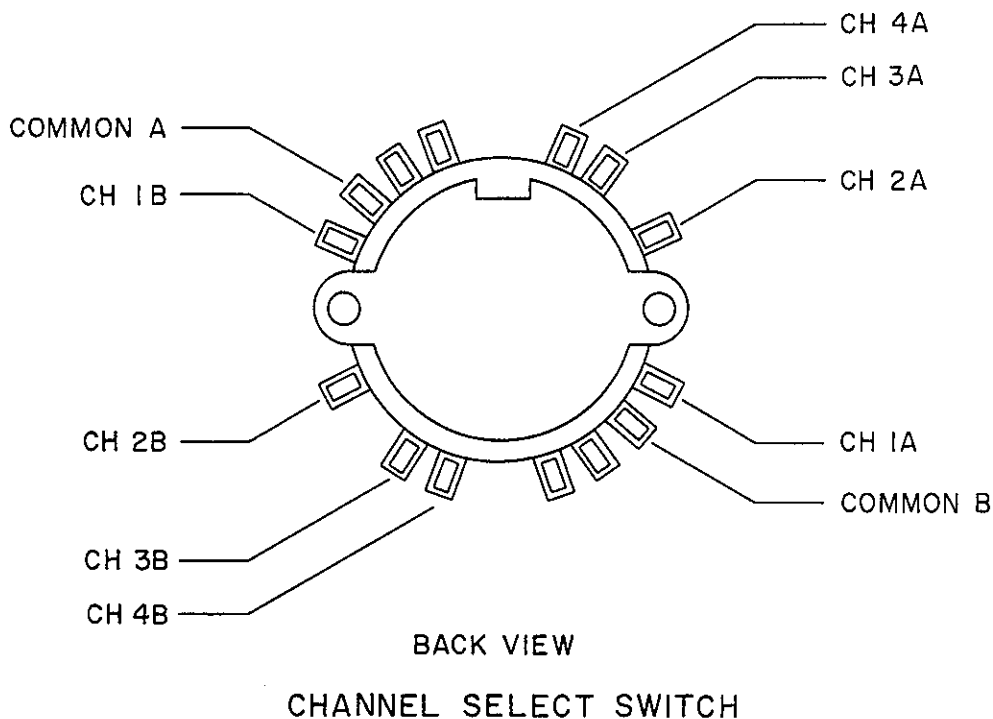
IDENTIFIER	PART NO.	DESCRIPTION
C1	1401011	Capacitor Tantalum 0.1 uF 16V
C2	1110076	Capacitor Mylar 0.01 uF 25V
C3	1147092	Capacitor Mylar 0.0047 uF 50V
C4	1147092	Capacitor Mylar 0.0047 uF 50V
C5	1410053	Capacitor Tantalum 10 uF 20V
C6	1410086	Capacitor Tantalum 1 uF 26V
C7	1410086	Capacitor Tantalum 1 uF 26V
C8	1333039	Capacitor Ceramic 33 uF NPO
C9, C10	N/A	
C11	1347108	Capacitor Ceramic 470 pF SL
C12	1301106	Capacitor Ceramic 0.01 uF
C13	1347119	Capacitor Ceramic Monolithic
C14	1301106	Capacitor Ceramic 0.01 uF
D1	2430119	Diode 1SS133
D2	2430119	Diode 1SS133
D3	2410175	Diode BZ X83-C5V6
IC1	2290069	IC MX-335
Q1	2030029	Transistor MPS 9634 (C)
Q2	2030063	Transistor MPS 9600 (H)
R1	0024734	Resistor Carbon Film 47k ohm 1/16W +5%
R2	0024734	Resistor Carbon Film 47k ohm 1/16W +5%
R3	0022246	Resistor Carbon Film 220k ohm 1/16W +5%
R4	0024723	Resistor Carbon Film 4.7k ohm 1/16W +5%
R5	0021029	Resistor Carbon Film 1k ohm 1/16W +5%
R6	0021250	Resistor Carbon Film 1.2M ohm 1/16W +5%
R7	0028248	Resistor Carbon Film 820k ohm 1/16W +5%
R8	0024734	Resistor Carbon Film 47k ohm 1/16W +5%
R9	0022235	Resistor Carbon Film 22k ohm 1/16W +5%
R10	0021041	Resistor Carbon Film 100k ohm 1/16W +5%
R11	0021041	Resistor Carbon Film 100k ohm 1/16W +5%
R12	0021250	Resistor Carbon Film 1.2M ohm 1/16W +5%
R14	0021041	Resistor Carbon Film 100k ohm 1/16W +5%
RV1	0724735	Resistor SemiFixed H0621A-22k
RV2	0722236	Resistor SemiFixed H0621A-22k
X1	2600604	Crystal 1 MHz (VM-1)

MAXON CM-4020-A UHF MOBILE CA-1112R Sub-Audible Tone Encoder

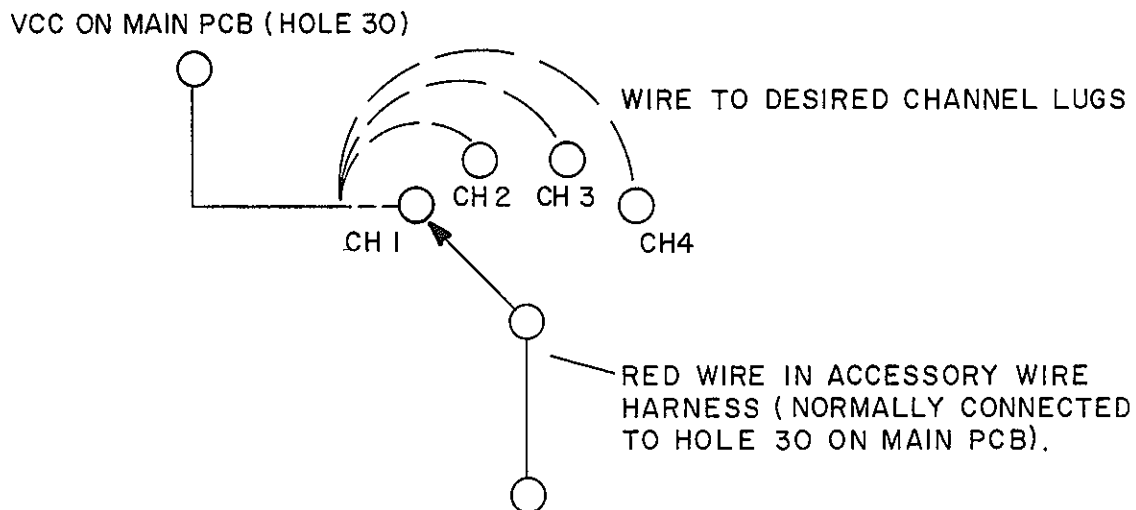


MA-3400B CONNECTION POINTS	CA-1112 R	
	FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	—	
CT-4	—	
CT-5	—	
CT-6	—	
CT-7	—	
CT-8	TONE OUT	YELLOW
CT-9	—	
CT-10	—	

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1112R Sub-Audible Tone Encoder

GENERAL DESCRIPTION

The Maxon CA-1112R is a new concept in programmable CTCSS tone encoders. Any 32 tones between 67 Hz and 255 Hz (+/- .01Hz) can be factory programmed into the CA-1112R. Once the unit is programmed, the tones contained in memory are user selected by means of pads on the PCB. The tone output is a low distortion sine wave, with a variable amplitude of 0 to 2 volts p-p. The PCB size is .53 x 1.00 x .16".

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

PROGRAMMING

This programmable line of products uses solder bridges from the pads (figure 1) to the Ground Buss to select the frequency desired. When the jumpers are in place, the binary code that is presented to IC-1 internally selects which one of the 32 frequencies is to be generated by the encoder. The CA-1112R is programmed by jumping from Programming Pads 5, 4, 3, 2, & 1 to the Ground Buss (see figure 1) to select the frequency desired. For instance, if 1Z (100.0Hz) is desired, the code required is located on the Programming Chart and the jumpers are added accordingly. For example, the code for 1Z is "01011," thus pads 5 and 3 are grounded to the Ground Buss and 4, 2, and 1 are left unconnected.

MAXON CM-4020-A UHF MOBILE CA-1112R Sub-Audible Tone Encoder

PROGRAMMING CHART FOR CTCSS PRODUCTS GROUP A

#	FREQ.	PAD NUMBER CODE	PAD NUMBER				
			5	4	3	2	1
1	67.0	XZ	0	0	0	0	0
2	71.9	XA	0	0	0	0	1
3	74.4	WA	0	0	0	1	0
4	77.0	XB	0	0	0	1	1
5	79.7	SP	0	0	1	0	0
6	82.5	YZ	0	0	1	0	1
7	85.4	YA	0	0	1	1	0
8	88.5	YB	0	0	1	1	1
9	91.5	ZZ	0	1	0	0	0
10	94.8	ZA	0	1	0	0	1
11	97.4	ZB	0	1	0	1	0
12	100.0	1Z	0	1	0	1	1
13	103.5	1A	0	1	1	0	0
14	107.2	1B	0	1	1	0	1
15	110.9	2Z	0	1	1	1	0
16	114.8	2A	0	1	1	1	1
17	118.8	2B	1	0	0	0	0
18	123.0	3Z	1	0	0	0	1
19	127.3	3A	1	0	0	1	0
20	131.8	3B	1	0	0	1	1
21	136.5	4Z	1	0	1	0	0
22	141.3	4A	1	0	1	0	1
23	146.2	4B	1	0	1	1	0
24	151.4	5Z	1	0	1	1	1
25	156.7	5A	1	1	0	0	0
26	162.2	5B	1	1	0	0	1
27	167.9	6Z	1	1	0	1	0
28	173.8	6A	1	1	0	1	1
29	179.9	6B	1	1	1	0	0
30	186.2	7Z	1	1	1	0	1
31	192.8	7A	1	1	1	1	0
32	203.5	M1	1	1	1	1	1

0 = SHORTED TO GROUND BUSS

1 = N/C

MAXON CM-4020-A UHF MOBILE CA-1112R Schematic Diagram

Top View

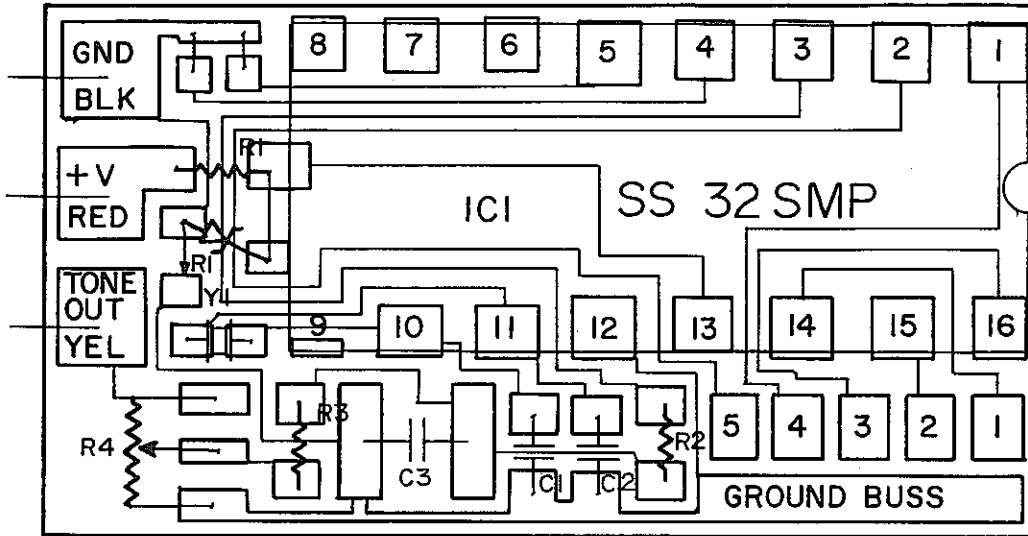
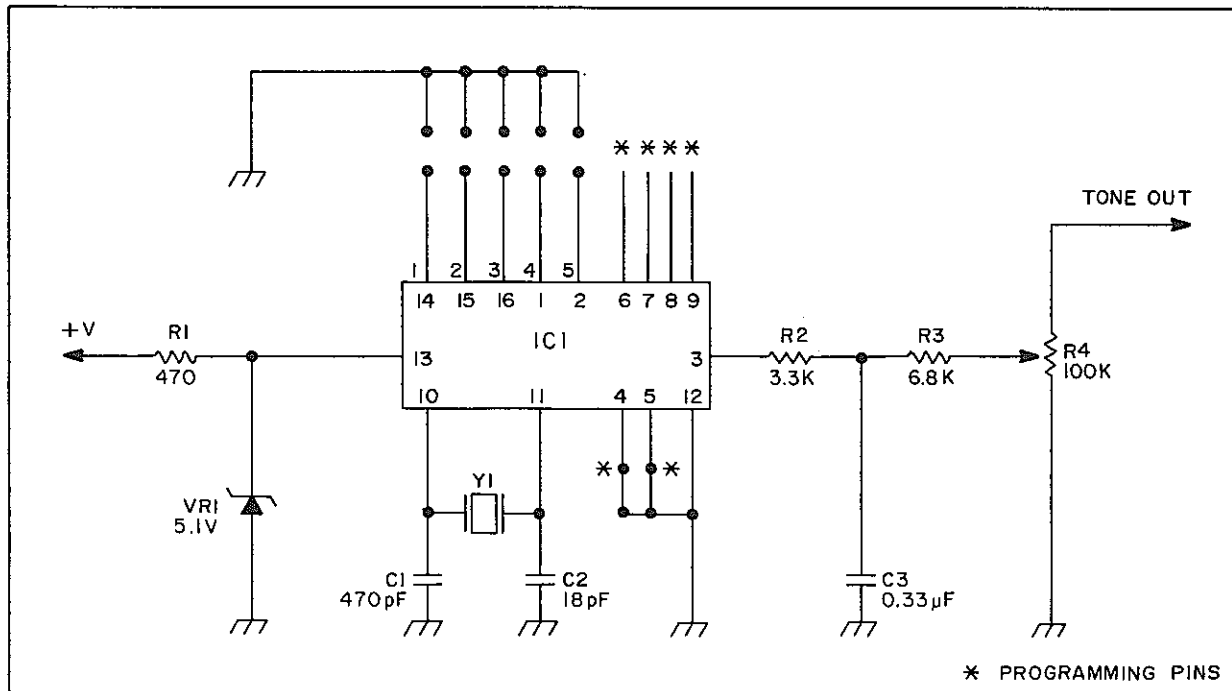


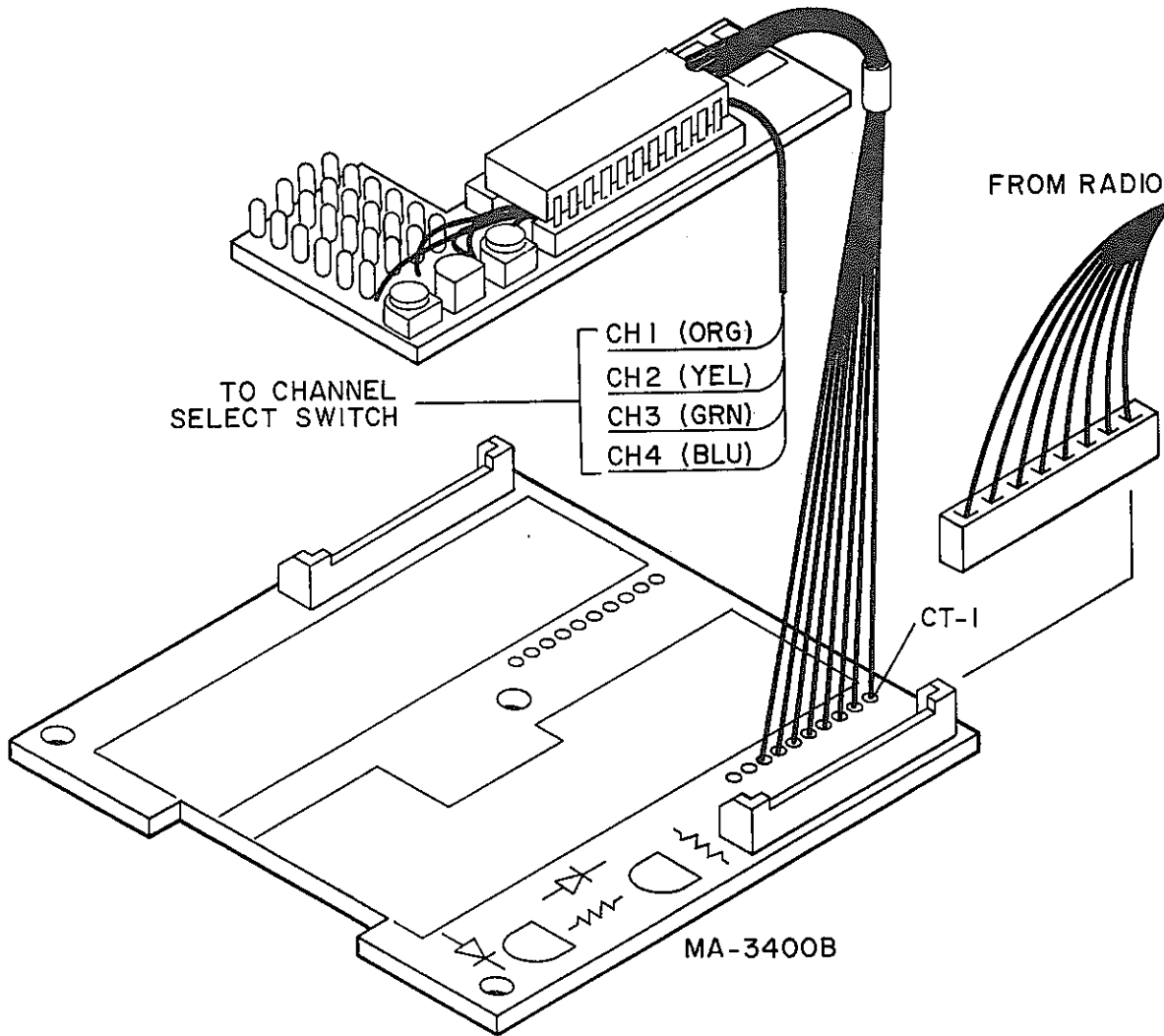
FIGURE 1



MAXON CM-4020-A UHF MOBILE CA-1112R Parts List

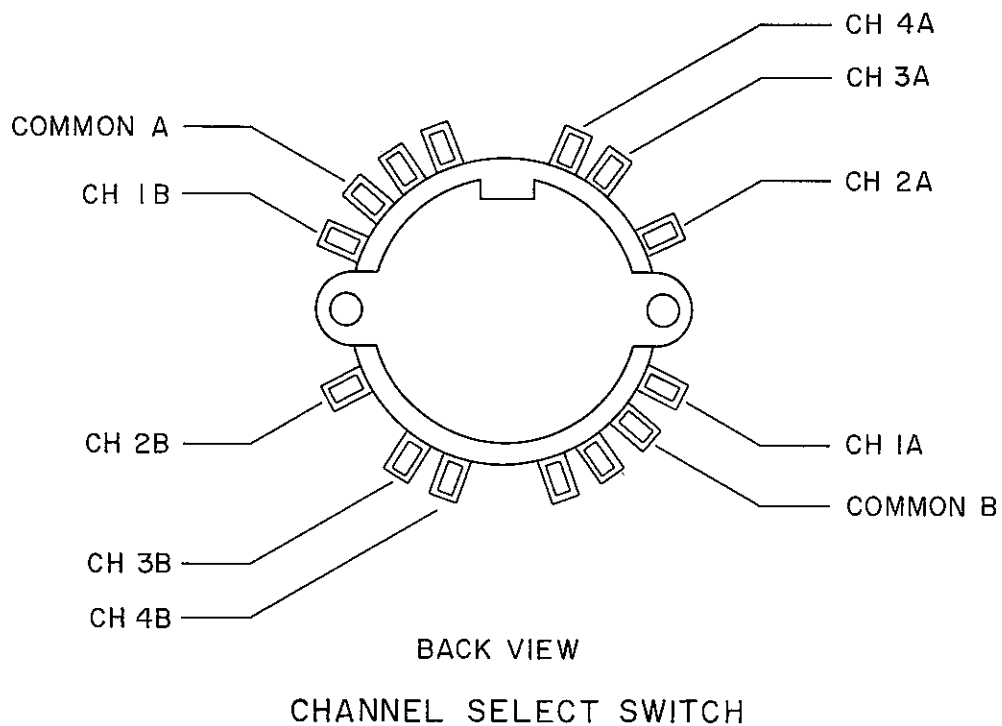
IDENTIFIER	PART NO.	DESCRIPTION
C1	*	Capacitor Monolithic Chip 470 pF NPO 0805
C2	*	Capacitor Monolithic Chip 18 pF NPO 0805
C3	*	Capacitor Monolithic Chip .33 uF -Z5U
IC1	*	IC-110 Programmable Encoder/Decoder
R1	*	Resistor Chip 470 ohm 5% 0805
R2	*	Resistor Chip 3.3k 5% 0805
R3	*	Resistor Chip 6.8k 5% 0805
R4	*	Potentiometer Hybrid 100k
VR1	*	Diode Chip Zener 5.1V 5%
Y1	*	Crystal Miniature 32.768 Kc

MAXON CM-4020-A UHF MOBILE CA-1114 Sub-Audible Tone Encoder/Decoder

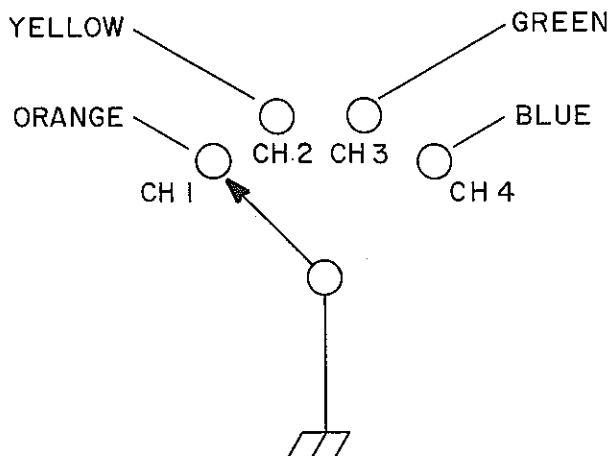


MA-3400B CONNECTION POINTS	CA-1114 FUNCTION		WIRE COLOR
CT-1	GROUND		BLACK
CT-2	(+) SUPPLY		RED
CT-3	SQUELCH SWITCHING		ORANGE
CT-4	TONE MONITOR		WHITE
CT-5	PTT SWITCH		GRAY
CT-6	AUDIO INPUT		GREEN
CT-7	AUDIO OUTPUT		BLUE
CT-8	ENCODE OUTPUT		YELLOW
CT-9	—		
CT-10	—		

MAXON CM-4020-A UHF MOBILE CA-1114 Channel Select Programming



WIRE GROUND TO THE COMMON OF THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED).



MAXON CM-4020-A UHF MOBILE CA-1114 Sub-Audible Tone Encoder/Decoder

GENERAL DESCRIPTION

The CA-1114 provides the capability for CTCSS sub-audible tone squelch on the CM-4020-A. Up to four different tones may be selected by programming the four channels per the program truth table. The channel desired is selected by pulling the desired channel select line (A,B,C, or D) to ground.

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

THEORY OF OPERATION

In the transmit mode, audio of the programmed frequency is digitally generated in a step generation of a sine wave. This results in a signal virtually identical to one of analog origin; the unfiltered distortion is less than 1.5%. In the receive mode, the detected tone is first processed by a programmable fourth-order bandpass filter; then again by a digital decoder which has a logic level output that switches high on detection of the desired CTCSS tone. The tone detect bandwidth is 3.2%, resulting in alternate CTCSS tone frequencies being rejected by 60 dB.

MAXON CM-4020-A UHF MOBILE Program Truth Table

CA-1111/CA-1114

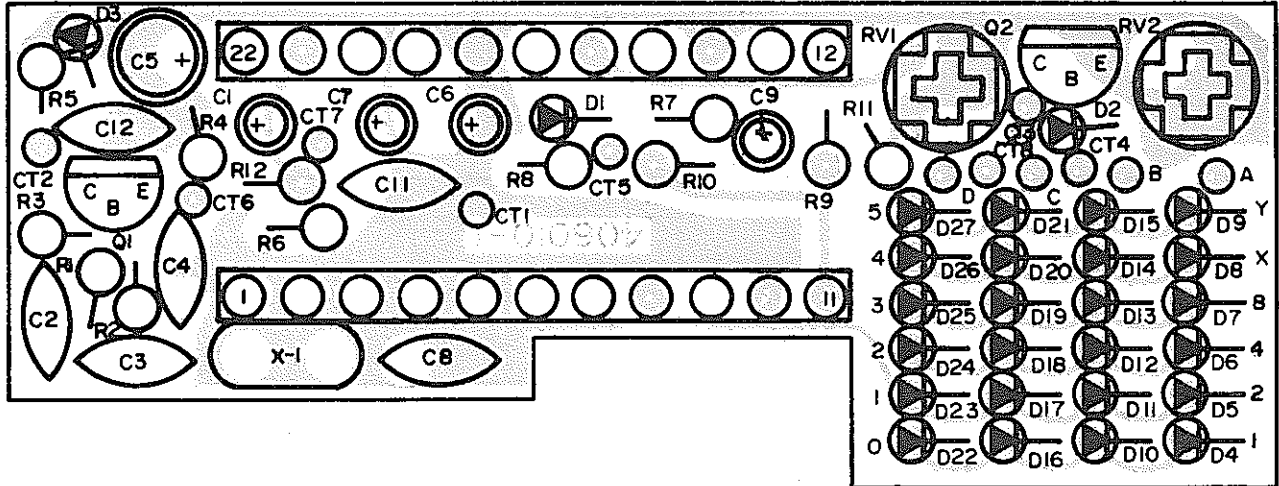
0 = GROUND

1 = OPEN (No Connector)

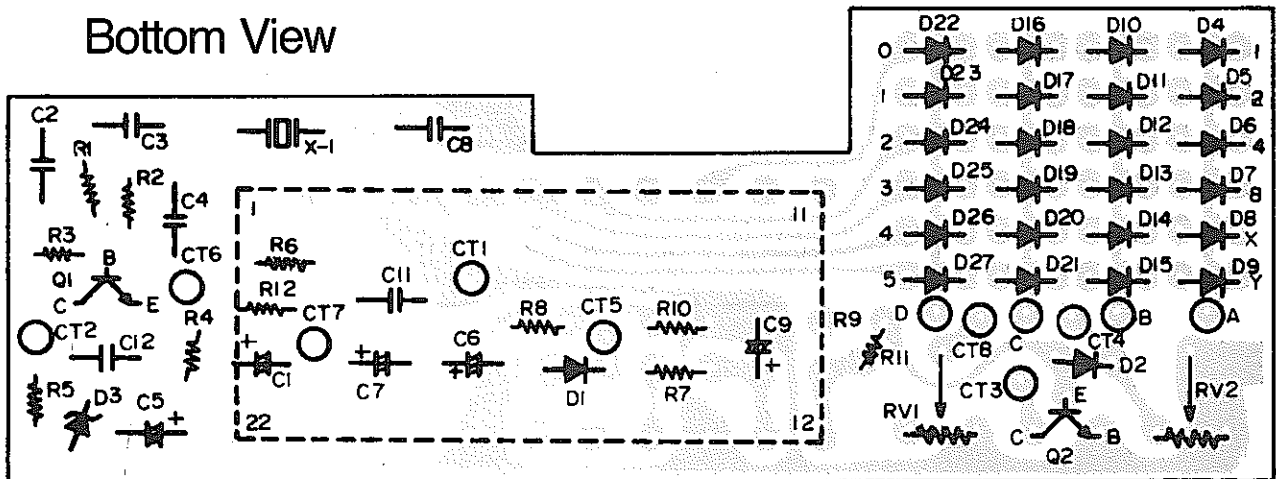
Frequency (Hz)	Call sign	Program lines					
		CA-1111 & CA-1114					
		MX-335 PIN NUMBERS					
		4	5	6	7	8	9
		Y	X	8	4	2	1
67.0	XZ	1	1	1	1	1	1
71.9	XA	0	1	1	1	1	1
74.4	UA	1	1	1	1	1	0
77.0	XB	0	0	1	1	1	1
79.7	SP	1	1	1	1	0	1
82.5	YZ	0	1	1	1	1	0
85.4	YA	1	1	1	1	0	0
88.5	YB	0	0	1	1	1	0
91.5	ZZ	1	1	1	0	1	1
94.8	ZA	0	1	1	1	0	1
97.4		1	1	1	0	1	0
100.0	1Z	0	0	1	1	0	1
103.5	1A	0	1	1	1	0	0
107.2	1B	0	0	1	1	0	0
110.9	2Z	0	1	1	0	1	1
114.8	2A	0	0	1	0	1	1
118.8	2B	0	1	1	0	1	0
123.0	3Z	0	0	1	0	1	0
127.3	3A	0	1	1	0	0	1
131.8	3B	0	0	1	0	0	1
136.5	4Z	0	1	1	0	0	0
141.3	4A	0	0	1	0	0	0
146.2	4B	0	1	0	1	1	1
151.4	5Z	0	0	0	1	1	1
156.7	5A	0	1	0	1	1	0
162.2	5B	0	0	0	1	1	0
167.9	6Z	0	1	0	1	0	1
173.8	6A	0	0	0	1	0	1
179.9	6B	0	1	0	1	0	0
186.2	7Z	0	0	0	1	0	0
192.8	7A	0	1	0	0	1	1
203.5	M1	0	0	0	0	1	1
210.7		0	1	0	0	1	0
218.1		0	0	0	0	1	0
225.7		0	1	0	0	0	1
233.6		0	0	0	0	0	1
241.8		0	1	0	0	0	0
250.3		0	0	0	0	0	0

MAXON CM-4020-A UHF MOBILE CA-1114 Sub-Audible Tone Encoder/Decoder

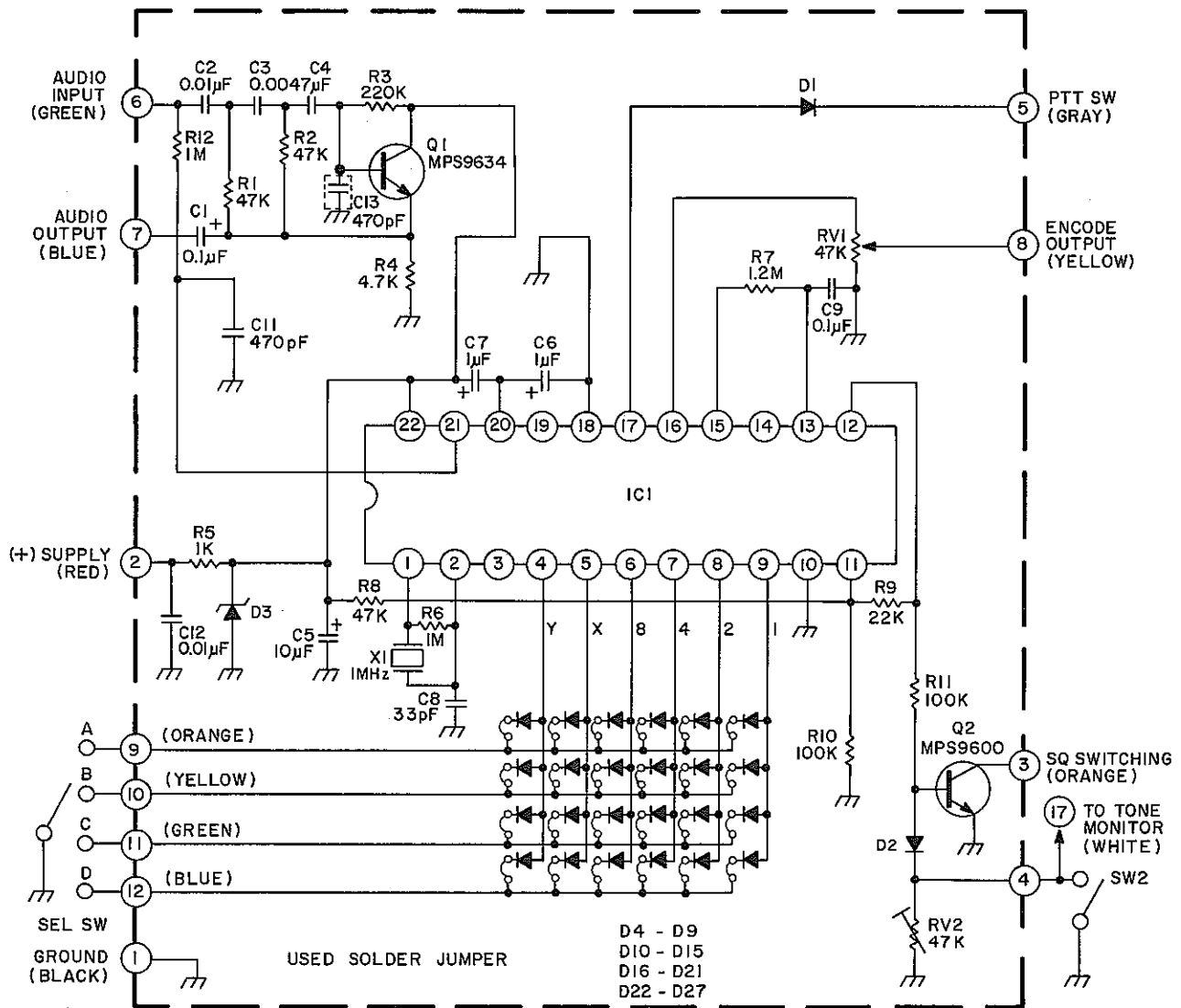
Top View



Bottom View



MAXON CM-4020-A UHF MOBILE CA-1114 Schematic Diagram



MAXON CM-4020-A UHF MOBILE CA-1114 Parts List

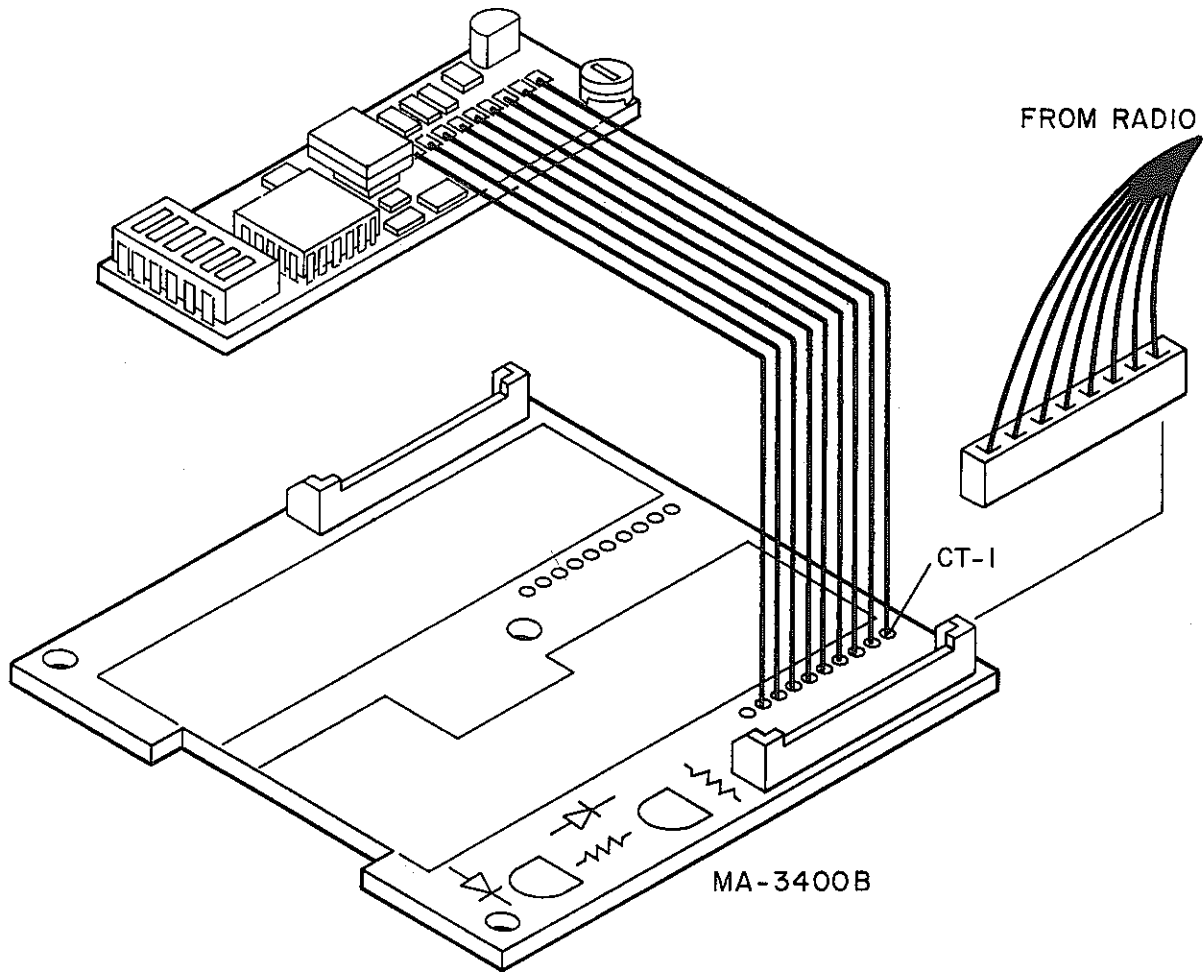
IDENTIFIER	PART NO.	DESCRIPTION
C1	1401033	Capacitor Tantalum 0.1 uF 16V
C2	1110076	Capacitor Mylar 0.01 uF 25V
C3	1147092	Capacitor Mylar 0.0047 uF 50V
C4	1147092	Capacitor Mylar 0.0047 uF 50V
C5	1410053	Capacitor Tantalum 10 uF 10V
C6	1410086	Capacitor Tantalum 1 uF 16V
C7	1410086	Capacitor Tantalum 1 uF 16V
C8	1333039	Capacitor Ceramic 33 pF NPO
C9	1401033	Capacitor Tantalum 0.1 uF 16V
C10	N/A	
C11	1347108	Capacitor Ceramic 470 pF SL
C12	1301106	Capacitor Ceramic 0.01 uF
C13	1347119	Capacitor Ceramic Monolithic 470 pF
C14	1301106	Capacitor Ceramic 0.01
D1	2430119	Diode 1SS133
D2	2430119	Diode 1SS133
D3	2410175	Diode BZX83-C5V6
D4 - D27	2430142	Diode 1S2473 "F" Type
IC1	2290069	IC MX-335
Q1	2030029	Transistor MPS9634(C)
Q2	2030063	Transistor MPS9600(H)
R1	0024734	Resistor Carbon Film 47k ohm 1/16W +5%
R2	0024734	Resistor Carbon Film 47k ohm 1/16W +5%
R3	0022246	Resistor Carbon Film 220k ohm 1/16W +5%
R4	0024723	Resistor Carbon Film 4.7k ohm 1/16W +5%
R5	0021029	Resistor Carbon Film 1k ohm 1/16W +5%
R6	0021052	Resistor Carbon Film 1M ohm 1/16W +5%
R7	0021250	Resistor Carbon Film 1.2M ohm 1/16W +5%
R8	0024734	Resistor Carbon Film 47k ohm 1/16W +5%
R9	0022235	Resistor Carbon Film 22k ohm 1/16W +5%
R10	0021041	Resistor Carbon Film 100k ohm 1/16W +5%
R11	0021041	Resistor Carbon Film 100k ohm 1/16W +5%
R12	0021052	Resistor Carbon Film 1M ohm 1/16W +5%
RV1	0724735	Resistor Semi-Fixed H0621A-47k
RV2	0722236	Resistor Semi-Fixed H0621A-47k
X1	0200604	Crystal 1 MHz (UM-1)

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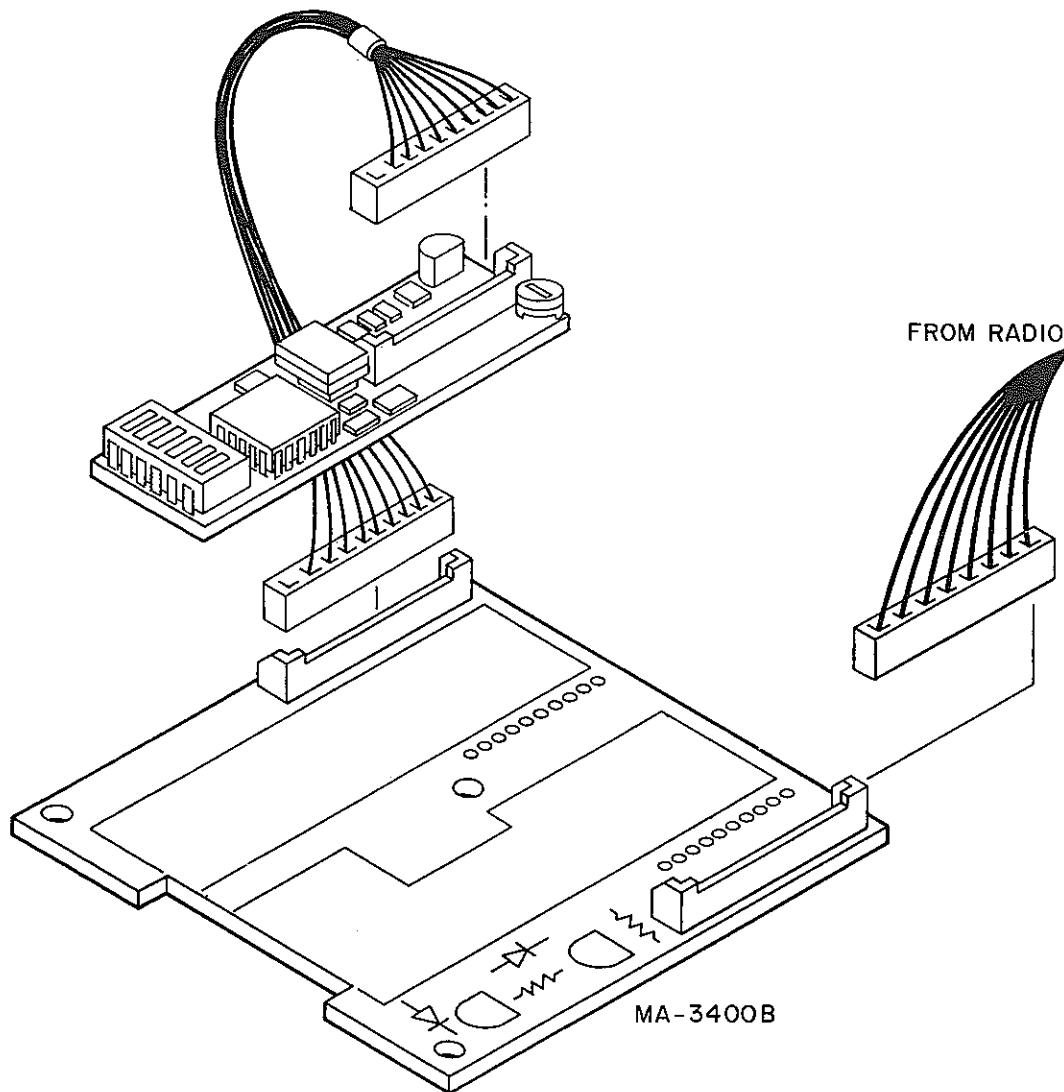
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MAXON CM-4020-A UHF MOBILE CA-1118 Sub-Audible Tone Encoder/Decoder



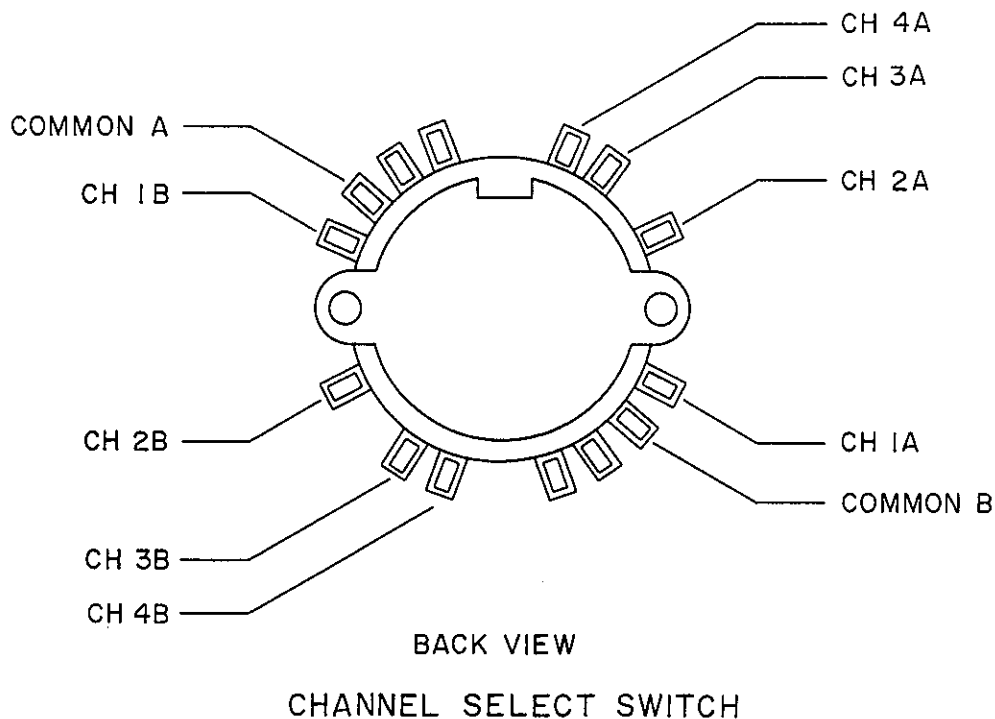
MA-3400B CONNECTION POINTS	CA-1118 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	SQUELCH CONTROL	YELLOW
CT-4	MONITOR IN	WHITE
CT-5	INPUT PTT	ORANGE
CT-6	DISC SIGNAL IN	GREEN
CT-7	AUDIO FILTER OUT	BLUE
CT-8	TONE OUT	VIOLET
CT-9	CARRIER SENSE IN	GRAY
CT-10	—	

MAXON CM-4020-A UHF MOBILE CA-1118 Sub-Audible Tone Encoder/Decoder

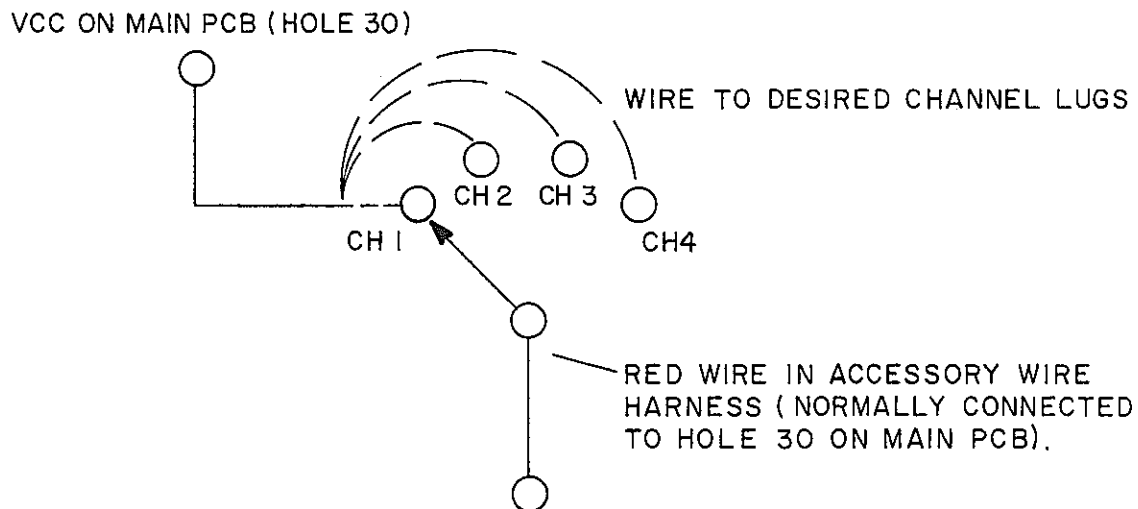


MA-3400B CONNECTION POINTS	CA-1118 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	SQUELCH CONTROL	YELLOW
CT-4	MONITOR IN	WHITE
CT-5	INPUT PTT	ORANGE
CT-6	DISC SIGNAL IN	GREEN
CT-7	AUDIO FILTER OUT	BLUE
CT-8	TONE OUT	VIOLET
CT-9	CARRIER SENSE IN	GRAY
CT-10	—	

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1118 Sub-Audible Tone Encoder/Decoder

GENERAL DESCRIPTION

All major encoding and decoding functions as well as audio filtering are provided by IC1, (MX365LH), a custom CMOS integrated circuit.

A regulated 5.0 VDC supplies IC1 via IC2 (78L05). Decoupling capacitors complete the supply circuitry. The discriminator signal is capacitively coupled to the tone (pin 24) and audio (pin 23) inputs of IC1 via C13. C8 provides decoupling. When a correct tone is decoded, two operations occur:

A. Pin 13 of IC1 goes low (.1VDC) and turns Q2 OFF, unquenching the receiver. Decode and dropout timing for both audio filter enabling and squelch control are controlled by R7, R8, D2, and C7. A comparator threshold level for decode and dropout is internally set. Decode threshold is $2.3 V_{dd}$ and dropout threshold is $\frac{1}{3} V_{dd}$.

B. Filtered audio appears at Pin 19 of IC1, but has noise imposed on the audio as a result of the internal switched capacitor filters. A simple low pass filter (R5, C5) removes the noise.

A monitor circuit is provided on the base of the squelch transistor Q2. Providing a ground at the base of Q2 unquenches the receiver.

The encode tone is generated whenever pin 17 of IC1 goes low, and appears at pin 16. R4 provides output amplitude adjustment and R3 provides isolation from the modulator circuitry in the radio.

The frequency of the encode/decode tone is selected by SW1. All 37 EIA CTCSS tones and 1 non-EIA tone (97.4 Hz) can be selected.

Overall frequency stability and accuracy is determined by a crystal.

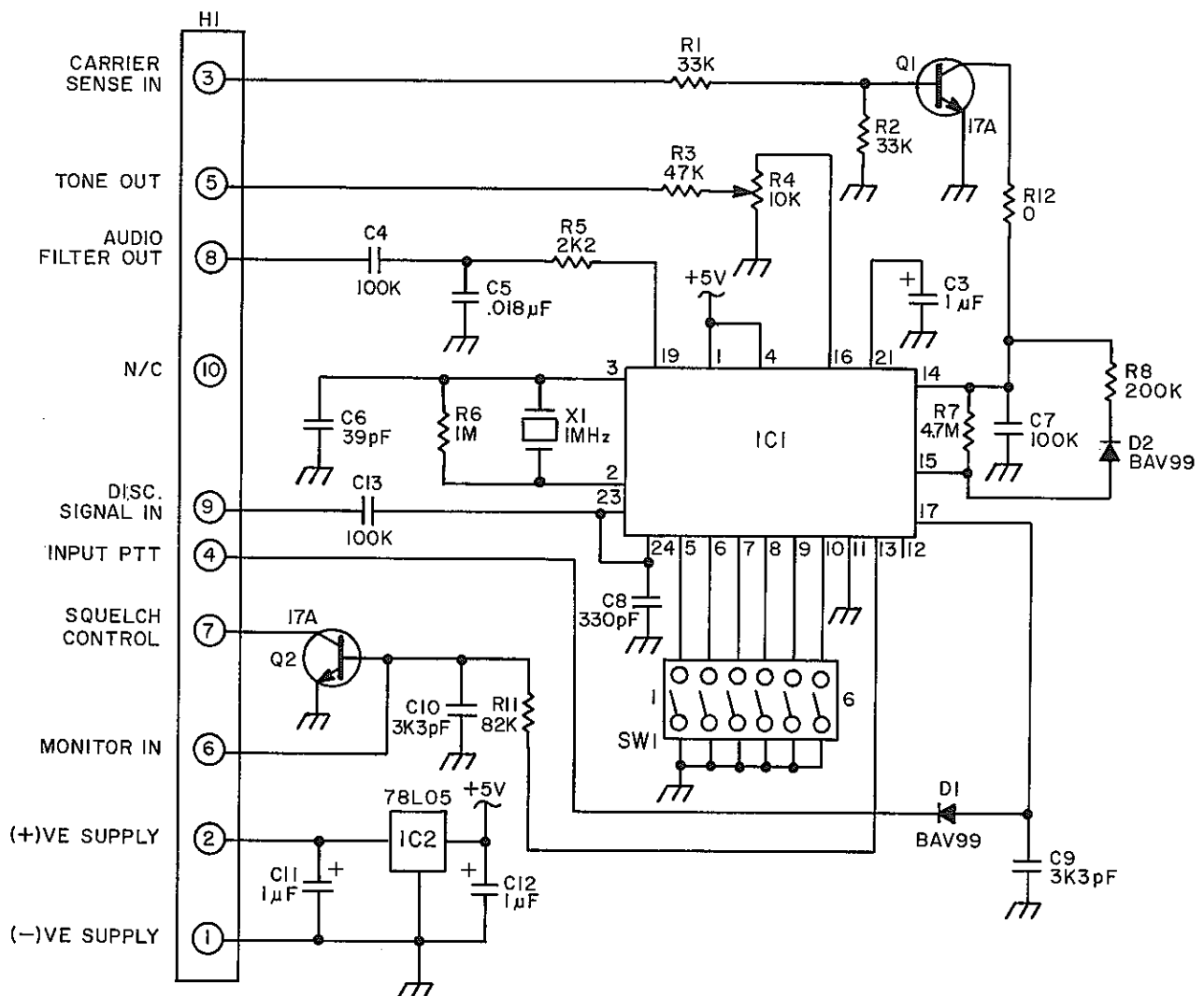
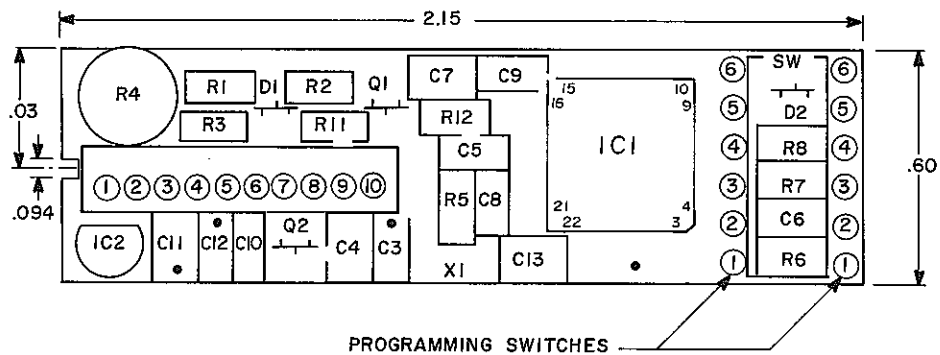
An antifalsing circuit comprising R1, R2, and Q1 is included. This circuit disables the tone decoder during high noise conditions.

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

MAXON CM-4020-A UHF MOBILE CA-1118 Schematic Diagram

Top View

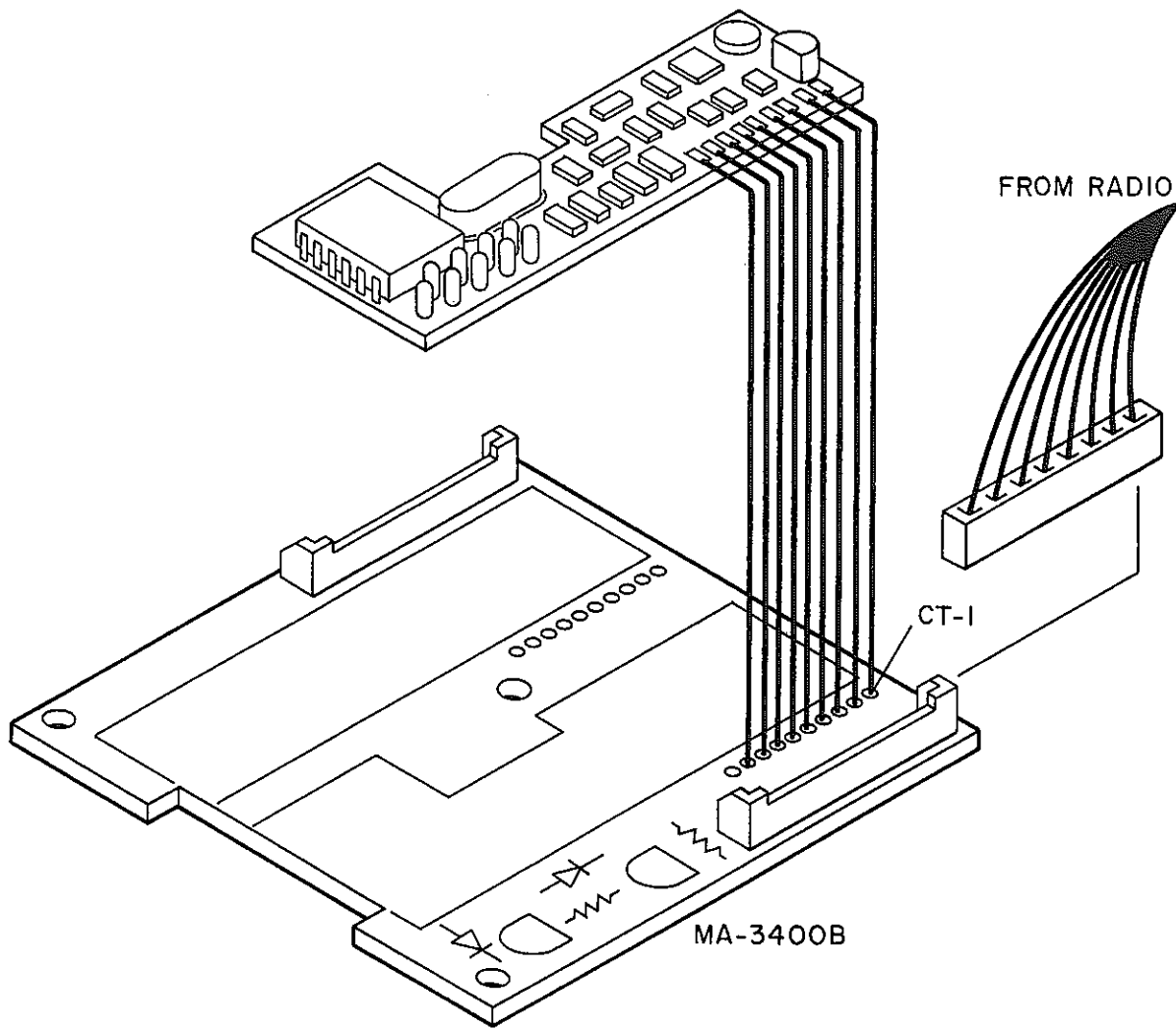


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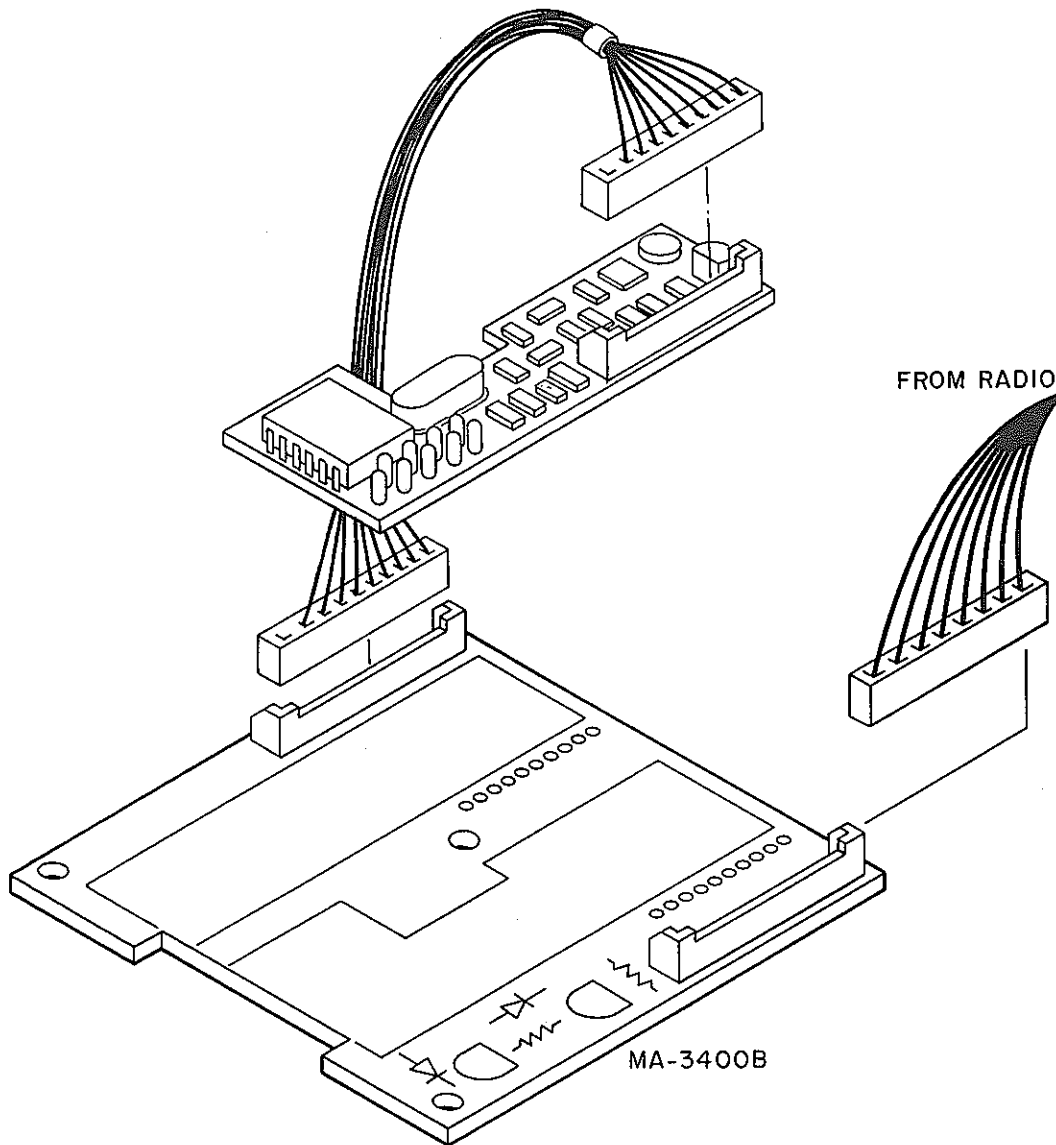
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MAXON CM-4020-A UHF MOBILE CA-1119 DCS Encoder/Decoder



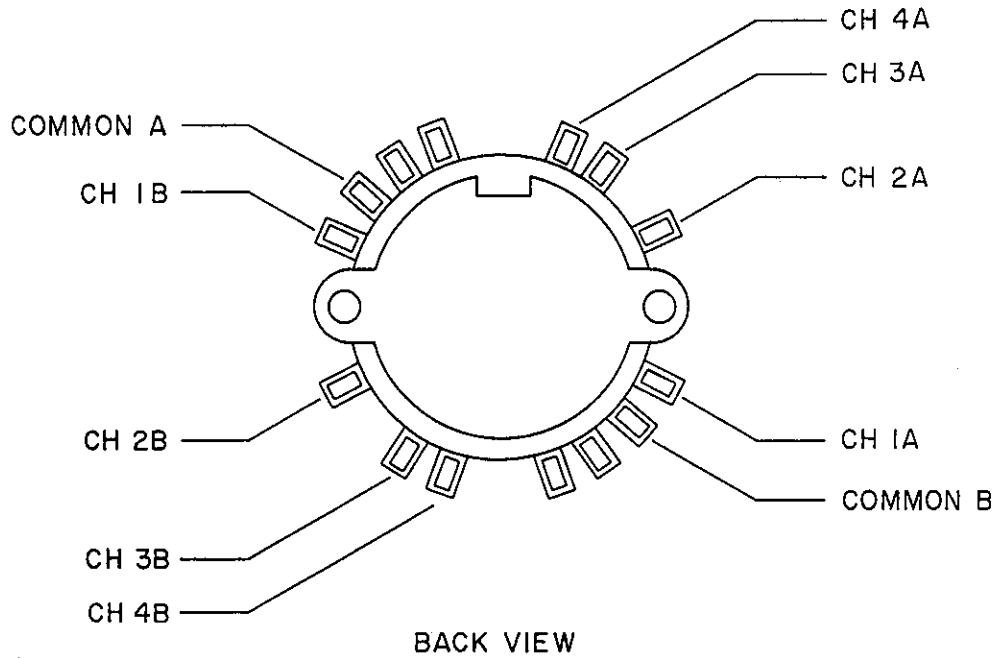
MA-3400B CONNECTION POINTS	CA-1119 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	SQUELCH CONTROL	YELLOW
CT-4	MONITOR IN	WHITE
CT-5	PTT	ORANGE
CT-6	DISC SIGNAL	GREEN
CT-7	AUDIO FILTER OUT	BLUE
CT-8	TONE OUT	VIOLET
CT-9	CARRIER SENSE	GRAY
CT-10	—	

MAXON CM-4020-A UHF MOBILE CA-1119 DCS Encoder/Decoder



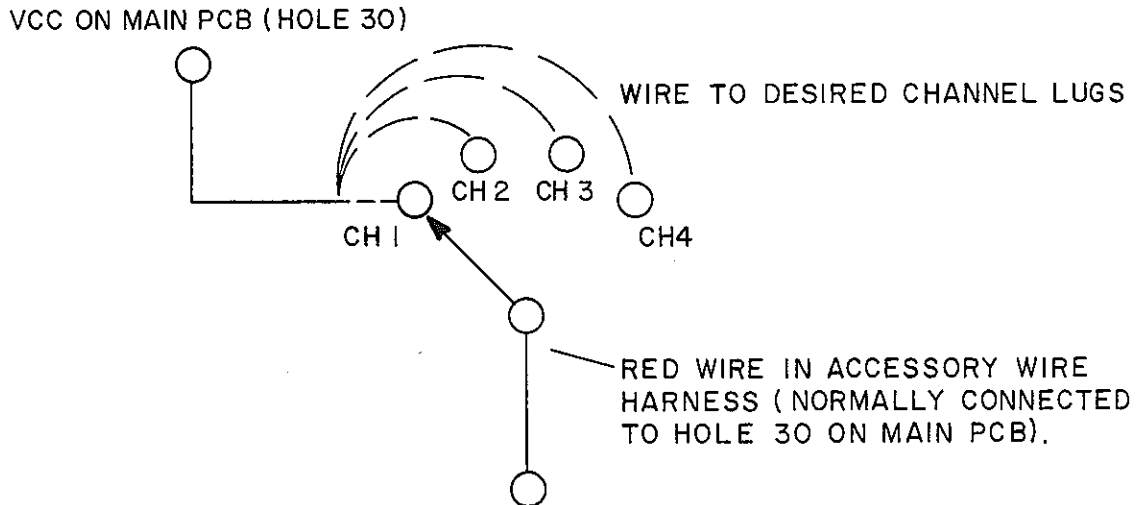
MA-3400B CONNECTION POINTS	CA-1119 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	SQUELCH CONTROL	YELLOW
CT-4	MONITOR IN	WHITE
CT-5	PTT	ORANGE
CT-6	DISC SIGNAL	GREEN
CT-7	AUDIO FILTER OUT	BLUE
CT-8	TONE OUT	VIOLET
CT-9	CARRIER SENSE	GRAY
CT-10	—	

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



BACK VIEW
CHANNEL SELECT SWITCH

WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1119 DCS Encoder/Decoder

GENERAL DESCRIPTION

The main controller of the CA-1119 is the CMOS Microprocessor Chip, IC1. All control, encoding and decoding functions are derived from within IC1. Interface components such as the transistor circuits isolate and protect IC1 from any transient voltages that might exist on any connecting wires to the CA-1119. The system clock is derived from a 3.579 MHz quartz crystal.

Jumpers on the unit allow the D.C.S. code selection, data polarity inversion, and mute polarity if desired.

A 3-pole high pass filter removes frequencies below 350 MHz.

A 5 volt regulator supplies power for the circuitry.

GENERAL SPECIFICATIONS

D.C.S. Codes	000 to 777
D.C.S. Code Programming	Via 0 ohm jumpers
Voltage Range	8.0 to 16 VDC
Current	10 mA @ 12 VDC
Temperature Range	-30°C to +60°C
Size	2.2" x .75" x .31" (5.6 x 1.9 x .8 CM)

ENCODER

Keying	Low to encode
Output Impedance	.47k ohm minimum
Output Level	3.5 Vpp (no load)
Turn Off Code	134 Hz for 180 msec upon release of key

DECODER

Signal to Noise	Better than 8dB SINAD For Decode as per EIA RS220A Spec
Input Impedance	50 K ohms typical
Input Signal Level	20m VRMS to 1.7 VRMS
Squelch Tail Elimination	By turn off code detection
Decode Time	170 msec
Fade Drop-Out Time	750 msec
Monitor Function	By pull to ground on monitor level
Squelch Control	Pull to ground (via transistor) to mute: release from ground (float) to unmute
Audio Filter	3-pole high pass, non-switched type

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

PROGRAMMING

The DCS code can be easily field programmed by the nine zero ohm jumpers on the CA-1119 circuit board. The DCS code consists of a three digit number ranging from 000 to 777. The leading digit (MSD) of the DCS code is programmed by J1, J2, and J3, the middle digit is programmed by J4, J5, and J6, and the least significant digit (LSD) is programmed by J7, J8, and J9. Remove power from the CA-1119 and program in the DCS code number using the jumpers according to the following table:

MAXON CM-4020-A UHF MOBILE CA-1119 DCS Encoder/Decoder

DCS CODES

DCS	J	J	J	
MSD	1	2	3	
MIDDLE	4	5	6	
LSD	7	8	9	
0	ON	ON	ON	
1	ON	ON	OFF	"ON" MEANS JUMPER CONNECTED
2	ON	OFF	ON	
3	ON	OFF	OFF	
4	OFF	ON	ON	"OFF" MEANS JUMPER CUT
5	OFF	ON	OFF	
6	OFF	OFF	ON	
7	OFF	OFF	OFF	

For example, to program the DCS code number 152, set the jumpers as follows:

J1	J2	J3	J4	J5	J6	J7	J8	J9
ON	ON	OFF	OFF	ON	OFF	ON	OFF	ON
+ ----- +		+ ----- +			+ ----- +		+ ----- +	
1		5			2			

The maximum number of DCS codes available is 512. However, only 104 of these codes are recommended for use. When selecting a DCS code for a new system, be sure to select a valid code from the table of "DCS CODES."

POLARITY JUMPERS

Now that the DCS code is programmed, the final step is to verify that the CA-1119 will encode and decode the proper data polarity signal for your two-way radio system.

Apply power to the transceiver, and have a mobile radio on the receiver channel generate a DCS signal for decoding. If the CA-1119 does not decode the DCS signal, disconnect power from the transceiver, and remove the RX POLARITY Jumper, J10. Now re-test the CA-1119 for DCS decoding. If the CA-1119 still does not decode the DCS signal, then the DCS code is not programmed correctly.

To test the DCS encode signal polarity, apply power to the transceiver, key the PTT on the microphone, and check to see if the transceiver will access your radio system properly. If proper decoding does not result, disconnect power from the transceiver, and remove the TX POLARITY Jumper, J11, from the CA-1119 board. Now re-test the DCS encoding. If the CA-1119 still does not access your radio system, then either the DCS code is not programmed correctly, or the DCS encode signal is not interfaced properly to the transceiver.

MAXON CM-4020-A UHF MOBILE CA-1119 DCS Encoder/Decoder

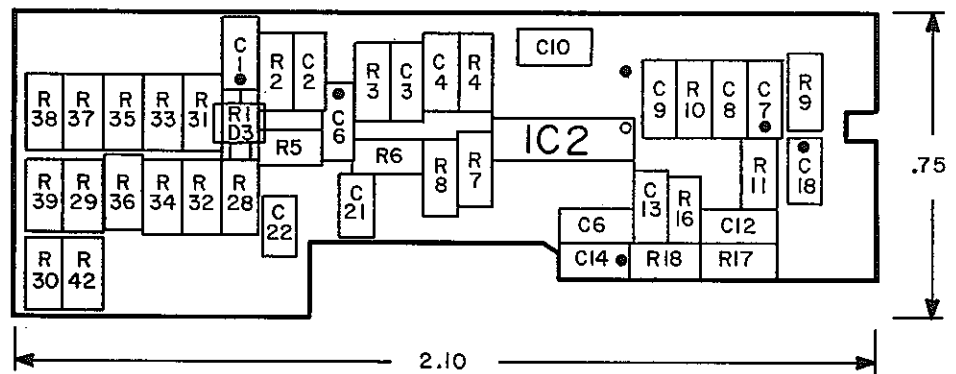
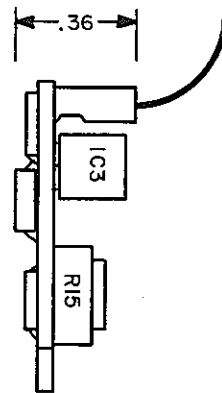
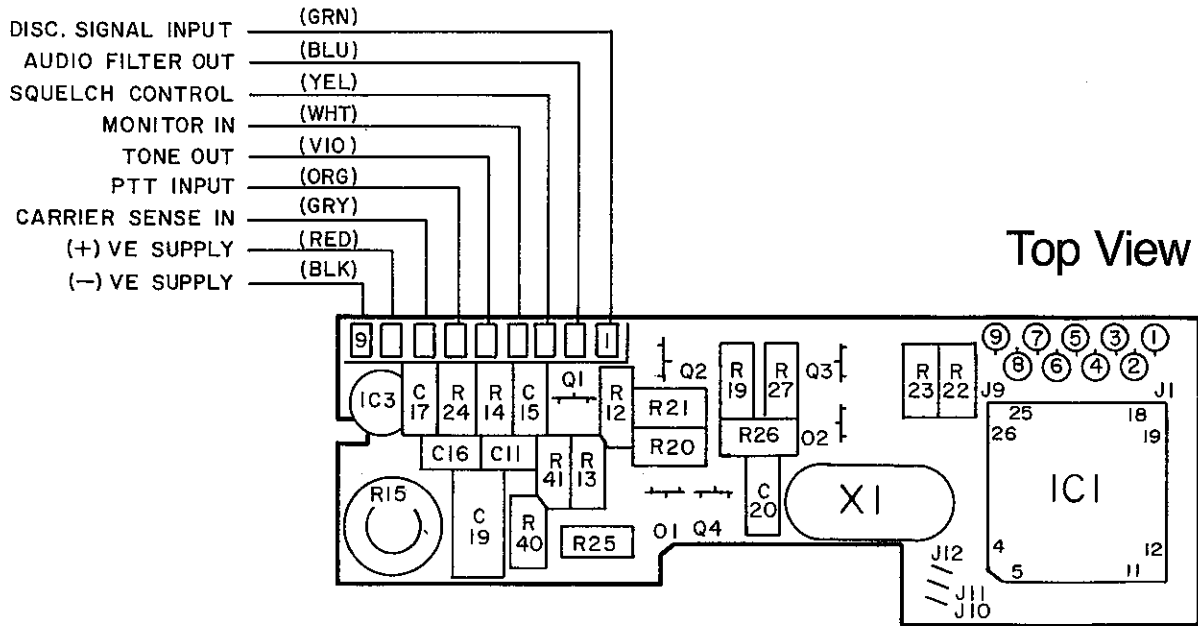
RECOMMENDED DCS CODES

#	EIA TONES		DIGITAL CODED SQUELCH			
	GROUP	HZ	CODE	COMPLIMENT**	CODE	COMPLIMENT**
1	C	67.0	023	/047	311	/664
2	B	71.9	025	/244	315	/423
3	C	74.4	026	/464	325	/526
4	A	77.0	031	/627	331	/465
5	C	79.7	032	/051	332	/455
6	B	82.5	036	/172	343	/532
7	C	85.4	043	/445	346	/612
8	A	88.5	047	/023	351	/243
9	C	91.5	051	/032	356	/212
10	B	94.8	053	/452	364	/131
* 11		97.4 *	054	/413	365	/125
12	A	100.0	065	/271	371	/734
13	B	103.5	071	/306	411	/226
14	A	107.2	072	/245	412	/143
15	B	110.9	073	/506	413	/054
16	A	114.8	074	/174	423	/315
17	B	118.8	114	/712	431	/723
18	A	123.0	115	/152	432	/516
19	B	127.3	116	/754	445	/043
20	A	131.8	122	/225	446	/255
21	B	136.5	125	/365	452	/053
22	A	141.3	131	/364	454	/266
23	B	146.2	132	/546	455	/332
24	A	151.4	134	/223	462	/252
25	B	156.7	143	/412	464	/026
26	A	162.2	145	/274	465	/331
27	B	167.9	152	/115	466	/662
28	A	173.8	155	/731	503	/162
29	B	179.9	156	/265	506	/073
30	A	186.2	162	/503	516	/432
31	B	192.8	165	/251	523	/246
32	A	203.5	172	/036	526	/325
33	B	210.7	174	/074	532	/343
34	A	218.1	205	/263	546	/132
35	B	225.7	212	/356	565	/703
36	A	233.6	223	/134	606	/531
37	B	241.8	225	/122	612	/346
38	A	250.3	226	/411	624	/632
			243	/351	627	/031
			244	/025	631	/606
			245	/072	632	/624
			246	/523	654	/743
			251	/165	662	/466
			252	/462	664	/311
			255	/446	703	/565
			261	/732	712	/114
			263	/205	723	/431
			265	/156	731	/155
			266	/454	732	/261
			271	/065	734	/371
			274	/145	743	/654
			306	/071	754	/116

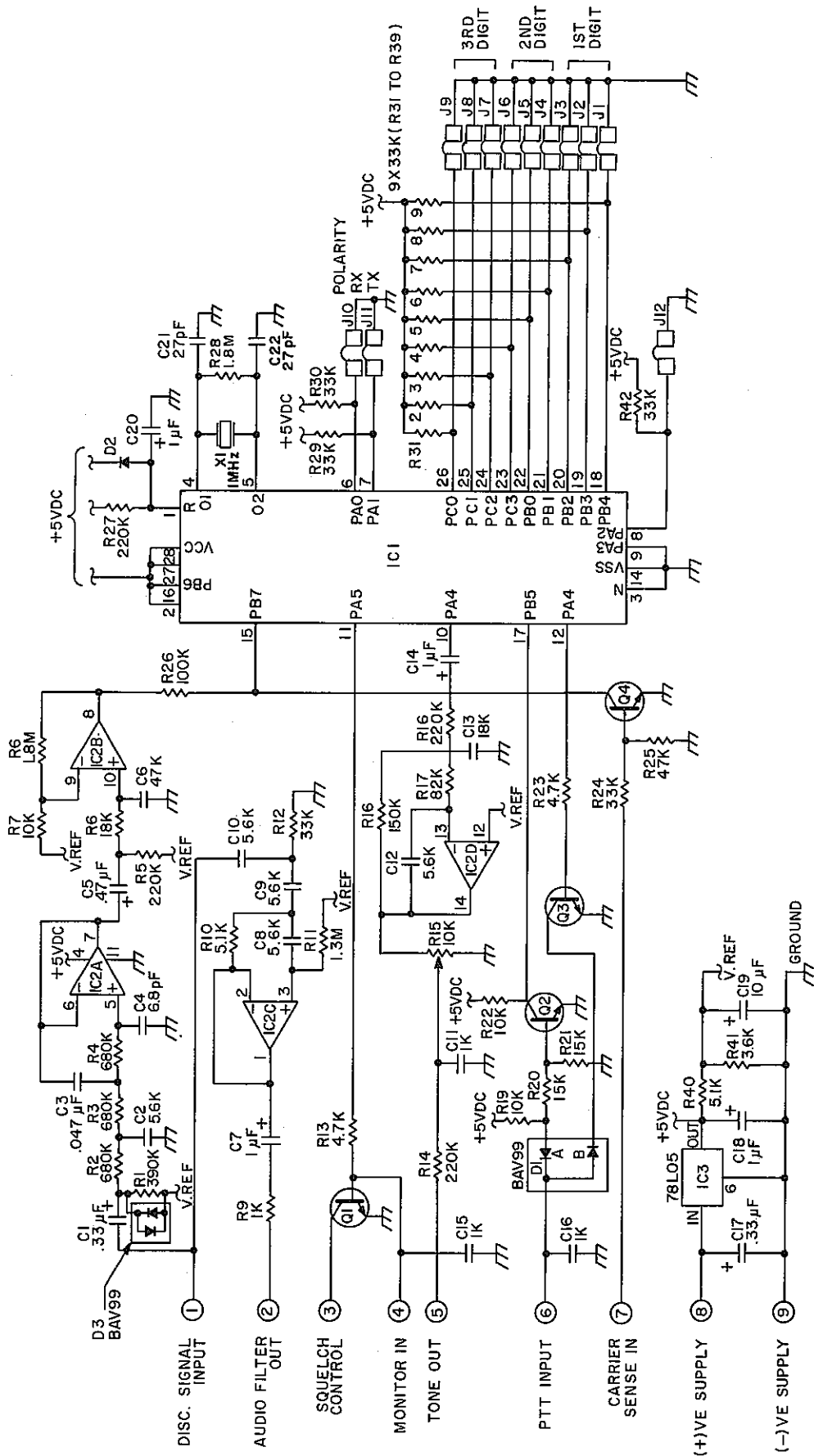
* 97.4 Hz is Not a Standard EIA Specified Tone.

**The Compliment Number (/) represents the octal compliment (180° Phase Inversion) of the listed code. Do NOT use a code and its compliment in the same system.

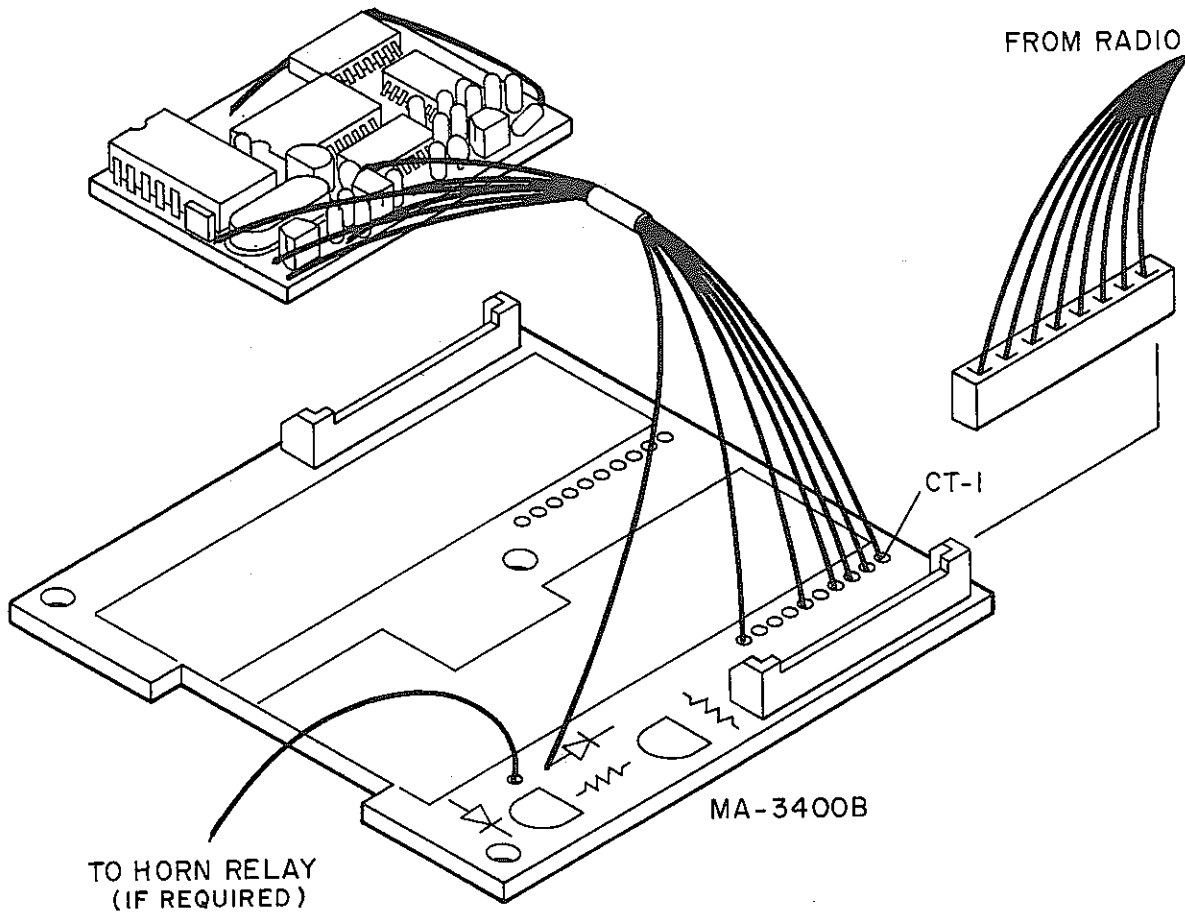
MAXON CM-4020-A UHF MOBILE CA-1119 DCS Encoder/Decoder



MAXON CM-4020-A UHF MOBILE CA-1119 Schematic Diagram



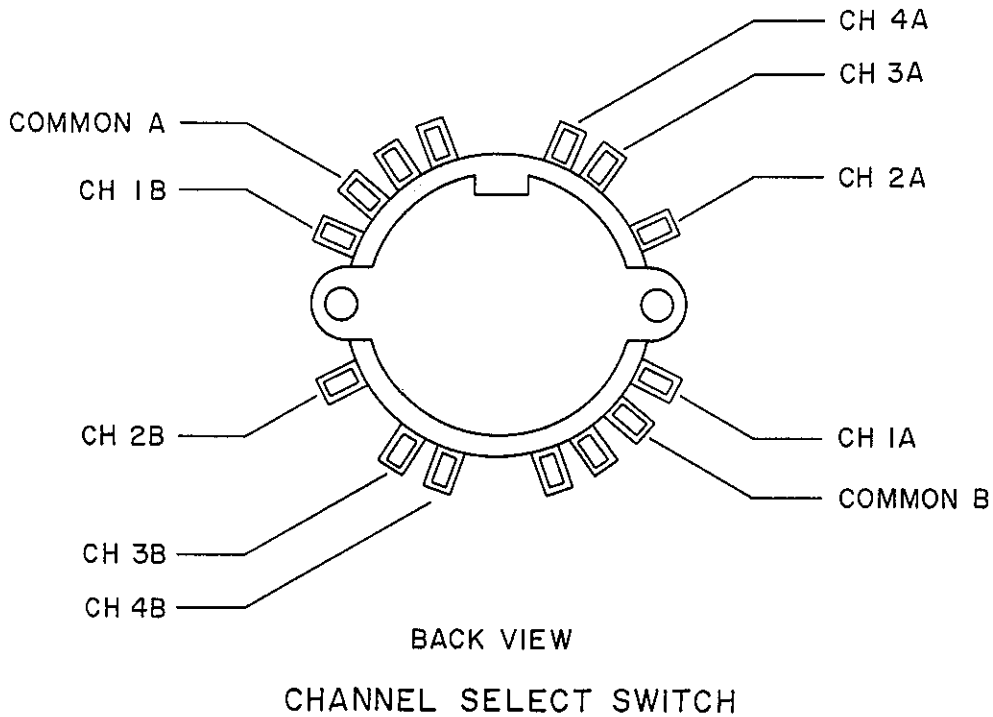
MAXON CM-4020-A UHF MOBILE CA-1377 DTMF Programmable Decoder



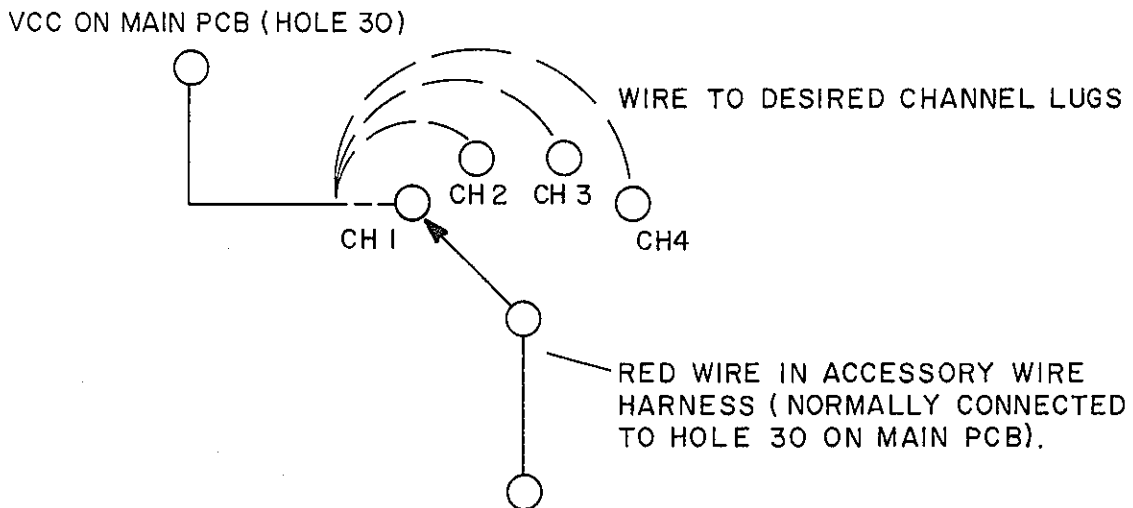
MA-3400B CONNECTION POINTS	CA-1377 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	RX MUTE OUTPUT	YELLOW
CT-4	MICROPHONE HANG-UP	WHITE
CT-5	—	
CT-6	RX AUDIO INPUT	GREEN *
CT-7	—	
CT-8	—	
CT-9	—	
CT-10	CALL LIGHT OUTPUT	ORANGE
HOLE OF CR2 (ANODE)	HORN RELAY OUTPUT	BLUE
NOT USED	TRANSMIT ACKNOWLEDGE	BROWN
NOT USED	TX PTT OUTPUT	GRAY

* - REMOVE J2 JUMPER ON CA-1377 P.C.B.

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1377 DTMF Programmable Decoder

GENERAL DESCRIPTION

The Maxon CA-1377 is a full featured DTMF selective call decoder for use in land mobile radio signaling. Offered in a 1.8" x 1" printed circuit board complete with connector, the unit is designed to be interfaced to an FM/PM radio transceiver unit. The major features of the CA-1377 are:

1. Selective (individual), group, and all-call capability.
2. Numbers up to 12 digits long, with any of the 16 DTMF tone combinations.
3. Programmability—all codes stored in EEPROM can easily be changed in the field.
4. Wrong digit lockout—will not decode embedded number sequences i.e.: if individual call code is 1234 the CA-1377 will not decode 01234 or 12345.
5. Command reset—allows remote reset of called unit.
6. Dual inter-digit timing—3 seconds of manual entry of code, 150 milliseconds for automatic entry of code. Selected at installation.
7. Horn output—open collector can sink 150mA maximum to drive the horn relay (extra diode required across relay if one doesn't exist).
8. Call light output—open collector can sink 50mA maximum, runs call light LED with series dropping resistor.
9. Receive mute output—open collector can sink 50mA maximum, normally connected to squelch switch transistor or to audio path relay.
10. Acknowledge tone transmission on receipt of correct code.
11. Wide input dynamic range of greater than 35dB allows use in all types of radios. (15 mVrms to 1.0 Vrms)
12. Wide supply voltage range: 6 to 18 VDC.
13. Wide temperature operating range: -30° to +65°C.

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

GENERAL SPECIFICATIONS

DECODER

Signaling Type	16 DTMF tone combination
Signaling Speed	0.3 to 20 digits/sec.
Digit Timeout	150 ms or 3.0 sec. max. program selectable
Tone Input Impedance	30k ohms AC coupled
Tone Input Level	15 mVRMS-1.0 VRMS
Twist Acceptance	+/-10 dB typ.
Signal to Noise	-12 dB typ.
Frequency Acceptance	1.5% min.
Address Length	1 to 12 digits programmable
Decoder Programming	By external DTMF encoder
Decode Type	Group call, All call, Decoder reset call

MAXON CM-4020-A UHF MOBILE CA-1377 DTMF Programmable Decoder

OUTPUTS

Call Light Output	Open collector 50 mA
Horn Relay Output	Open collector 150 mA
RX Mute Output	Open collector 50 mA
TX PTT Output	Open collector 150 mA
TX Acknowledge Tone	3 beep tones
Tone Output Impedance	3.0 K AC coupled
Address Storage	By EEPROM
Temperature Range	-30°C to +65°C
Supply Voltage	6.0 to 18.0 VDC
Current Requirements	16 mA @ 12 VDC
Size	1.8" x 1.0" x 0.33" PCB

OPERATION

After power is applied to the CA-1377, the unit will be ready for operation. The CA-1377 may be placed into the monitor mode at any time by lifting the microphone off-hook. This will activate the RX MUTE OUTPUT and will unmute the receiver audio. Transmissions may now be monitored on the radio channel. The CA-1377 can be placed back into the muted condition by placing the microphone back on-hook (grounded).

Upon receipt of DTMF digits, the CA-1377 will acknowledge a valid sequence of digits (a decode) by grounding the CALL LIGHT OUTPUT and unmuting the receive audio. An acknowledge tone is also transmitted on the RF channel, back to the calling party that sent the DTMF tones, to indicate that the unit called did receive the call. This acknowledge tone consists of 3 beep tones sent on the transmit channel a few seconds after the call is verified as a valid decode. If the decoder is turned off, or out of range, the unit will not send the acknowledge tone. If the called party is away from the radio set when a call is received, the HORN RELAY OUTPUT may be used to sound the horn. The HORN RELAY OUTPUT will "beep" the horn on a vehicle three times to signal a call.

The DTMF decoder can be reset, after a call has been received, by placing an off-hook microphone back on-hook. The unit can also be reset by the calling party by sending the DECODER RESET CALL on the radio channel. When the decoder is reset, the CALL LIGHT OUTPUT will turn off and the RX MUTE OUTPUT will mute the receiver, if the microphone is on-hook.

A valid decode is recognized by the CA-1377 when a sequence of DTMF digits match a programmed sequence in memory. For example, if the CA-1377 is programmed to decode the sequence "123," this sequence must be received by the CA-1377 in correct order, and within the Digit Timeout period. The sequence: "12344," "01234," or "12034," would not constitute a valid sequence, and would not decode. The Digit Timeout can be programmed for a 3 second or for a 150 milliseconds delay. The Digit Timeout requires that each DTMF address digit for the CA-1377 be transmitted at a rate that does not exceed the duration of the Digit Timeout timer for any individual digit. If the CA-1377 is allowed to timeout, the received DTMF address digits will not be considered a valid sequence and will not decode. These features greatly reduce the possibility of false calls.

If at any time the CA-1377 CALL LIGHT flashes, this indicates a fault in the unit and the EEPROM should be reinitialized and re-programmed as described in the PROGRAMMING THE CA-1377.

MAXON CM-4020-A UHF MOBILE CA-1377 DTMF Programmable Decoder

INSTALLATION

CAUTION:

Installation of the CA-1377 should be done by a qualified two-way radio technician. Refer to the installation diagram on page 73 . The following defines the CA-1377 connections:

CALL LIGHT OUTPUT (P1-1, ORANGE)

This output will pull to ground upon receipt of a valid decode. This output will remain at ground until the decoder is reset.

HORN RELAY OUTPUT (P1-2, BLUE)

This output is a momentary pull to ground which can be used to sound the horn in a vehicle. This connection should be connected to the Horn Relay, and NOT to the Horn directly. If this connection is used to drive a relay, be sure that the relay coil has a diode across the coil to reduce any inductive kick-back which may damage the output transistor on the CA-1377. Also be sure NOT to exceed the current rating of this output. If the horn relay requires more current than what the CA-1377 can handle, use an external buffer relay to drive the horn relay. For mobile installations, an external switch can be used in series with this output for enabling and disabling the HORN RELAY OUTPUT.

GROUND (P1-3, BLACK)

MICROPHONE HANG-UP (P1-4, WHITE)

This connection is used to mute and unmute the receiver audio for monitoring purposes. The MICROPHONE HANG-UP can also be used for resetting the decoder after a call has been received. If the CA-1377 is used in conjunction with a CTCSS decoder, refer to the last paragraph of this section.

+VDC (P1-5, RED)

(P1-6, YELLOW)

This wire is normally at ground and mutes the receiver when no call has been received. The receiver is unmuted by Q3 when a call is received, and appears as an open circuit. See PROGRAMMING THE CA-1377 if a reverse polarity signal is required to mute and unmute the receiver.

TX PTT OUTPUT (P1-7, GRAY)

This connection will pull to ground for 2 seconds, and key the transmitter upon a successful decode, in order to send the TRANSMIT ACKNOWLEDGE TONE. This wire should be connected to the PTT line inside the transmitter. This function is normally not used in the CM-4020.

TRANSMIT ACKNOWLEDGE TONE (P1-8, BROWN)

This output generates an audio tone when a successful decode is verified. This output can be connected to the microphone input of a transmitter. If a high impedance microphone is used with the radio set, a 100K resistor should be placed in series with P1-8 to reduce any loading effects that may occur because of this connection. The output level of the TRANSMIT ACKNOWLEDGE TONE can be adjusted by R13 on the ET51B. This function is normally not used in the CM-4020.

RX AUDIO INPUT (P1-9, GREEN)

This wire connected to the GREEN discriminator output on the receiver.

The CA-1377 can be used in conjunction with a CTCSS decoder by connecting the MICROPHONE HANG-UP wire on the CA-1377 as described above and connecting the Hang-up wire from the CTCSS decoder to the RX MUTE OUTPUT wire on the CA-1377. The squelch output on the CTCSS decoder should be connected to the squelch switch transistor inside the CM-4020.

MAXON CM-4020-A UHF MOBILE CA-1377 DTMF Programmable Decoder

PROGRAMMING

Programming the CA-1377 DTMF decoder is accomplished by using an external DTMF encoder. In short, the desired decoding address is generated from the external DTMF encoder and fed into the CA-1377 RX AUDIO OUTPUT. The CA-1377 will then store this data into the EEPROM for a permanent record of the DTMF address for later recall. Thus, whenever DTMF digits are received by the CA-1377, it will compare the received digits with the digits recorded in the EEPROM and look for a match. If a match occurs, the result will be a valid decode. The following Parameters and their factory pre-programmed default values can be reprogrammed by you in the field to meet your system requirements.

PARAMETER	DEFAULT	CODE
Individual Call Address	not programmed	1#
Group Call Address	not programmed	2#
All Call Address	not programmed	3#
Decoder Reset Call Address	not programmed	4#
DTMF Digit Timeout (150 ms./3.0 sec.)	3.0 seconds	5#/6#
Polarity of the RX MUTE OUTPUT ground to mute RX		7#/8#
Re-initialize EEPROM		9#

To program any or all of these Parameters, verify that the Program Jumper J3 on the ET51B PCB is installed. Place the microphone on-hook and apply power to the unit. The CA-1377 will now be in the Program Mode.

After power is applied the RX MUTE OUTPUT will briefly unsquelch the radio receiver to acknowledge entry into the Program Mode. If the CA-1377 did not squelch the receiver, you may wish to open the squelch control on the receiver and turn up the volume control so that you can hear the squelch noise burst.

Now, with an external DTMF encoder attached directly to the CA-1377, or via a radio channel, the CA-1377 may be programmed for your system requirements. Please note that when a Call Address is programmed as outlined below no more than 4 seconds can elapse between each digit of the Call Address after the “#” key is pressed. The CA-1377 knows that a complete Call Address has been entered when a 4 second time period elapses between dialed digits. The CA-1377 will acknowledge acceptance of the DTMF data after the last digit is dialed by unsquelching the receiver for 1 second. Additional Parameters may then be programmed.

When all Parameters have been programmed for your system, remove power from the ET51B and remove the Program Jumper J3 on the CA-1377 PCB. Re-apply power to the CA-1377 and the unit will be ready for operation. Proceed to the following paragraphs to program the parameters necessary for your particular DTMF system:

PROGRAMMING (INDIVIDUAL CALL ADDRESS)

To program an Individual Call Address, press the DTMF digits “1#” followed by the Address that you want to program. The address length may be any length between 0 to 12 digits. If no digits are programmed for the Call Address, the Call Address will be inhibited from operation. Do not let more than 4 seconds elapse between pressing the “#” key and the address digits to be programmed. Example: “1#” 1234” This sequence of DTMF digits will program the decoder to respond to the 4 digit Address of “1234”. When the digits have been accepted after the 4 second digit interval, the RX MUTE OUTPUT will unsquelch the receiver briefly to acknowledge acceptance of the programming. Additional Parameters may then be programmed, if required.

MAXON CM-4020-A UHF MOBILE CA-1377 DTMF Programmable Decoder

PROGRAMMING (GROUP CALL ADDRESS)

Programming A Group Call Address is essentially the same as programming an Individual Call Address. The only difference is the leading digit of the code that tells the CA-1377 which Parameter to program. To program a Group Call Address, press the DTMF digits "2#" followed by the Address that you want to program. Example: "2# 567A*". This sequence of DTMF digits will program the decoder to respond to the 5 digit Group Call Address of "567A*". Please note that all 16 DTMF digits can be used in any Call Address.

PROGRAMMING (ALL CALL ADDRESS)

All Call programming is similar to the Individual Call Address programming. To program an All Call Address, press the DTMF digits "3#" followed by the Address that you want to program. Example: "3# 00#23456". An All Call Address will be decoded if the CA-1377 decodes the 8 digit sequence "00#23456".

PROGRAMMING (DECODER RESET CALL ADDRESS)

To program a Decoder Reset Call Address, press the DTMF digits "4#" followed by the Address that you want to program. Example: "4# 123456789". When the CA-1377 decodes the sequence of digits, "123456789", the decoder will be automatically reset.

PROGRAMMING (DIGIT TIMEOUT VALUE)

The DTMF Digit Timeout is the amount of time that elapses between DTMF digits that are encoded to the CA-1377. When shipped from the factory, the Digit Timeout is programmed to 3.0 seconds. This means that no more than 3.0 seconds can elapse between DTMF address digits that are encoded to the CA-1377. If the time duration between DTMF address digits exceeds the maximum Digit Timeout, the CA-1377 will assume that all digits have been received and will look for a valid decode match.

The Digit Timeout values can be programmed in the decoder. A 3.0 second Digit Timeout can be programmed by pressing the DTMF digits: "6#". A 150 millisecond Digit Timeout can be programmed by pressing the DTMF digits: "5#". This short timeout value is normally only used if an automatic DTMF encoder is used in this system.

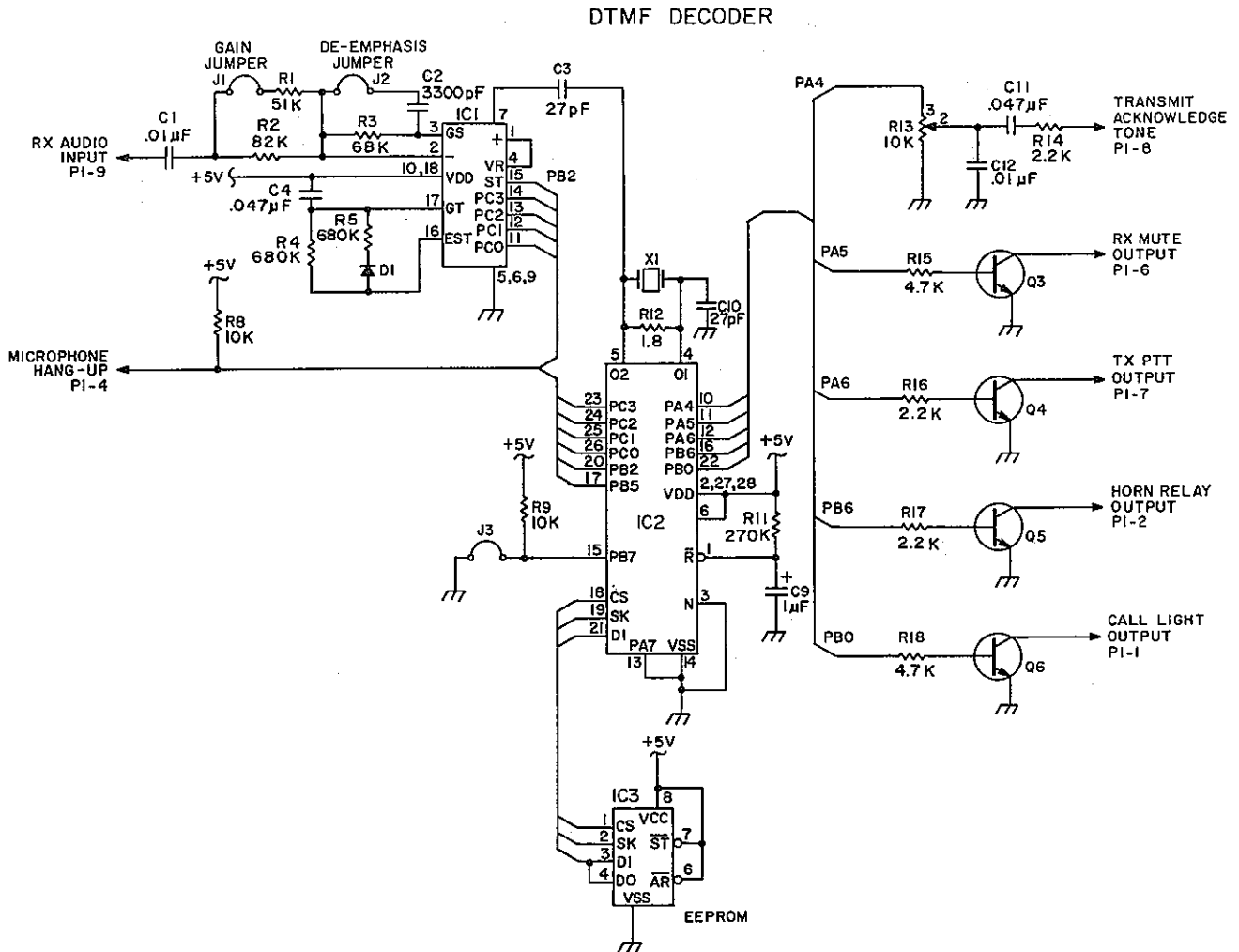
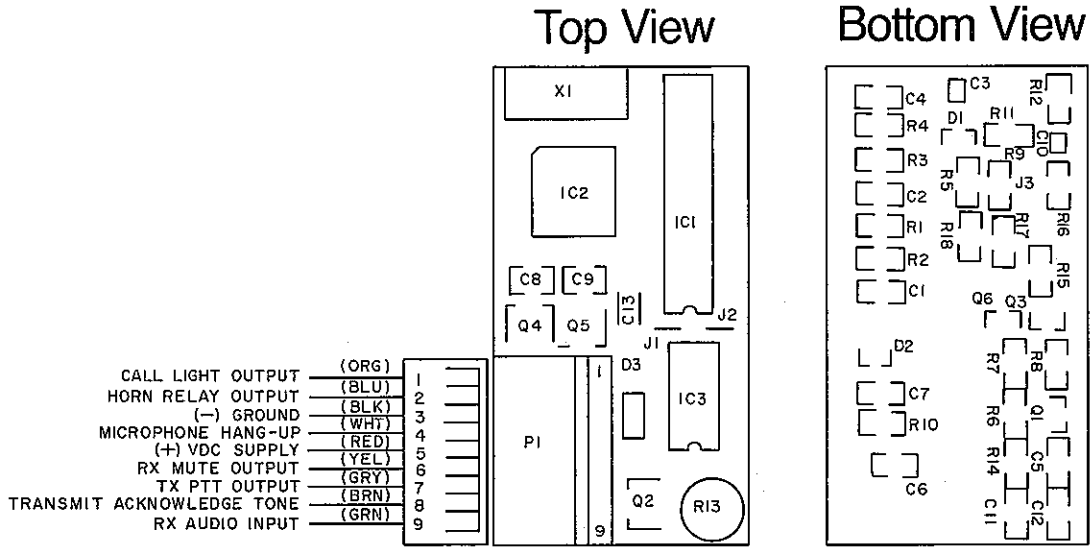
RX MUTE POLARITY

Most receivers require a pull to ground to MUTE audio, an open circuit condition to UNMUTE receive audio. When shipped from the factory, the CA-1377 is programmed to provide a pull to ground to MUTE the receive audio. If a pull to ground is required to UNMUTE the audio, press the digits: "8#". If the common pull to ground is required to MUTE the audio, press the DTMF digits: "7#". The CM-4020 requires a pull to ground to mute the radio.

EEPROM INITIALIZATION

This parameter will re-program the EEPROM back to the initial default values which are shown at the beginning of this section. The CA-1377 is shipped from the factory in this configuration. This parameter can be used to clear out all previous programming inside the EEPROM and reset the contents to a known value. This parameter can be programmed by pressing the DTMF digits: "9#" while in the Program Mode.

MAXON CM-4020-A UHF MOBILE CA-1377 Schematic Diagram



MAXON CM-4020-A UHF MOBILE CA-1377 Parts List

IDENTIFIER	PART NO.	DESCRIPTION
C1	*	Capacitor Chip .01 uF X7R 20% 50V
C2	*	Capacitor Chip 3300 pF X7R 20% 50V
C3	*	Capacitor NPO 27 pF 20% 50V
C4	*	Capacitor Chip .047 uF X7R 20% 50V
C5	*	Capacitor Chip 3300 pF X7R 20% 50V
C6	*	Capacitor Chip .047 uF X7R 20% 50V
C7	*	Capacitor Chip 3300 pF X7R 20% 50V
C8	*	Capacitor Chip Tantalum 1 uF 20% 35V
C9	*	Capacitor Chip Tantalum 1 uF 20% 35V
C10	*	Capacitor NPO 27 pF 20% 50V
C11	*	Capacitor Chip .047 uF X7R 20% 50V
C12	*	Capacitor Chip .01 uF X7R 20% 50V
C13	*	Capacitor Chip .047 uF X7R 20% 50V
D1	*	Diode Silicon SOT-23
D2	*	Diode Silicon SOT-23
D3	*	Diode Zener 1/2 wt 5% 6.2V
IC1	*	DTMF Decoder
IC2	*	Microprocessor CMOS PLCC
IC3	*	EEPROM 16 x 16
Q1	*	Transistor, NPN SOT-23
Q2	*	Transistor, NPN SOT-89
Q3	*	Transistor, NPN SOT-23
Q4	*	Transistor, NPN SOT-89
Q5	*	Transistor, NPN SOT-89
Q6	*	Transistor, NPN SOT-23
R1	*	Resistor Chip 51k 5% 1206
R2	*	Resistor Chip 82k 5% 1206
R3	*	Resistor Chip 68k 5% 1206
R4	*	Resistor Chip 680k 5% 1206
R5	*	Resistor Chip 680k 5% 1206
R6	*	Resistor Chip 10k 5% 1206
R7	*	Resistor Chip 2.2k 5% 1206
R8	*	Resistor Chip 10k 5% 1206
R9	*	Resistor Chip 10k 5% 1206
R10	*	Resistor Chip 2.2k 5% 1206
R11	*	Resistor Chip 270k 5% 1206
R12	*	Resistor Chip 1.8 Meg 5% 1206
R13	*	Resistor Chip 10k POT RND TOP ADJ.
R14	*	Resistor Chip 2.2k 5% 1206
R15	*	Resistor Chip 4.7k 5% 1206
R16	*	Resistor Chip 2.2k 5% 1206
R17	*	Resistor Chip 2.2k 5% 1206
R18	*	Resistor Chip 4.7k 5% 1206
X1	*	Crystal 3.579 MHz HC-43U

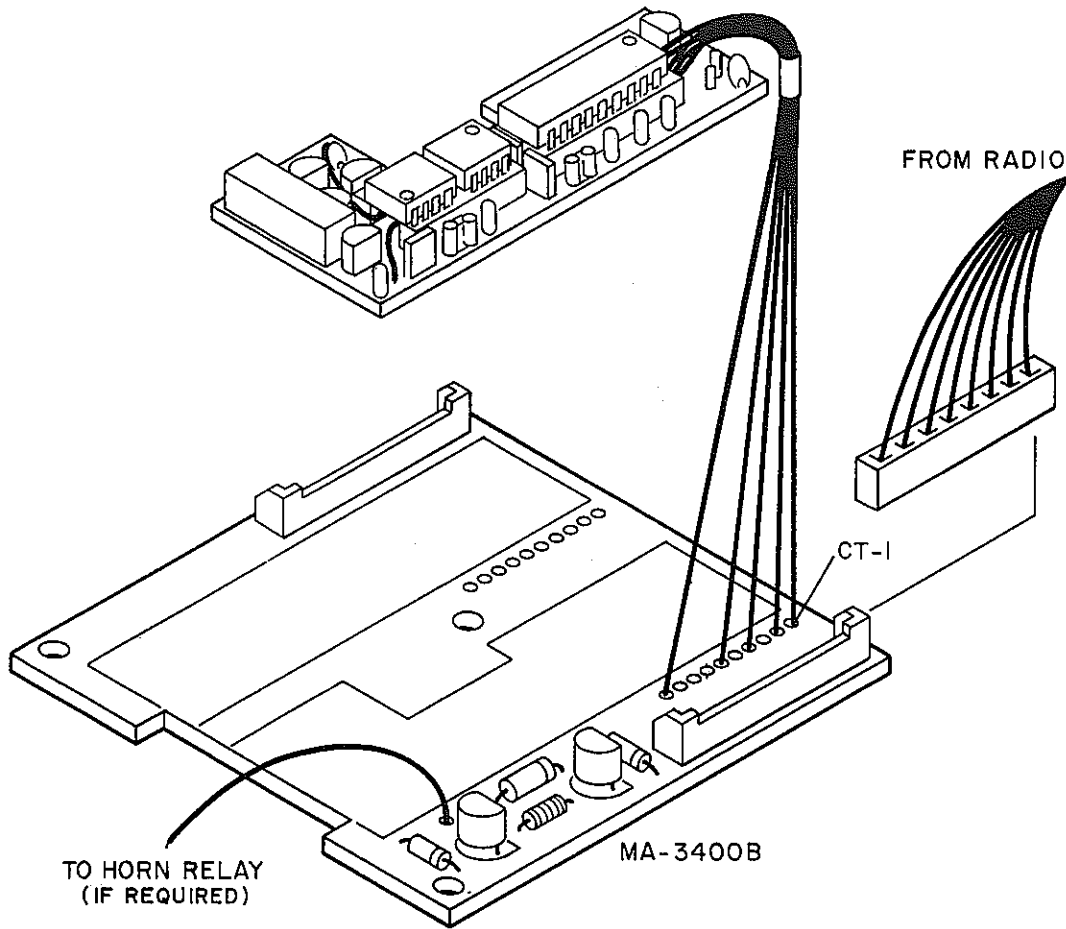
*TO ORDER PARTS CONTACT MAXON ELECTRONICS FOR DESIGNATED PART NUMBERS

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MAXON CM-4020-A UHF MOBILE CA-1475 Two-Tone Sequential Decoder

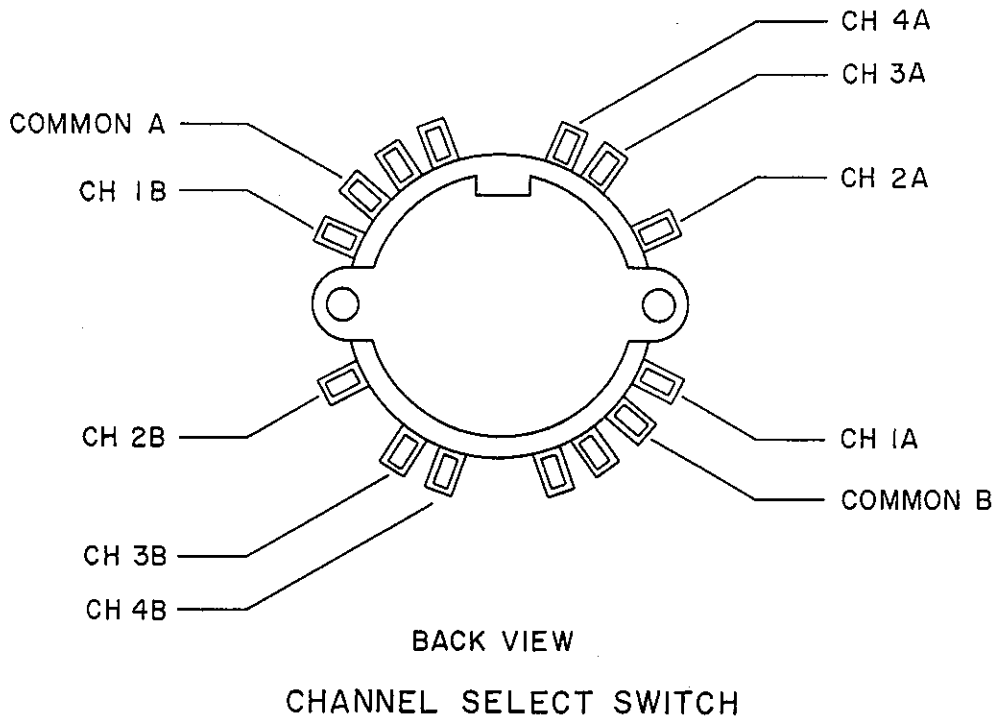


MA-3400B PARTS LIST

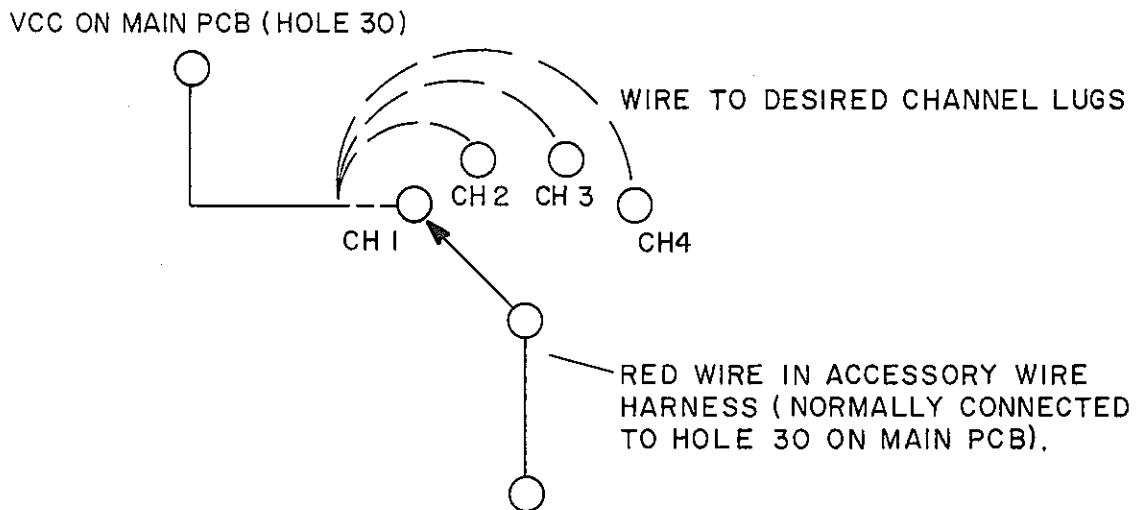
REFERENCE NO.	PART NO.	PART NAME & DESCRIPTION
CR1	2430087	Diode IN4148
CR2	2450131	Diode IN4001
Q1, Q2	2030063	Transistor MPS 9600
R1	0021546	Resistor 150K ohm
R2	0021030	Resistor 10K ohm

MA-3400B CONNECTION POINTS	CA-1475	
	FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	—	
CT-4	MONITOR / RESET	WHITE
CT-5	—	
CT-6	AUDIO INPUT	GREEN
CT-7	—	
CT-8	—	
CT-9	—	
CT-10	SQUELCH SWITCH	ORANGE
NOT USED	B+ DEFEAT	BROWN

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1475 Two-Tone Sequential Decoder

(After Serial Number 1001)

GENERAL DESCRIPTION

The Maxon CA-1475 two-tone sequential decoder module is similar to CTCSS in that it controls the audio squelch circuit. The module cannot transmit, it only receives. Normally a base station transmits the tones to page one of many handhelds.

When the radio is in the tone position, the CA-1475 monitors the audio similar to CTCSS. The CA-1475 does not require a continuous tone to keep the radio unsquelched, but does require recognition of two audio tones in sequence to set a latched output. The radio will then be unsquelched until carrier squelch is activated or the reset (monitor) button is pushed.

Four variables are present in the two-tone sequential signaling format.

1. Tone frequency (typically from 300 Hz to 3,000 Hz).
2. First tone duration or space (typically 1 second or less).
3. Intertone duration or space (typically zero to 250 ms).
4. Second tone duration (typically 2 seconds or less).

Maxon uses a "state variable active filter" for tone recognition. Slight variations of the circuits are necessary to recognize different timing parameters and tone frequencies. Two standard versions are supplied:

1. Slow: low frequencies (300-1,500 Hz) long duration (> 250 ms).
2. Fast: high frequencies (800-3,000 Hz) short duration (> 50 ms).

The above versions will accommodate most customer requirements.

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

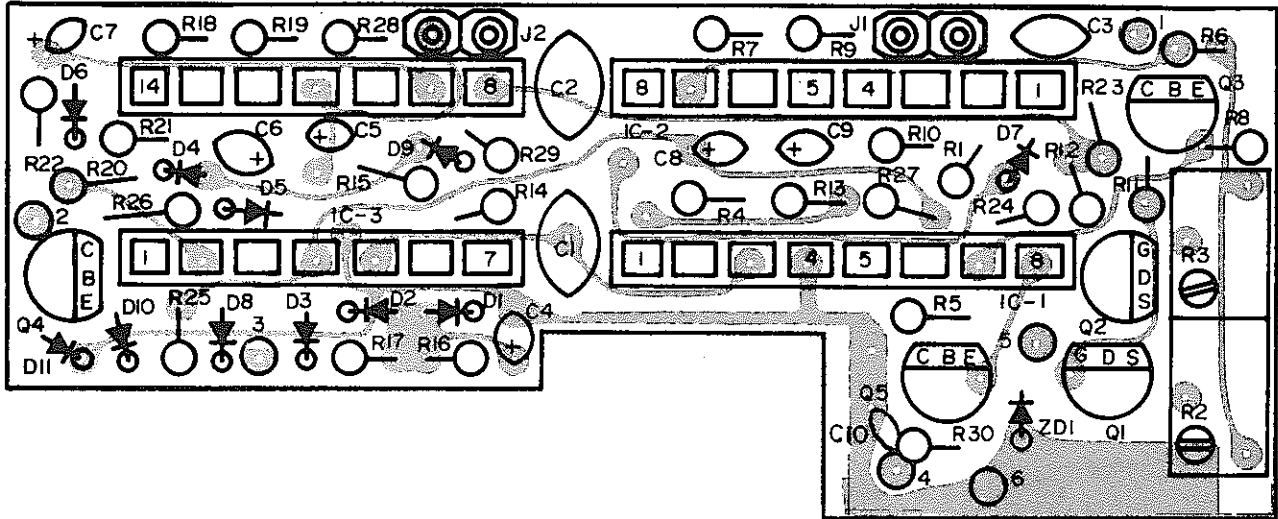
THEORY OF OPERATION

IC1-A acts as an amplifier/limiter for audio input. IC1-B and IC-2 form a state variable active filter, with the band pass output delivered to IC3-A. IC3-A and B detects the tone and produces a high output on pin 14. If the tone is present for more than 7 seconds, C6 discharges through R20 raising the voltage on pin 2 above the reference voltage on pin 3; decode occurs and is latched by D3. If the tone duration is less than 7 seconds, pin 14 goes low causing a negative going pulse at pin 9. This causes pin 8 to go high, turning Q3 on, Q1 off, Q2 on, and tries to pull pin 2 of IC-3 up through D9. The circuit waits in this state until one of two things happens. If tone 2 is detected, pin 14 goes high removing forward bias on D4 allowing D9 to immediately pull up pin 2 of IC3, resulting in latched decode. If tone 2 is not detected, C7 will charge through R22 raising pin 9 higher than pin 10, turning Q2 and Q3 off and Q1 on (looking for tone 1). Time duration is determined by C7 and R22 (for "A" model 330 ms for "B" 150 ms).

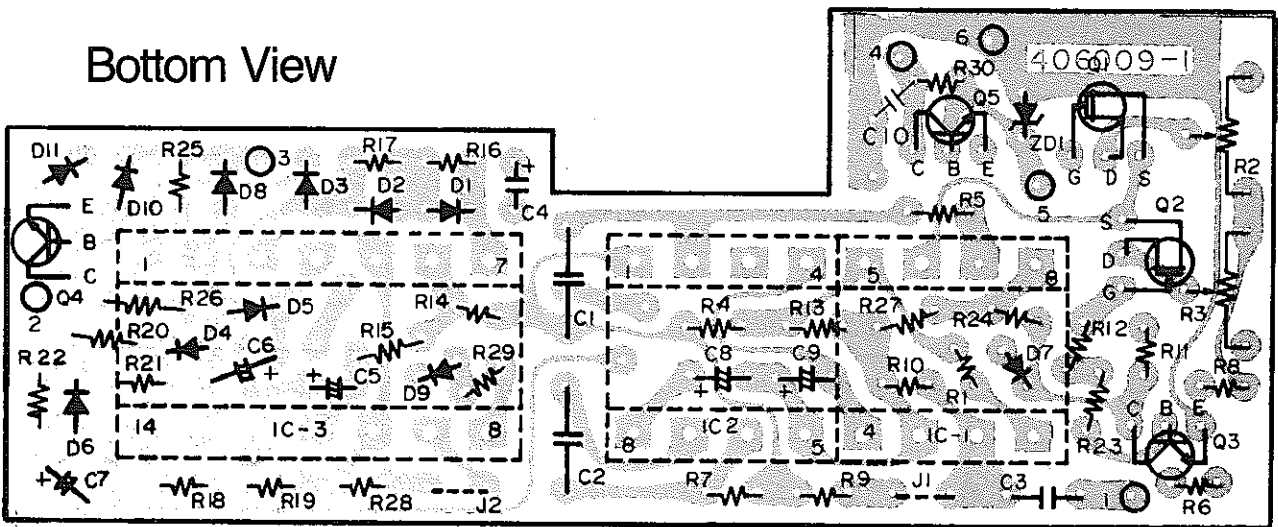
Once the decoder is latched it can be reset by grounding the monitor lead which forces IC-3 pin 2 low.

MAXON CM-4020-A UHF MOBILE CA-1475 Two-Tone Sequential Decoder

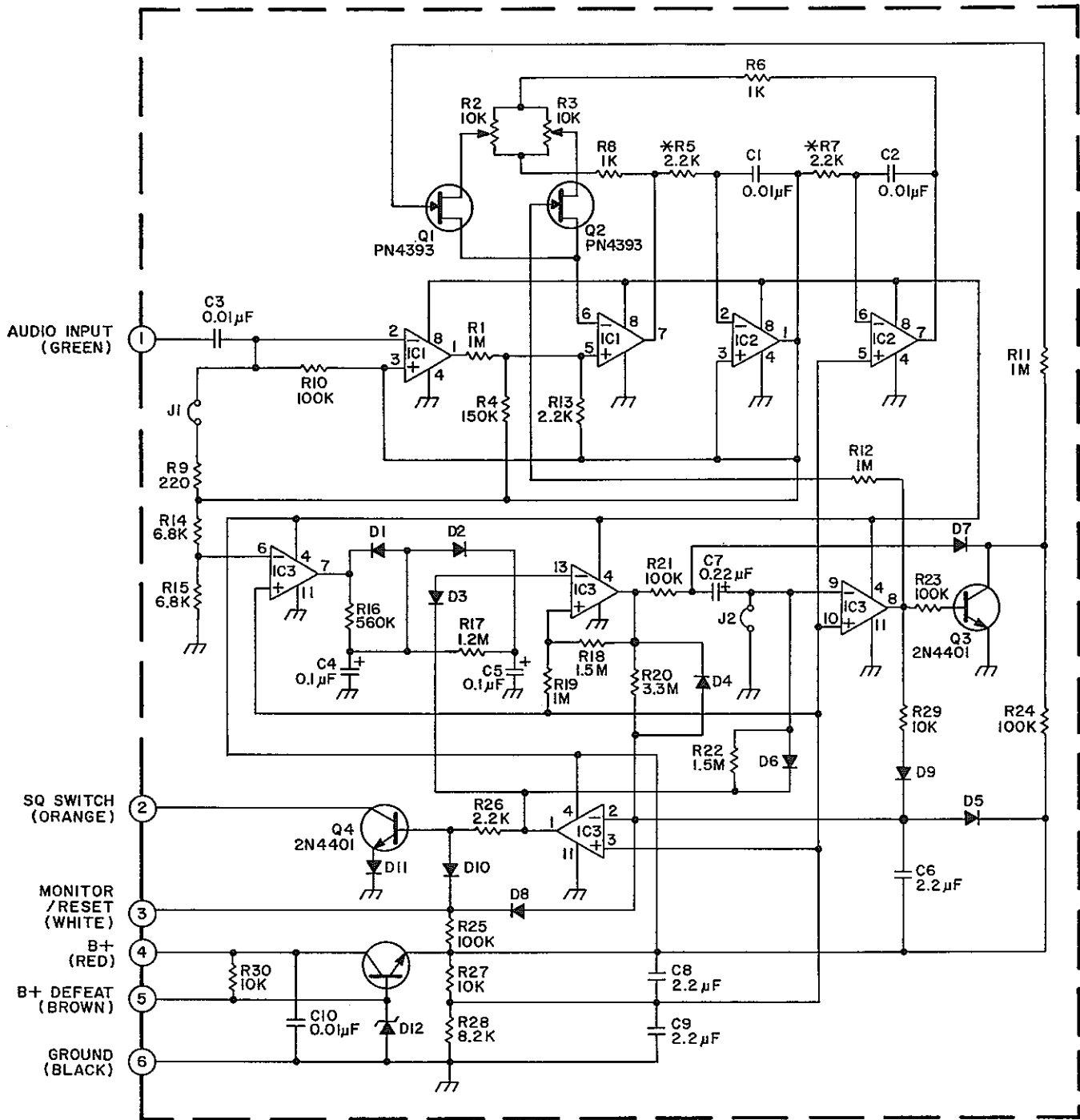
Top View



Bottom View



MAXON CM-4020-A UHF MOBILE CA-1475 Schematic Diagram

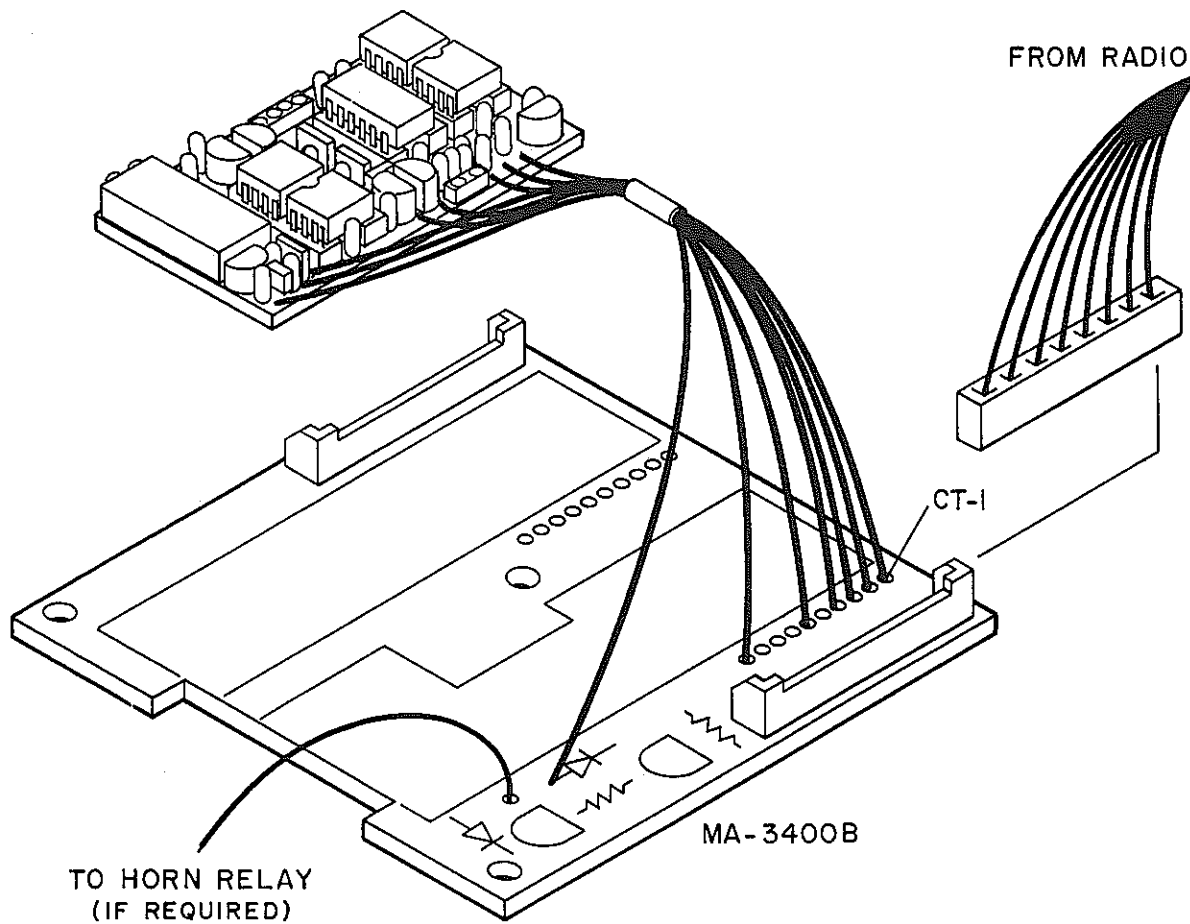


* = TOLERANCE 1% , IC1 - IC2 = LF353N , IC3 = LM324N

MAXON CM-4020-A UHF MOBILE CA-1475 Parts List

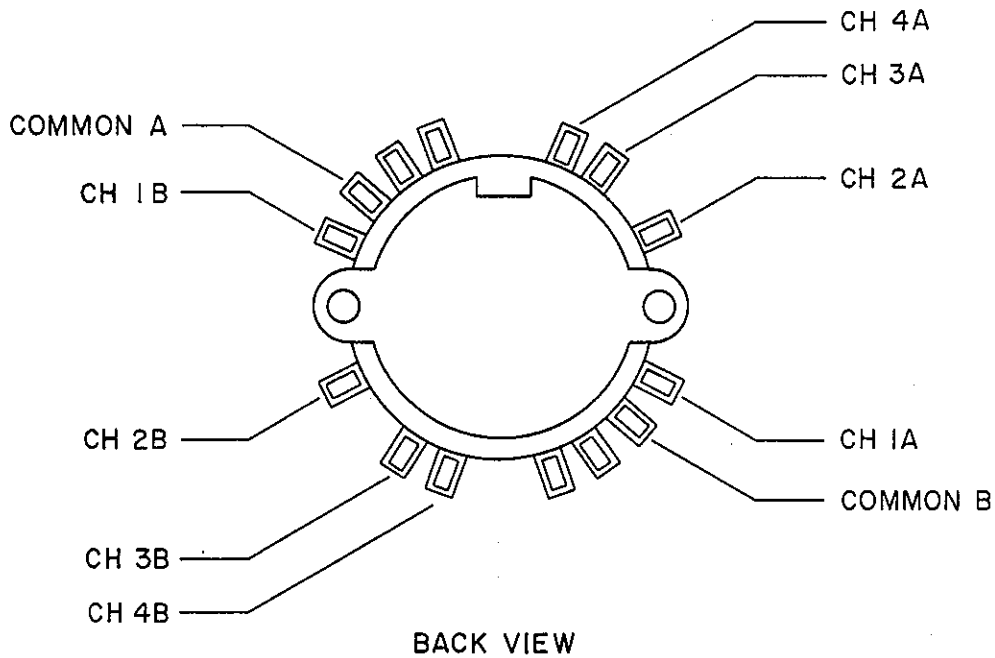
IDENTIFIER	PART NO.	DESCRIPTION
C1	1301195	Capacitor Ceramic 0.01 uF
C2	1301195	Capacitor Ceramic 0.01 uF
C3	1110076	Capacitor Mylar 0.01 uF 25V
C4	1401011	Capacitor Tantalum 0.1 uF 16V
C5	1401011	Capacitor Tantalum 0.1 uF 16V
C6	1422018	Capacitor Tantalum 2.2 uF 16V
C7	1422018	Capacitor Tantalum 2.2 uF 16V
C9	1422018	Capacitor Tantalum 2.2 uF 16V
C10	1301106	Capacitor Ceramic 0.01 uF
D1 - D11	2430087	Diode IN4148
D12	2410153	Diode Zener BZ x 83-C7V5
IC1	2230223	IC MC34002P (LF353N)
IC2	2230223	IC MC34002P
IC3	2310017	IC LM324N
Q1	2110014	Fet PN4393
Q2	2110014	Fet PN4393
Q3	2030216	Transistor 2N4401
Q4	2030216	Transistor 2N4401
Q5	2030216	Transistor 2N4401
R1	0021052	Resistor Carbon Film 1M ohm
R2	4800145	Potentiometer 10k
R3	4800145	Potentiometer 10k
R4	0021546	Resistor Carbon Film 150k ohm
R5	0062235	Resistor Carbon Film 22k ohm 1/8W + 1%
R6	0021029	Resistor Carbon Film 1k ohm 1/16W + 5%
R7	0062535	Resistor Carbon Film 22k ohm 1/8W + 1%
R8	0021029	Resistor Carbon Film 1k ohm 1/16W + 5%
R9	0022213	Resistor Carbon Film 220k ohm 1/16W + 5%
R10	0021041	Resistor Carbon Film 100k ohm 1/16W + 5%
R11	0021052	Resistor Carbon Film 1M ohm
R12	0021052	Resistor Carbon Film 1M ohm
R13	0022224	Resistor Carbon Film 2.2k ohm 1/16W + 5%
R14	0026826	Resistor Carbon Film 6.8k ohm 1/16W + 5%
R15	0026837	Resistor Carbon Film 68k ohm 1/16W + 5%
R16	0025643	Resistor Carbon Film 560k ohm 1/16W + 5%
R17	0021250	Resistor Carbon Film 1.2M ohm 1/16W + 5%
R18	0021557	Resistor Carbon Film 1.5M ohm 1/16W + 5%
R19	0021052	1/16W + 5%
R20	0043353	Resistor Carbon Film 3.3M ohm 1/8W + 5%
R21	0021041	Resistor Carbon Film 100k ohm 1/16W + 5%
R22	0021557	Resistor Carbon Film 1.5M ohm 1/16W + 5%
R23	0021041	Resistor Carbon Film 100k ohm 1/16W + 5%
R24	0021041	Resistor Carbon Film 100k ohm 1/16W + 5%
R25	0021041	Resistor Carbon Film 100k ohm 1/16W + 5%
R27	0021030	Resistor Carbon Film 10k ohm 1/16W + 5%
R29	0021030	Resistor Carbon Film 10k ohm 1/16W + 5%
R30	0021030	Resistor Carbon Film 10k ohm 1/16W + 5%

MAXON CM-4020-A UHF MOBILE CA-1476 Two-Tone Sequential Decoder



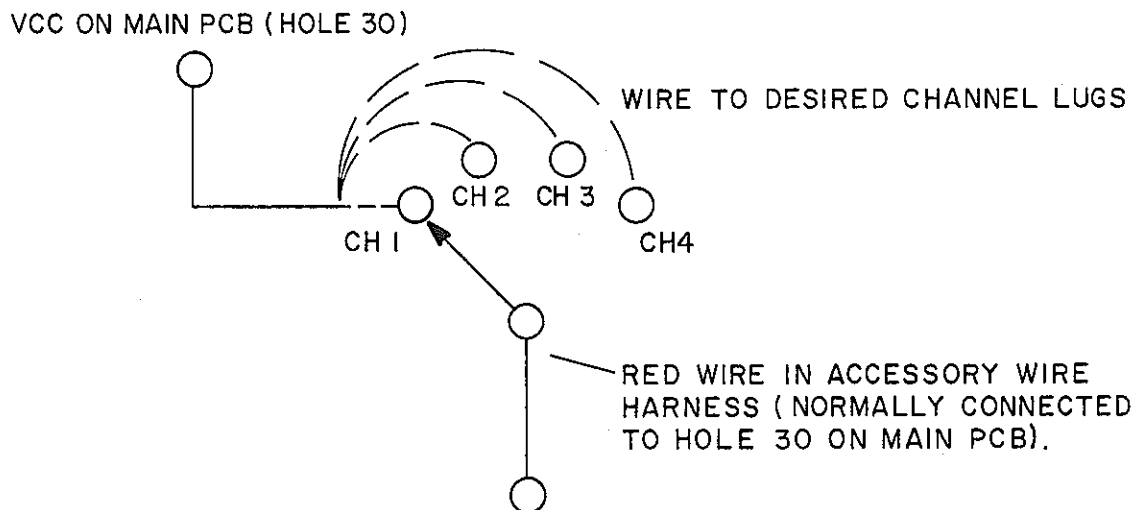
MA-3400B CONNECTION POINTS	CA-1476 FUNCTION	WIRE COLOR
CT-1	GROUND	BLACK
CT-2	(+) SUPPLY	RED
CT-3	DECODE LATCH	WHT/ORG
CT-4	MONITOR/HOOK LATCH	BROWN
CT-5	—	
CT-6	TONE INPUT	GREEN
CT-7	—	
CT-8	—	
CT-9	—	
CT-10	LAMP	BLK / ORG
HOLE OF CR2 (ANODE)	DECODE MOMENTARY	WHT / VIO
NOT USED	SET	WHITE

MAXON CM-4020-A UHF MOBILE Accessory Power Channel Switching



CHANNEL SELECT SWITCH

WIRE THE OPTION (+) SUPPLY TO THE UNUSED SECTION ON THE CHANNEL SELECT SWITCH (EITHER A OR B WILL BE UNUSED). THIS IS NECESSARY WHEN THE OPTION IS TO BE USED ONLY ON CERTAIN CHANNELS.



MAXON CM-4020-A UHF MOBILE CA-1476 Two-Tone Sequential Decoder

GENERAL DESCRIPTION

The CA-1476 is a sub-miniature circuit board which decodes two-tone sequential tone formats commonly used in radio paging and RCC systems.

SPECIFICATIONS

Operating Voltage	+10.5 VDC to 30 VDC (7VDC min. w/regulator removed & jumpered)
Operating Current	Typically less than 20 mA
Frequency Range	Continuously tunable 300 to 1200 Hz
Decode Bandwidth	+/-1.5%
Operating Temp	Exceeds EIA spec. (-30°C to +60°C)
Frequency Stability	Less than +/- .5% Typically +/- .2%
Input Level	20mVrms to 2Vrms
Input Impedance	Less than 50K
Tone Format:	
Tone #1:	Less than 250 ms
Intertone Time	250 ms max.
Tone #2	250 ms

GROUP CALL

5 sec. of tone #1

OUTPUTS

1. Latched open collector, 40mA @ 24 VDC, with hook switch monitor and reset.
2. Momentary open collector, 250mA @ 24 VDC, approximately 3 sec. duration.
3. Latched open collector, 250mA @ 24 VDC, with hookswitch reset and disable.

SIZE

1.2" W x 1.9" L x .38" H (3.05 cm x 4.83 cm x .95 cm)

INTERFACE

18" Flying leads

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

THEORY OF OPERATION

When the proper tone code is received, the CA-1476 will provide (1) a latched transistor output to unmute the radio's squelch circuit, (2) a latched transistor output to drive a call lamp and (3) a momentary (3 sec. nominal) transistor output which may be used to control a vehicle horn or other external function.

The CA-1476 also has a "GROUP CALL" feature which allows paging of multiple units simultaneously. The group call activates all units coded with the same tone #1. The group call feature may be defeated by removal of R29.

MAXON CM-4020-A UHF MOBILE CA-1476 Two-Tone Sequential Decoder

INSTALLATION

We have attempted to configure the CA-1476 to require minimum installation time.

(+) SUPPLY (RED)

Connected to system (+) supply. +7VDC operation is possible by removing VR1 and CR1 and jumpering input to output. This modification removes reverse polarity protection.

(-) SUPPLY (BLACK)

Connected to system (-) ground.

TONE INPUT (GREEN)

Connected to discriminator output.

MONITOR/HOOKSWITCH (BROWN)

Connected to microphone hang up line. Selectable ground to monitor or release from ground to monitor by position of JU-1. Resets latched output on hang up and call lamp when off hook.

JU-1 jumpered from common to "A" allows for "ground to mute" and reset operation.

JU-1 placed from common to "B" provides "ground to monitor" release from ground to reset and mute operation. The CM-4020 is configured for "ground to mute" operation.

SET (WHITE)

Causes decoder to unmute radio (latched output changes states) on application of (+) supply. Lead is not used in the CM-4020.

DECODE LATCHED OUTPUT (WHITE/ORANGE)

Open collector output 40mA at 24VDC, decode polarity selectable by JU-3. Setable by hookswitch or SET connection (see above).

JU-3 IN provides for output normally saturated to ground until decode or monitor.

JU-3 OUT provides for output normally off until decode or monitor.

JU-3 should be IN when the CA-1476 is used with the CM-4020.

CALL LAMP (-) LATCHED OUTPUT (BLACK/ORANGE)

Open collector (Darlington) output 250mA at 24VDC. Saturated to ground on decode only. Latched until "off hook" Hookswitch condition.

DECODE MOMENTARY OUTPUT (WHITE/VIOLET)

Open collector output 250mA at 24VDC. Active approximately 3 sec. following decode.

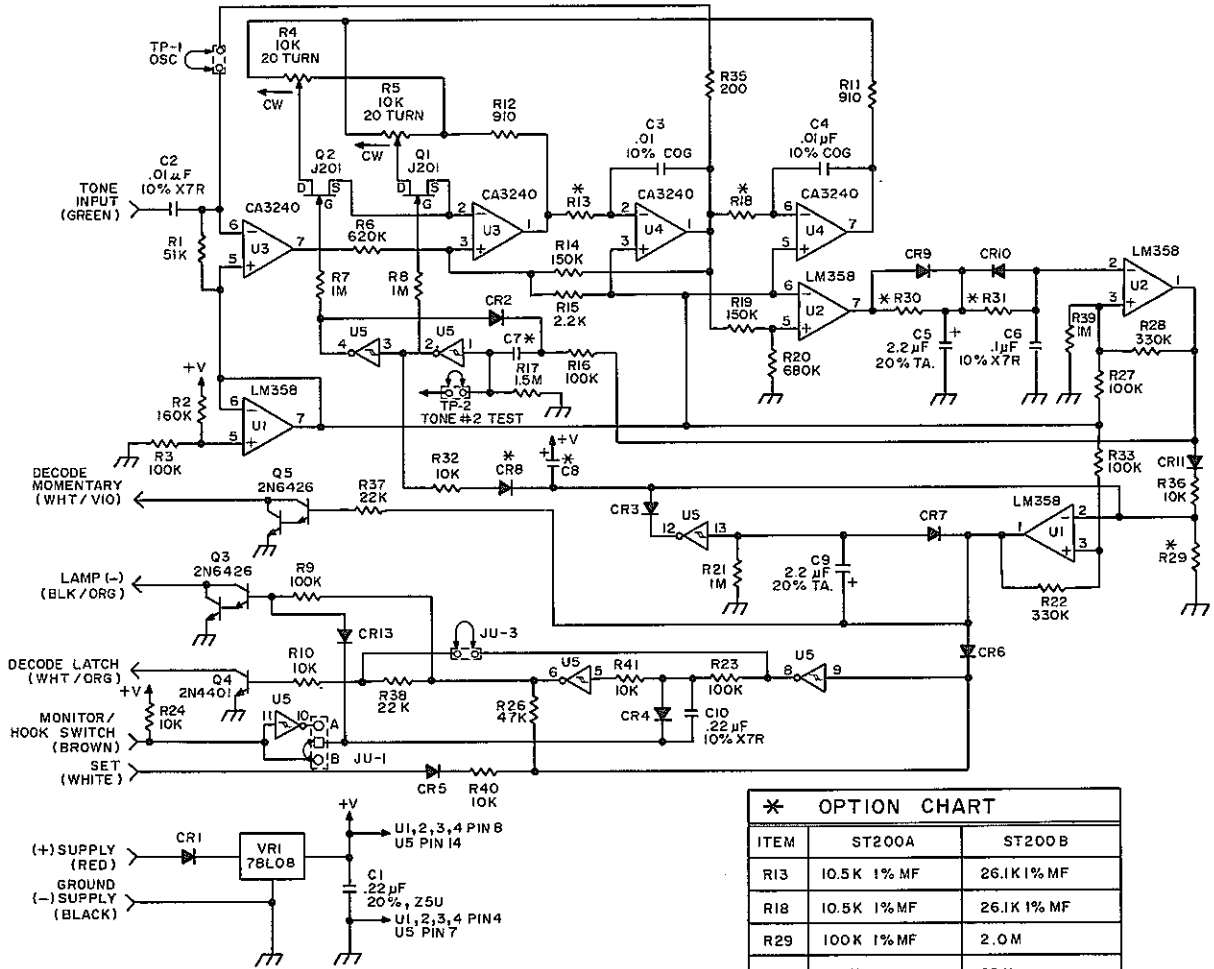
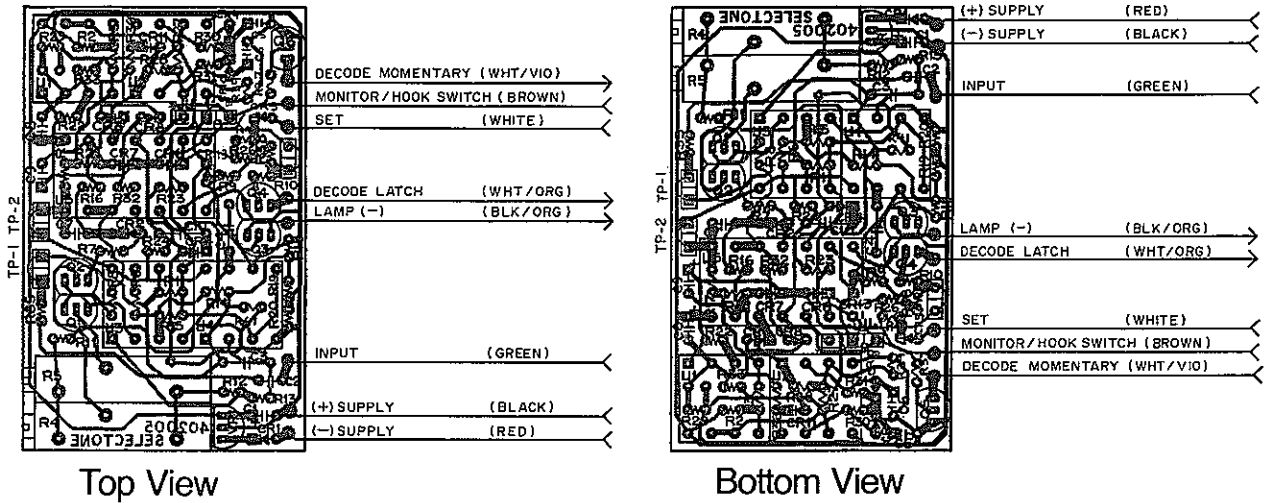
FREQUENCY ADJUSTMENT

The CA-1476 has been designed to provide you with maximum flexibility in filling paging code requirements. Each tone is independently tunable over the frequency range 300 Hz to 1200 Hz.

To tune the unit, both TP1 and TP2 must be installed. This is how the unit is shipped from the factory. The frequency of oscillation will be for tone #2 of the page code and can be measured on the GREEN wire. Adjust R4 to the required frequency using a frequency counter or a lissajous figure and a tone standard. Remove the test jumper at tone 2 test (TP2). Oscillation will now be for tone #1 test (TP1). The CA-1476 is now ready for operation.

The test jumpers in the CA-1476 are intended to use wire leads of approx. 26 gauge or wire leads from ¼ to ⅛ watt resistors. This should provide a reasonable source for test jumpers for future frequency changes. The tone test jumper (TP1) may be used as the tone test connection when the tone input lead has been installed and is not available.

MAXON CM-4020-A UHF MOBILE CA-1476 Schematic Diagram



*** OPTION CHART**

ITEM	ST200A	ST200B
R13	10.5 K 1% MF	26.1 K 1% MF
R18	10.5 K 1% MF	26.1 K 1% MF
R29	100 K 1% MF	2.0 M
R30	2.2 K	62 K
R31	200	2.0 M
C7	.047 μF 10% X7R	.22 μF 10% X7R
C8	.1 μF 10% X7R	2.2 μF 20% TA.
CR8	CATHODE TO C8	REVERSE

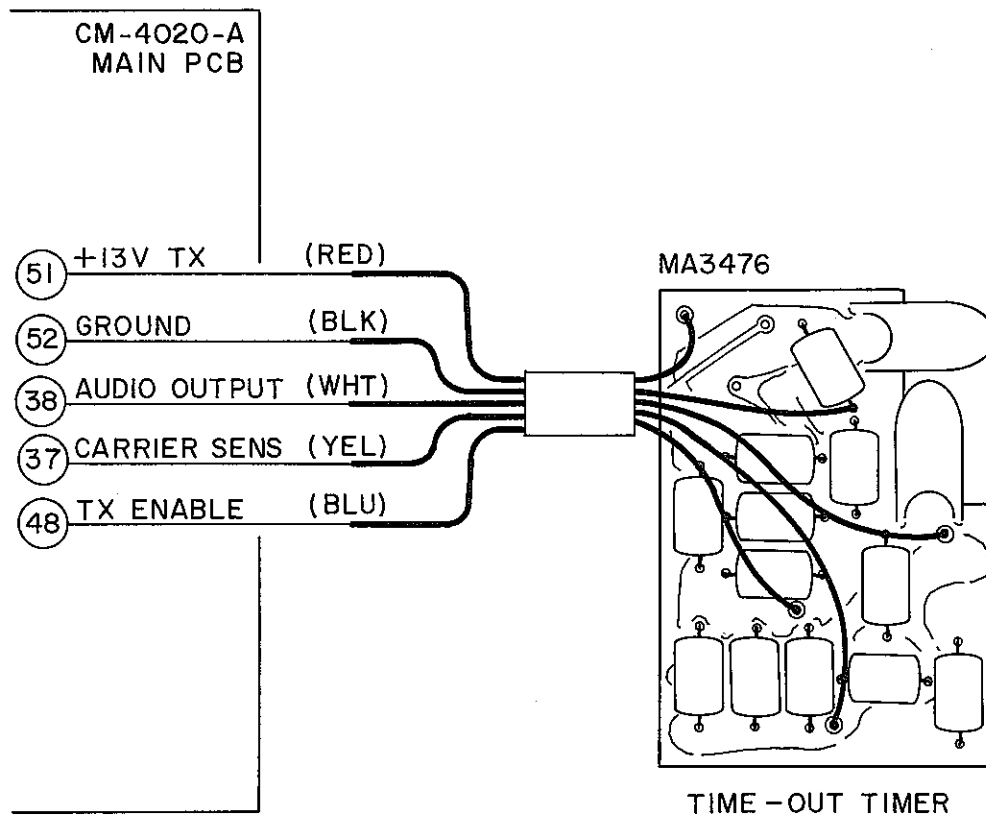
- NOTES: UNLESS OTHERWISE INDICATED;**
1. ALL RESISTORS ARE 1/8W, ± 5%.
 2. ALL DIODES ARE IN914.
 3. ALL IC'S ARE 74C14.
 4. TRANSISTOR'S Q1 & Q2 MAY BE SUBSTITUTED WITH TYPE PN4339 TRANSISTORS.

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MAXON CM-4020-A UHF MOBILE MA-3476 Time-Out Timer



MAXON CM-4020-A UHF MOBILE MA-3476 Time-Out Timer

GENERAL DESCRIPTION

The MA-3476 Time-Out Timer with Busy Channel Lockout is designed to provide automatic shut down of radio transmissions after an adjustable period of time. It will also prevent transmission on a busy channel when a carrier is being detected on that channel. The unit incorporates an audible warning tone which is emitted to the radio's speaker after time-out or lock-out and until transmit condition is terminated. The time-out timer of the CA-3476 can be set to 30 seconds, 60 seconds, 90 seconds, or 120 seconds. The time is selected by solder swipe on the PC board.

MOUNTING

Mount the unit with the double-sided tape supplied. Glue or other adhesives are not recommended.

THEORY OF OPERATION

The MA-3476 Time-Out Timer/Busy Channel Lockout is a 555 timer chip connected to operate in the astable mode. In this mode the timer will trigger itself and operate as a free-running multivibrator.

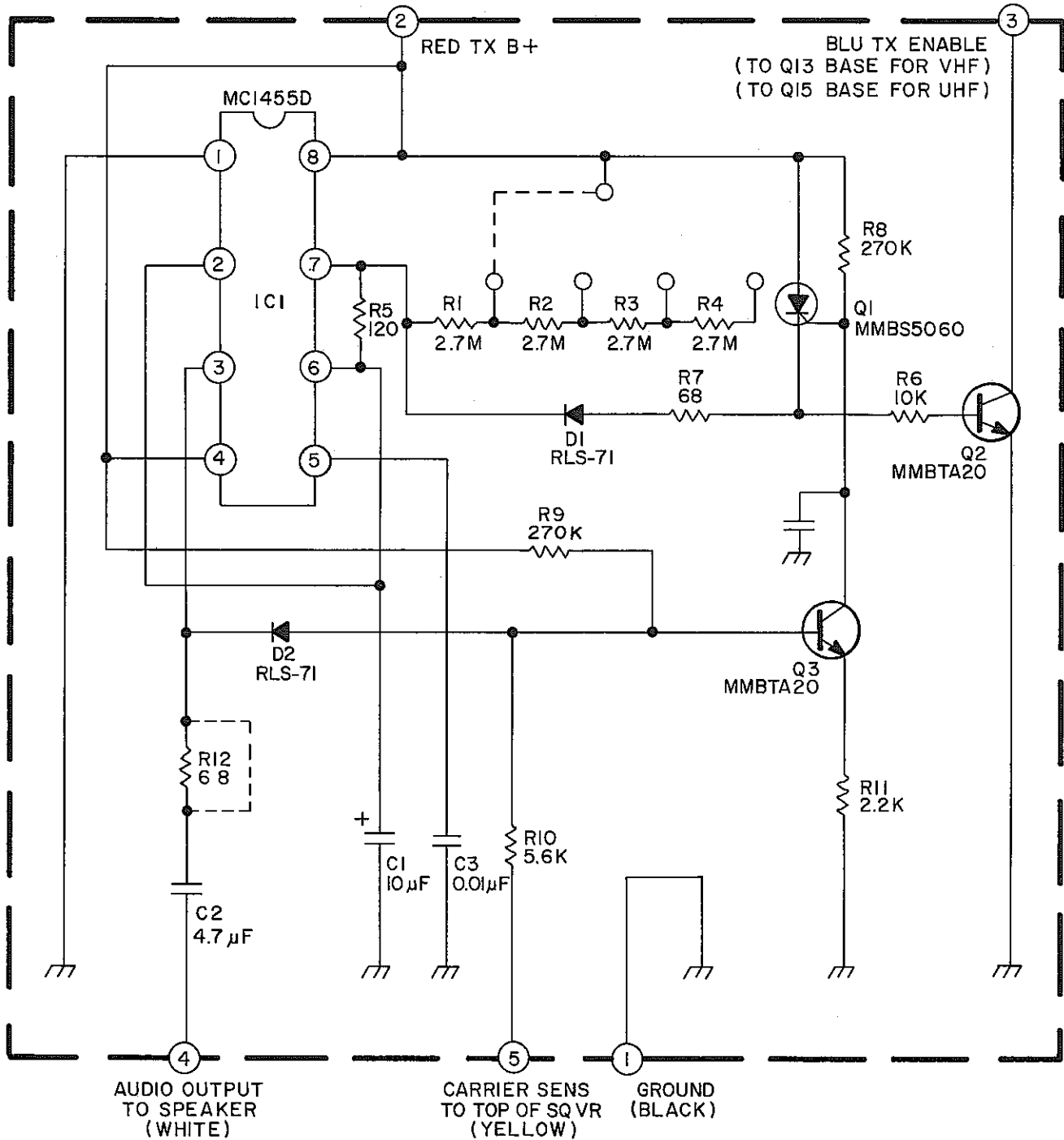
TIME-OUT TIMER

The resistor chain consisting of R1, R2, R3, and R4 is used to select the length of the first clock pulse. The pulse can be set at 30 sec., 1 min., 2 min., or 3 min. depending on how many resistors are selected by the jumper from VCC. C1 charges through the resistor chain and R5 and discharges through R5 alone. As a result, the duty cycle (ratio of on-to-off time) is controlled by the ratio of the resistor chain value selected and R5. When the timer is connected as an astable oscillator, the capacitor C1 charges and discharges between one-third and two-thirds VCC. When VCC is applied to the circuit the charge time for C1 is long because of the very high values of resistors in the resistor chain. When the capacitor reaches two-thirds VCC (a period of 30 sec. to 2 min.) the output at pin 3 pulses low. This output pulse stays low only a short period of time because of the low value of the discharge resistor R5. Pin 3 is low long enough to turn off the transistor Q3. This allows the gate of Q1 to go high enough to trigger the SCR. When this happens the resistor chain is bypassed and C1 charges through the small value of resistance R7 and R5. This causes the output at Pin 3 to oscillate at approximately 800 Hz because of the short charge and discharge time of C1. This signal is coupled to the speaker of the radio through C2 to warn of a timed out condition. Q2 is turned on at the same time the SCR is triggered causing its collector to go low. The collector of Q2 is connected to the power control circuit in the transmitter. A low collector voltage on Q2 will prevent the transmitter from transmitting.

BUSY CHANNEL LOCKOUT

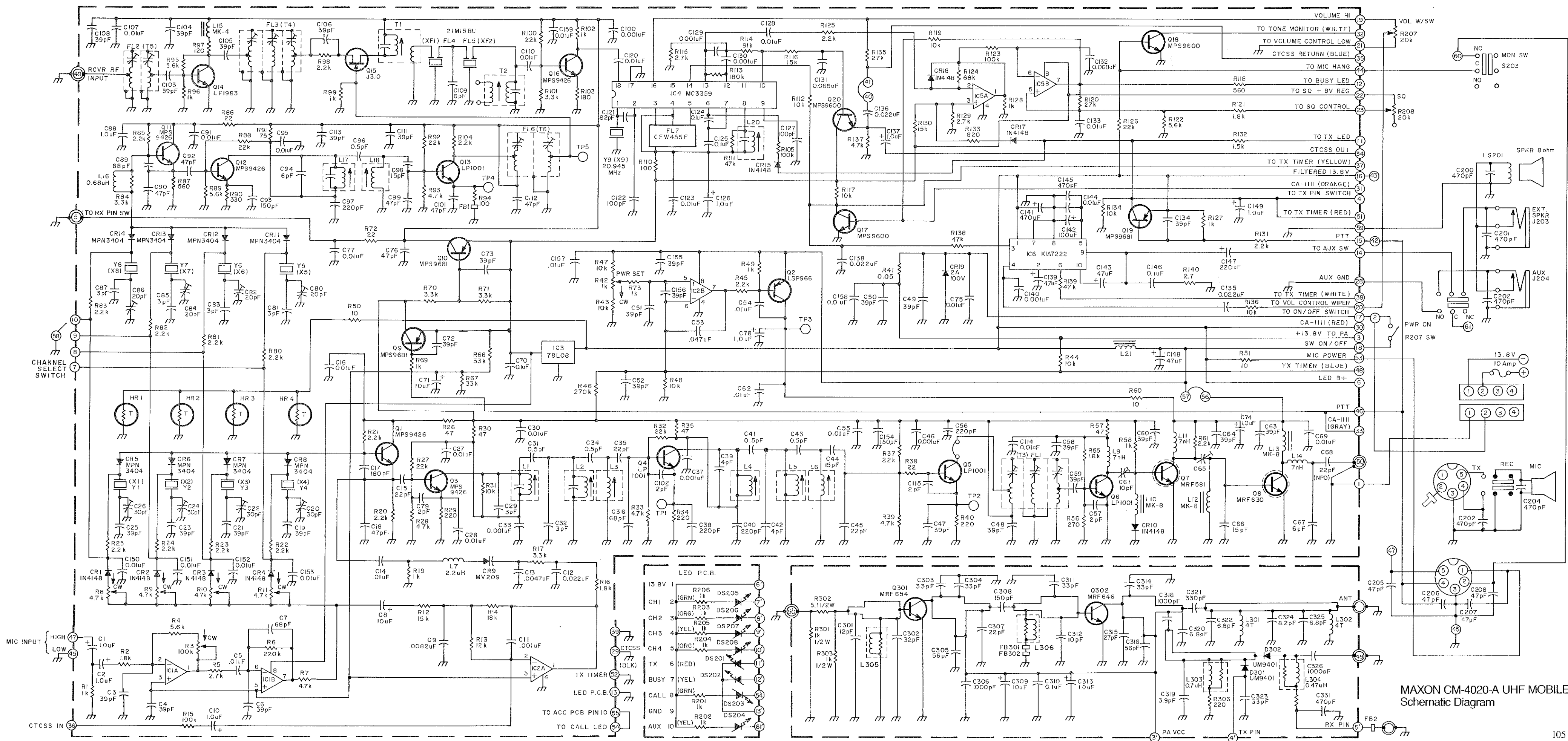
The base of Q3 is connected through an 8.2K resistor, R10, to the top of the squelch pot of the radio. When there is no signal detected by the receiver, there is enough voltage at this point to keep Q3 turned on. When VCC is applied to the circuit it acts as a timer as described above. When a carrier is detected at the receiver, the voltage at the top of the squelch pot is low enough to cause Q3 to be turned off when VCC is applied. This causes the SCR, Q1 to fire immediately on power up. This in turn causes the transmitter to have no output and the tone to be heard at the speaker. As long as there is a signal at the receiver the transmitter will not be allowed to function and when the push-to-talk switch is activated a warning tone will be heard at the speaker.

MAXON CM-4020-A UHF MOBILE MA-3476 Schematic Diagram



MAXON CM-4020-A UHF MOBILE MA-3476 Parts List

IDENTIFIER	PART NO.	DESCRIPTION
C1	1410031	Capacitor Tantalum 10 uF 16V
C2	1447024	Capacitor Tantalum 4.7 uF 16V
C3	1301128	Capacitor Ceramic Monolithic 0.01 uF
D1	2470076	Diode Chip RLS-71
D2	2470076	Diode Chip RLS-71
IC1	2230267	IC MC1455D
Q1	2030766	SCR MMRS5060
Q2	2030492	Transistor MMBTA20
Q3	2030492	Transistor MMBTA20
R1	0022752	Resistor Carbon Film 2.7M ohm 1/16W +5%
R2	0022752	Resistor Carbon Film 2.7M ohm 1/16W +5%
R3	0022752	Resistor Carbon Film 2.7M ohm 1/16W +5%
R4	0022752	Resistor Carbon Film 2.7M ohm 1/16W +5%
R5	0021216	Resistor Carbon Film 120 ohm 1/16W +5%
R6	0021030	Resistor Carbon Film 10k ohm 1/16W +5%
R7	0026804	Resistor Carbon Film 68 ohm 1/16W +5%
R8	0022741	Resistor Carbon Film 270k ohm 1/16W +5%
R9	0022741	Resistor Carbon Film 270k ohm 1/16W +5%
R10	0025621	Resistor Carbon Film 5.6k ohm 1/16W +5%
R11	0022224	Resistor Carbon Film 2.2k ohm 1/16W +5%
R12	0026804	Resistor Carbon Film 68 ohm 1/16W +5%



MAXON CM-4020-A UHF MOBILE Schematic Diagram