

TEMPO VHF/ONE

OPERATING AND MAINTENENCE MANUAL



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PLEASE READ THE OPERATING INSTRUCTIONS
BEFORE USING THE VHF/ONE.

NOTE: The schematic, block diagram, front and back
panel drawings, and parts layout are included in a
separate technical supplement.

Registered Owner: _____ Amateur Call: _____

Street: _____

City: _____ State: _____ Zip Code: _____

EQUIPMENT TYPE:

SERIAL NUMBER:

Purchased From: _____ Date: _____

Street: _____

City: _____ State: _____ Zip Code: _____

Please return this side to us within 10 days of the purchase date.

LIMITED WARRANTY

Henry Radio warrants each new product sold by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit which under normal installation, use, and service discloses such defect, provided the unit, or part, is delivered by the original owner to us intact for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to the original purchaser and provided that such examination discloses in our judgment that it is thus defective. Should a malfunction be suspected, write in detail to our service department for suggestions concerning the operation, repair, or return of your unit if it should prove necessary.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of the instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, nor in cases where the serial number thereof has been removed or defaced or changed, nor to units used with accessories not manufactured or recommended by us.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by Henry Radio without charge to the owner. This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

Henry Radio reserves the right to make any improvements to its products which it may deem desirable without obligation to install such improvements in its previously sold products.

.....TEMPO VHF/ONE OPERATING
.....AND MAINTENANCE MANUAL

SECTION ONE INTRODUCTION

1.1 GENERAL DESCRIPTION

The Tempo VHF/One is a VHF/FM transceiver for communications on the 2 meter amateur band between 144 and 148 MHz with an output power of 10 watts. The VHF/One is compact and light weight, making it ideal for mobile use from a 13.8 VDC, negative ground power source. It is attractive, ruggedly built, and employs completely solid state circuitry. The transceiver can also be used for base station operation when operated with its accessory AC power supply.

The VHF/One's special features include fully synthesized phase lock loop (PLL) frequency selection to 5 KHz for FM operation and a 5 digit LED frequency readout for the receive frequency. Repeater operation is accomplished with a toggle switch which allows simplex operation or ± 600 KHz transmit offset. There are also two programmable channels for often used frequencies. The front panel meter acts as an S-meter during receive and an RF power output meter during transmit. A rear panel jack is provided for wiring in accessories such as encoders, decoders, dialers, tone burst, etc. A side panel jack is provided for the use of an accessory single sideband converter, the Tempo SSB/One.

The transceiver's circuits are built on separate transceiver, synthesizer, display, and program boards. The transceiver's mechanical construction was designed for ease of service with maximum shielding to prevent unwanted spurious frequencies. All of the components are conservatively rated for long lasting reliable operation. A reverse polarity circuit gives fuse protection to prevent damage from improper power connections. The power transistor is protected against no load, or mismatched antenna conditions.

The VHF/One is a complex electronic component which can be damaged when improperly operated. Please read all of the operating instructions before installing the radio.

1.2 UNPACKING

Remove the transceiver from its shipping box and packing material and examine it carefully for visible damage. If the equipment has been damaged in shipment, save the box and packing material and notify the transportation company immediately. It is a good idea to save the box and packing in any case, since they are useful for shipping or moving the transceiver.

The following accessories should be packed inside the box with the transceiver.

PLACE
POSTAGE
HERE

Check to make sure that all of these are included.

- | | |
|---|-------------------------|
| 1 Manual | 1 Microphone Hanger |
| 1 Mobile mounting bracket
with mounting screws | 1 Replacement Fuse |
| 1 Low impedance hand
microphone | 1 Power Cord |
| | 1 9-pin Plug |
| | 1 External Speaker Plug |

1.3 INSTALLATION -- DC OPERATION

LOCATION AND ENVIRONMENT - Select a location for your transceiver which will allow free access to the front controls, good air circulation, rear access to the power and antenna connectors, and protection from extreme temperature changes.

The VHF/One is designed to work over a broad range of temperature conditions, voltages, and antenna conditions. However for maximum performance you must attempt to optimize your operating parameters.

Select the operating location as close as possible to the power source and the antenna location. At the same time, try to keep the cables as far as possible from potential noise sources. Do not mount the transceiver where it is hit by hot or cold ventilation. Also try to mount the transceiver so that the frequency display is easily visible from the operating position.

MOUNTING - The VHF/One is supplied with a bracket which allows "over" or "under" mounting by placing the U shaped bracket in the desired position. Figure 1 shows the possible ways of mounting the transceiver.

PRIMARY POWER - Install the supplied DC power cable by routing it to the selected 13.8 VDC power source. The red wire is positive (+) and the black wire is negative (-). Make sure that all connections are clean, tight, and moisture free. If the polarity is connected incorrectly the fuse will blow.

ANTENNA - There are many fine 2-meter antennas available. When the radio is installed, the antenna should be trimmed for minimum SWR. With the VHF/One, as with all solid state transmitters, the higher the SWR the lower the output power.

AMPLIFIERS - Henry Radio has a complete line of solid state power amplifiers to boost the transmitter power as high as 130 watts. When an amplifier is installed in the transmission line the SWR of the system (as seen by the transceiver) should again be adjusted for optimum performance.

MICROPHONE - The VHF/One is supplied with a low impedance PTT type, hand microphone. If a different microphone is required (base station, noise canceling, telephone hand set, speaker-mike, etc.) remember to choose a low impedance type.

SPEAKER - The VHF/One has a built-in speaker and provisions for a plug-in external speaker. The external speaker should be 8 ohms and capable of accepting at least one watt of audio.

HENRY RADIO, INC.
11240 West Olympic Blvd.
Los Angeles, Calif. 90064

(Cut Here)

Keep this side for your records.

EQUIPMENT TYPE:

SERIAL NUMBER:

PURCHASED FROM:

Distributor

Street

City State Zip Code

PURCHASE DATE

INVOICE NUMBER

PLEASE NOTE: Any warranty claim should be accompanied with a copy of the purchase invoice or another proof of purchase.

HENRY RADIO
11240 West Olympic Boulevard
Los Angeles, California 90064
(213) 477-6701

The attached warranty has been drafted to comply with the new Federal law applicable to products manufactured after July 4, 1975. It replaces the warranty included elsewhere in this package. This warranty in no manner reduces the coverage provided to you under the warranty it replaces.

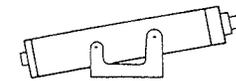
SCHEMATIC NO.	DESCRIPTION
R386	RESISTOR: Variable, semi-fixed, 10 K ohm, .1 watt, type B.
R387	RESISTOR: 4.7 K ohm
R389	RESISTOR: 2.2 K ohm
Y301	CRYSTAL: 14.14333 MHz, HC-18/U, 32 pf
Y302	CRYSTAL: 5.12 MHz, HC-18/U, 32 pf
PC-003A	PRINTED CIRCUIT BOARD: Synthesizer unit

9.4 DISPLAY UNIT (DSU-2A) PARTS

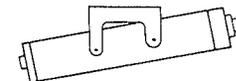
SCHEMATIC NO.	DESCRIPTION
DS401 through DS405	LED: 7 segment display, type TLR-303
DS406	LED: +5 KHz display, red, type TLR-102
DS407	LED: SIGNAL display, green, type TLG-102
DS408	LED: XMIT display, red, type TLR-102
R401	RESISTOR: Carbon composition, 680 ohm, 1/4 watt, 5%
R402 through R405	RESISTOR: Carbon composition, 1.2K ohm, 1/4 watt, 5%
R406	RESISTOR: Carbon composition, 680 ohm, 1/4 watt, 5%
PC-001A	PRINTED CIRCUIT BOARD: Display unit

9.5 DECODER UNIT (DEU-2A) PARTS

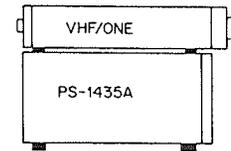
SCHEMATIC NO.	DESCRIPTION
IC401 through IC403	INTEGRATED CIRCUIT: TTL, type SN7447AN
R411 through R434	RESISTOR: Carbon composition, 1.2K ohm, 1/4 watt, 5%
RB401 through RB403	RESISTOR ARRAY: 1 K ohm, 10%, 4 times, type RK-1/8-B4-1K-K
PC-002A	PRINTED CIRCUIT BOARD: Decoder unit



MOUNT LOCATED BELOW FOR MOBILE OR BASE USE



MOUNT LOCATED ABOVE FOR MOBILE INSTALLATION



BASE CONFIGURATIONS

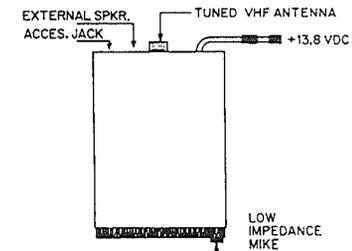


Figure 1. Installation Diagram.

1.4 INSTALLATION -- AC OPERATION

All of the elements described for DC operation should be kept in mind for AC operation. The only additional requirement would be an AC to DC power supply.

POWER SUPPLIES - The Tempo PS-1435-A is a matching power supply for the VHF/One. The Tempo PS-3 is a general purpose, less expensive power supply that will also operate the VHF/One. If another power supply is used, it should be capable of providing about 3.5 amps of filtered DC at 13.8 VDC.

SECTION 2 SPECIFICATIONS

2.1 GENERAL SPECIFICATIONS

- FREQUENCY RANGE: 144.000 to 147.995 for transmit and receive.
- OSCILLATION SYSTEM: PLL (Phase Lock Loop) synthesizer with two programmable channels.
- NUMBER OF SELECTABLE CHANNELS: 800 selectable receive frequencies with simplex and ± 600 KHz transmit frequencies for each receive frequency.
- CHANNEL SPACING: Selectable to 5 KHz increments.
- ANTENNA IMPEDANCE: 50 ohms unbalanced.
- POWER REQUIREMENTS: 13.8 VDC nominal, negative ground.
11.0 to 16.0 VDC possible.
Approximately 250 ma in receive.
Approximately 3.5 amps in transmit.
- MICROPHONE: Dynamic hand-held push-to-talk microphone with coil cord.
- FREQUENCY STABILITY: $\pm 0.0002\%$. MODE: F3.
- OPERATING CONDITIONS: Ambient temperature - -10 to +50 degrees C.
- METERING: Transmitting relative power output.
Relative strength of incoming signals on receive.
- INDICATOR LAMPS: Open squelch, transmit, and +5KHz lights.
- DIMENSIONS: 7.1" wide x 2.4" high x 9.4" deep.
- WEIGHT: 4.4 pounds (shipping weight approximately 8 pounds).

2.2 TRANSMITTER SPECIFICATIONS

- RF OUTPUT: 10 watts nominal.
- MODULATION: Direct frequency modulation to the VCO of the PLL.
- MAXIMUM DEVIATION: ± 10 KHz.
- AUDIO SENSITIVITY: 0.15 volts ± 3 db for 70% deviation.
- SPURIOUS AND HARMONIC ATTENUATION: 60 db nominal below the carrier power level.

SCHEMATIC NO.	DESCRIPTION
(All the resistors below are carbon, 1/4 watt, 5% resistors, unless otherwise noted)	
R301	RESISTORS: 100K ohm
R302	RESISTORS: 15K ohm
R303 and R304	RESISTORS: 100K ohm
R305	RESISTORS: 4.7 K ohm
R306	RESISTORS: 10K ohm
R307	RESISTORS: 100 ohm
R308	RESISTORS: 1K ohm
R309	RESISTORS: 100K ohm
R310	RESISTORS: 1.2K ohm
R311	RESISTORS: 100 ohm
R312	RESISTORS: 4.7K ohm
R313	RESISTORS: 15K ohm
R315	RESISTORS: 1K ohm
R316	RESISTORS: 470 ohm
R317	RESISTORS: 4.7K ohm
R318	RESISTORS: 1K ohm
R319	RESISTORS: 15K ohm
R320	RESISTORS: 220 ohm
R321	RESISTORS: 15K ohm
R322	RESISTORS: 33K ohm
R323	RESISTORS: 470 ohm
R324	RESISTORS: 390 ohm
R325	RESISTORS: 1K ohm
R326	RESISTORS: Variable, semifixed, 10K ohm, 1/10 W. type B
R327	RESISTORS: Carbon composition, 10K ohm, 1/4 W.
R329	RESISTORS: Variable, semifixed, 50K ohm, 1/10 W. type B
R331	RESISTORS: 68K ohm
R332	RESISTORS: 100K ohm
R333	RESISTORS: 68K ohm
R334	RESISTORS: 270 ohm
R335	RESISTORS: 6.8K ohm
R336	RESISTORS: 22K ohm
R337	RESISTORS: 100 ohm
R338	RESISTORS: 470 ohm
R339	RESISTORS: 4.7K ohm
R340	RESISTORS: 2.7K ohm
R341	RESISTORS: 100 ohm
R342	RESISTORS: 470 ohm
R343	RESISTORS: 4.7K ohm
R344	RESISTORS: 22K ohm
R345	RESISTORS: 100 ohm
R346	RESISTORS: 470 ohm
R347	RESISTORS: 100K ohm
R348	RESISTORS: 2.2K ohm
R349	RESISTORS: 6.8K ohm
R350	RESISTORS: 100 ohm
R351	RESISTORS: 100K ohm
R352	RESISTORS: 2.2K ohm
R353	RESISTORS: 100 ohm
R355	RESISTORS: 470 ohm
R361	RESISTORS: 1.8 K ohm
R362	RESISTORS: 220 ohm
R363	RESISTORS: 560 ohm
R364	RESISTORS: 220 ohm
R365 and R366	RESISTORS: 4.7 K ohm
R373 and R374	RESISTORS: 10 K ohm
R375	RESISTORS: 6.8 K ohm
R376 through R378	RESISTORS: 1 K ohm
R379	RESISTORS: 10 K ohm
R384	RESISTORS: Variable, semi-fixed, 10 K ohm, .1 watt, type B
R385	RESISTORS: 10 K ohm

SCHEMATIC NO.	DESCRIPTION
C323 through C325	CAPACITOR: Electrolytic, 2.2 microfarad, 25 VDC
C331	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C332	CAPACITOR: Electrolytic, 10 microfarad, 16 VDC
C333	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C334	CAPACITOR: Ceramic disc, 150 picofarad, 50 VDC
C335	CAPACITOR: Ceramic disc, 100 picofarad, 50 VDC
C336	CAPACITOR: Ceramic disc, 10 picofarad, 50 VDC
C337 and C338	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C339	CAPACITOR: Ceramic disc, 27 picofarad, 50 VDC
C340 and C341	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C342	CAPACITOR: Ceramic disc, 1 picofarad, 50 VDC
C343 through C345	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C346	CAPACITOR: Ceramic disc, 27 picofarad, 50 VDC
C347	CAPACITOR: Ceramic disc, 15 picofarad, 50 VDC
C348 and C349	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C350	CAPACITOR: Electrolytic, 100 microfarad, 16 VDC
C351 through C354	CAPACITOR: Ceramic feedthrough, 0.001 microfarad, 50 V
C357	CAPACITOR: Ceramic trimmer, 10 picofarad
C358	CAPACITOR: Ceramic disc, 22 picofarad, 50 VDC
C359	CAPACITOR: Ceramic disc, 3 picofarad, 50 VDC
C361	CAPACITOR: Ceramic disc, 0.02 microfarad, 25 VDC
C363 and C364	CAPACITOR: Ceramic disc, 680 picofarad, 50 VDC
C365	CAPACITOR: Ceramic trimmer, 10 picofarad
C366	CAPACITOR: Ceramic disc, 10 picofarad, 50 VDC
C367 and C368	CAPACITOR: Ceramic disc, 47 picofarad, 50 VDC
C369	CAPACITOR: Ceramic disc, 680 picofarad, 50 VDC
C372	CAPACITOR: Electrolytic, 4.7 microfarad, 16 VDC
C373 and C374	CAPACITOR: Polyester film, 0.1 microfarad, 50 VDC
C375	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C377 through C393	CAPACITOR: Ceramic feedthrough, 0.001 microfarad, 50V
C396	CAPACITOR: Polyester film, 0.01 microfarad, 50 VDC
C397	CAPACITOR: Electrolytic, 10 microfarad, 16 VDC
C398	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
CR301 and CR302	DIODE: Silicon, varicap diode, type 1S2236
CR303 through CR306	DIODE: Silicon, type 1S1555
CR307	DIODE: Silicon, varicap diode, type 1S1658
CR308	DIODE: Silicon, type 1S1555
CR310	DIODE: Silicon, zener, type 02BZ2.2
CR312	DIODE: Silicon, type 1S1555
IC301	INTEGRATED CIRCUIT: TTL, type SN7400N
IC302 and IC303	INTEGRATED CIRCUIT: TTL, type SN7490AN
IC304	INTEGRATED CIRCUIT: TTL-Linear, type MC4044P/ MPC1008C.
IC306 through IC308	INTEGRATED CIRCUIT: TTL, type SN74192N
L301	INDUCTOR: Coil, VCO, 135 MHz, type 34H-211-467
L302	INDUCTOR: Coil, choke, 0.15 microhenry
L303 through L305	INDUCTOR: Coil, RF, 146 MHz, type 34H-211-594
L306	INDUCTOR: Coil, RF, 43 MHz, type 34H-211-595
L307	INDUCTOR: Coil, RF, 127 MHz, type 34H-211-596
L308	INDUCTOR: Coil, choke, 10 microhenry
L309	INDUCTOR: Coil, choke, 1.0 microhenry
L310	INDUCTOR: Coil, choke, 0.47 microhenry
Q301	TRANSISTOR: Silicon, NPN, type 2SC784 (O)
Q302	TRANSISTOR: Silicon, FET, type 2SK19 (GR)
Q303 and Q304	TRANSISTOR: Silicon, NPN, type 2SC784 (O)
Q305 through Q307	TRANSISTOR: Silicon, NPN, type 2SC372 (O)
Q308	TRANSISTOR: Silicon, NPN, type 2SC784 (O)
Q309	TRANSISTOR: Silicon, FET, type 2SK10 (GR)
Q310	TRANSISTOR: Silicon, NPN, type 2SC372 (O)
Q314	TRANSISTOR: Silicon, NPN, type 2SC373
Q315	TRANSISTOR: Silicon, NPN, type 2SC234 (Y)
Q316	TRANSISTOR: Silicon, NPN, type 2SC373

FM NOISE: At least -50 db below ± 3.5 KHz deviation at 100 Hz.

2.2 RECEIVER SPECIFICATIONS

TYPE OF RECEIVER: Dual conversion superheterodyne.

SENSITIVITY: 0.5 microvolts nominal for 20 db quieting.

SQUELCH SENSITIVITY: Adjustable sensitivity starts at .2 microvolts or less.

SELECTIVITY: ± 6 KHz bandwidth at least 6 db down.
 ± 12 KHz bandwidth at least 60 db down.

SPURIOUS AND IMAGE ATTENUATION: At least 60 db below the desired signal threshold sensitivity.

AUDIO OUTPUT: At least 1 watt on internal speaker (with less than 10% distortion).

INTERMEDIATE FREQUENCIES: First - 10.7 MHz Second - 455 KHz.

AUDIO RESPONSE (for 1000 Hz tone): +6 db (± 3 db) at 300 Hz.
-8 db (± 3 db) at 3000 Hz.

SECTION 3 OPERATING CONTROLS

3.1 FRONT PANEL CONTROLS (See Figure 2)

FREQUENCY SELECTION SWITCH - This control is a dual concentric 10 - position switch for selecting the desired 100 KHz and 10 KHz receive frequency. The larger diameter knob closest to the front panel selects the 100 KHz and the smaller diameter knob farthest from the front panel selects the 10 KHz as displayed by the LEDs.

MHz/CH SWITCH - This 6 position rotary switch selects between 144, 145, 146, or 147 MHz or one of the two programmable channels. The display reads the selected MHz or reads the programmed channel, if they have been programmed.

SQL/+5 KHz SWITCH - This is a dual function control. The squelch control on the VHF/One removes the background noise from the speaker, allowing only signals stronger than the noise level to be received. With the volume at a comfortable level and the squelch fully counter clockwise you will hear the background noise from the speaker. Advance the squelch clockwise until the background noise just disappears from the speaker. Any signal stronger than that level will break the squelch. To receive weaker signals, the squelch must be turned down. Do not use any more squelch than necessary. The +5 KHz offset of the receive frequency is accomplished by pulling out the squelch knob. Whenever the knob is pulled out the +5 KHz indicator light is illuminated.

PWR/VOL SWITCH - This potentiometer switch control turns the transceiver on and off and adjusts the audio output from the transceiver. When the control is fully counterclockwise the transceiver is off. Turning the control clockwise turns the transceiver on and increases the volume level.

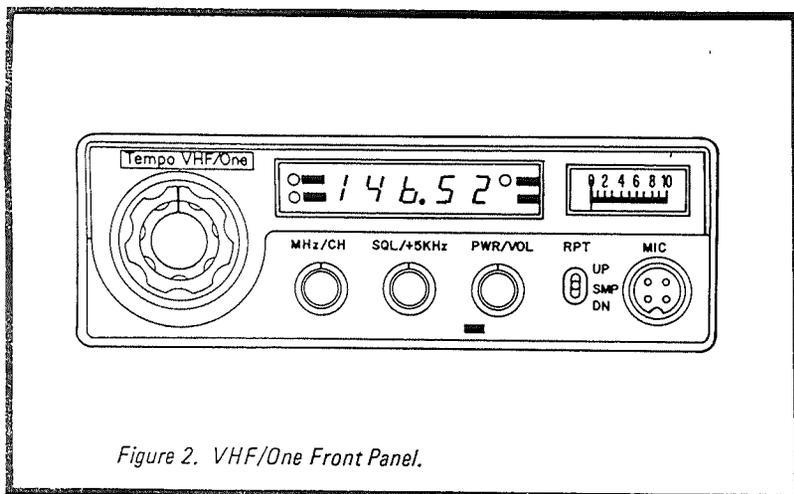


Figure 2. VHF/One Front Panel.

RPT SWITCH - This toggle switch selects the transmit frequency of the transceiver.

CAUTION: Always be certain that this switch is in the desired position. You could be interfacing on an incorrect frequency or operating out of band if the switch is in the wrong position.

In the UP position the transmit offset is +600 KHz. In the DN position the transmit offset is - 600 Hz from the displayed receive frequency. In the SMP position the transmit frequency is identical to the displayed receive frequency. See Section 4 for a more complete description.

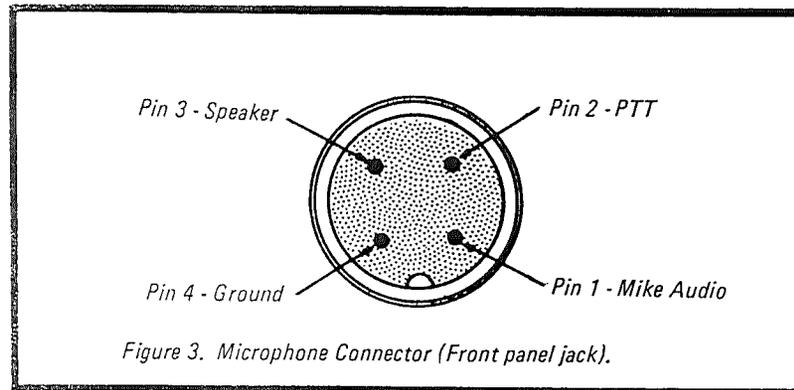


Figure 3. Microphone Connector (Front panel jack).

SCHMATIC NO.	DESCRIPTION
R154	RESISTOR: 4.7 K ohm
R155	RESISTOR: 15 K ohm
R156 and R157	RESISTOR: 1 K ohm
R158	RESISTOR: 100 ohm
R159	RESISTOR: 100 K ohm
R160	RESISTOR: 10 ohm
R161	RESISTOR: 560 ohm
R162	RESISTOR: 10 K ohm
R163	RESISTOR: 1 K ohm
R164	RESISTOR: 47 ohm
R165	RESISTOR: 4.7 K ohm
R166	RESISTOR: 470 ohm
R167	RESISTOR: 10 K ohm
R168	RESISTOR: 3.9 K ohm
R169	RESISTOR: Variable, semi-fixed, 10 K ohm, .1 watt, type B
R170	RESISTOR: 820 ohm
R171 and R172	RESISTOR: 3.3 K ohm
R173 and R174	RESISTOR: 150 ohm
R175	RESISTOR: 470 ohm
R176	RESISTOR: 220 ohm
R177	RESISTOR: 1 K ohm
R178	RESISTOR: 100 ohm
R179 through R182	RESISTOR: 1 K ohm
R183	RESISTOR: 100 ohm
R184	RESISTOR: 470 K ohm
R185	RESISTOR: 100 ohm
R186	RESISTOR: 470 K ohm
R187	RESISTOR: 100 K ohm
R188	RESISTOR: 150 ohm
R189	RESISTOR: 100 ohm
R190	RESISTOR: 4.7 K ohm
R191	RESISTOR: 15 K ohm
R192	RESISTOR: Carbon composition, 22 ohm, 5%, 1/4 watt
R193 and R194	RESISTOR: 100 ohm
R196	RESISTOR: 3.9 K ohm
R198	RESISTOR: 680 ohm
R199	RESISTOR: Carbon composition, 100 ohm, 5%, 1/4 watt
Y101	CRYSTAL: 2nd local oscillator, 10.245 MHz, type HC-18/U, 32 pf.
Y102	CRYSTAL: Simplex, 10.7 MHz, type HC-18/U, 32 pf
Y103	CRYSTAL: Down, 10.1 MHz, type HC-18/U, 32 pf
Y104	CRYSTAL: UP, 11.3 MHz, type HC-18/U, 32 pf
PC-004A	PRINTED CIRCUIT BOARD: R/T Unit

9.3 SYNTHESIZER UNIT (SYU-2A) PARTS

SCHMATIC NO.	DESCRIPTION
C301	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C302	CAPACITOR: Ceramic disc, 1 picofarad, 50 VDC
C303	CAPACITOR: Ceramic disc, 120 picofarad, 50 VDC
C304	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C305	CAPACITOR: Ceramic disc, 5 picofarad, 50 VDC
C306	CAPACITOR: Ceramic trimmer, 10 picofarad
C307	CAPACITOR: Ceramic disc, 22 picofarad, 50 VDC
C308	CAPACITOR: Ceramic disc, 12 picofarad, 50 VDC
C309	CAPACITOR: Ceramic disc, 5 picofarad, 50 VDC
C310 through C312	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C313	CAPACITOR: Ceramic disc, 5 picofarad, 50 VDC
C314	CAPACITOR: Ceramic disc, 10 picofarad, 50 VDC
C315 and C316	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C317	CAPACITOR: Ceramic disc, 1 picofarad, 50 VDC
C318 and C320	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C321	CAPACITOR: Polyester film, 0.022 microfarad, 50 VDC
C322	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC

SCHEMATIC NO.	DESCRIPTION
K101	RELAY: Type, NF4-12V
Q101	TRANSISTOR: Silicon, FET, type 3SK41 (K)
Q102	TRANSISTOR: Silicon, FET, type 2SK19 (GR)
Q103	TRANSISTOR: Silicon, FET, type 3SK35 (Y)
Q104	TRANSISTOR: Silicon, FET, type 2SK19 (GR)
Q105 through Q109	TRANSISTOR: Silicon, NPN, type 2SC372 (O)
Q110	TRANSISTOR: Silicon, PNP, type 2SA562 (Y)
Q111	TRANSISTOR: Silicon, NPN, type JA7152/2SC1449
Q112	TRANSISTOR: Silicon, NPN, type 2SC373
Q113	TRANSISTOR: Silicon, PNP, type 2SA562 (Y)
Q114	TRANSISTOR: Silicon, PNP, type 2SA489 (Y)
Q115	TRANSISTOR: Silicon, NPN, type 2SC372 (O)
Q116	TRANSISTOR: Silicon, PNP, type 2SA509 (Y)
Q117	TRANSISTOR: Silicon, FET, type 2SK19 (GR)
Q118	TRANSISTOR: Silicon, NPN, type 2SC784 (O)
Q119	TRANSISTOR: Silicon, NPN, type 2SC741
Q120	TRANSISTOR: Silicon, NPN, type 2SC1606
Q121	TRANSISTOR: Silicon, NPN, type 2SC1729
Q122 through Q124	TRANSISTOR: Silicon, FET, type 2SK19 (GR)
(NOTE: All of the resistors listed below are carbon, 1/4 watt, 5% resistors unless otherwise noted.)	
R101	RESISTOR: 22 ohm
R103	RESISTOR: 100 K ohm
R104	RESISTOR: 68 ohm
R105	RESISTOR: 100 ohm
R106	RESISTOR: 56 ohm
R109	RESISTOR: 2.2 K ohm
R110	RESISTOR: 10 K ohm
R111	RESISTOR: 1 K ohm
R112	RESISTOR: 470 ohm
R113	RESISTOR: 5.6 K ohm
R114	RESISTOR: 100 K ohm
R115	RESISTOR: 150 ohm
R116	RESISTOR: 100 ohm
R117 and R118	RESISTOR: 10 K ohm
R119	RESISTOR: 100 K ohm
R120	RESISTOR: 2.2 K ohm
R121	RESISTOR: 1.5 K ohm
R122	RESISTOR: 1 K ohm
R123	RESISTOR: 1.5 K ohm
R124	RESISTOR: 100 ohm
R125	RESISTOR: Variable, semi-fixed, 50 K ohm, .1 watt, type B
R126 and R127	RESISTOR: 100 ohm
R128 and R129	RESISTOR: 10 K ohm
R130	RESISTOR: 3.3 K ohm
R131	RESISTOR: 22 K ohm
R132	RESISTOR: 10 K ohm
R134	RESISTOR: 10 K ohm
R135	RESISTOR: 1 K ohm
R136	RESISTOR: 22 K ohm
R137	RESISTOR: 100 ohm
R138	RESISTOR: 560 ohm
R139	RESISTOR: 470 ohm
R140	RESISTOR: 100 ohm
R141 and R142	RESISTOR: 22 K ohm
R143	RESISTOR: 2.2 K ohm
R144	RESISTOR: 33 K ohm
R145	RESISTOR: 100 K ohm
R146	RESISTOR: 270 ohm
R147	RESISTOR: 1.2 K ohm
R148	RESISTOR: 1 K ohm
R149	RESISTOR: 47 K ohm
R150	RESISTOR: 150 K ohm
R151	RESISTOR: 150 K ohm
R152	RESISTOR: 10 K ohm
R153	RESISTOR: Variable, semi-fixed, 1 K ohm, .1 watt, type B

MIC CONNECTOR - The microphone connector is a 4-pin jack which mates with the connector attached to the microphone. Pin number 1 (See Figure 3) is the microphone audio, pin 2 is the PTT control, pin 3 brings the receiver audio to the front panel, and pin 4 is ground. See Figure 3 for wiring instructions remembering that the illustration shows the front panel jack, not the connector on the end of the microphone cord.

XMIT LIGHT - The transmit light illuminates whenever the VHF/One is transmitting.

SIG LIGHT - The signal light illuminates whenever the squelch is broken and a signal is being received.

DISPLAY - The 5 LED displays show the transceiver's receive frequency, as selected by the MHz switch, the 100 KHz switch, and the 10 KHz switch.

+5 KHZ LIGHT - The +5 KHz light is illuminated when the +5 KHz switch is pulled out to offset the receive frequency by +5 KHz.

METER - During receive the meter acts as an S-meter to indicate the relative strength of the received signal. During transmit the meter reads the relative power output of the transceiver.

3.2 BACK PANEL CONTROLS

ANTENNA CONNECTOR - The RF connector for the VHF/One is a UHF type coax connector which mates with a PL-259 plug. The transceiver should always be connected to a dummy load or VHF antenna whenever it is transmitting. Always use RG-58 or RG-8 50 ohm coaxial cable for this connection.

EXTERNAL SPEAKER - 8 OHMS - This connector is a mini type phone jack for connecting an 8 ohm external speaker. When a plug is inserted into the jack, the audio is removed from the transceiver's internal speaker.

DC - 13.8 VDC CORD - This cord connects the transceiver to its DC power source. The in line fuse is a 5 amp, 3 AG type. The red wire is positive and the black wire is negative. A DC cord with matching plug is supplied with the transceiver and extra cables are available on request.

ACC. CONNECTOR - This 9-pin connector has most of the connections wired to it which are required for common accessories (such as tone bursts, dialers, decoders, etc.). There are also three unused pins which can be wired as desired. The connections are as follows:

Pin 1 Ground	Pin 6 Discriminator
Pin 2 Mike Audio	Pin 7 Speaker
Pin 3 PTT	Pin 8 12 VDC (unswitched)
Pin 4 No Connection	Pin 9 No Connection
Pin 5 No Connection	

SECTION 4 OPERATION

4.1 MOUNTING AND INSTALLATION

The transceiver can be powered from a 13.8 VDC, negative ground battery source for mobile or portable operation or with an accessory AC power supply for base station operation. See Section 1 for instructions on proper installation.

4.2 STAND-BY

After properly installing the transceiver in its operating location, turn the VOLUME control clockwise to switch the transceiver on. The SQUELCH control should be fully counterclockwise.

Select the desired receive frequency, as displayed by the 5 LEDs, using the MHz/CH switch, the 100 KHz switch and the 10 KHz control. With no squelch, a sound will be heard and the green receive lamp will light. If no sound is audible, make sure the transceiver is working properly by turning the volume control further clockwise. Even if the channel is not in use, VHF noise can be heard. The meter light and panel back lights should be illuminated. If none of the lamps is lighted, check the power source and the power cord fuse.

Set the volume control about midscale for a comfortable audio level and, when the channel is free, turn the SQUELCH control clockwise until the channel noise just stops. For optimum performance, do not use a greater squelch level than necessary.

Pull the SQUELCH control knob out to offset the receive frequency +5 KHz for receiving 5 KHz or 15 KHz receive channels.

During receive the meter acts as an S-meter and shows the relative received signal strength. Before transmitting, be certain that the UP/SMP/DN switch is in the proper position to prevent transmitting at an undesired frequency.

4.3 TRANSMISSION

Connect the microphone to the VHF/One.

CAUTION: Be careful that your transmit frequency is where you want it. If the UP/SMP/DN switch is not in the desired position you can be interfering on an improper frequency or transmitting outside of the legal band limits.

SIMPLEX OPERATION - When the UP/SMP/DN switch is in its middle, simplex position, the VHF/One transmits at the receive frequency, as displayed on the transceiver.

Example: Set the receive display to read 146.52
Set the UP/SMP/DN switch to simplex
You are operating 146.52 simplex.

SCHEMATIC NO.	DESCRIPTION
C239	CAPACITOR: Ceramic disc, 100 picofarad, 50 VDC
C240	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C241 and C242	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C243	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C244 and C245	CAPACITOR: Ceramic trimmer, 20 picofarad
C246	CAPACITOR: Ceramic disc, 27 picofarad, 50 VDC
C247	CAPACITOR: Ceramic disc, 1 picofarad, 50 VDC
C248	CAPACITOR: Ceramic disc, 10 picofarad, 50 VDC
C249	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C250 and C251	CAPACITOR: Ceramic disc, 18 picofarad, 50 VDC
C254 and C255	CAPACITOR: Ceramic disc, 18 picofarad, 50 VDC
C256 and C257	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C258	CAPACITOR: Ceramic disc, 27 picofarad, 50 VDC
C259	CAPACITOR: Ceramic disc, 39 picofarad, 50 VDC
C260	CAPACITOR: Ceramic disc, 10 picofarad, 50 VDC
C261	CAPACITOR: Ceramic disc, 4 picofarad, 50 VDC
CR101 through CR103	DIODE: Silicon varicap diode, type 1S2236
CR105 through CR108	DIODE: Germanium, type 1N60
CR109 and CR110	DIODE: Silicon, type 1S1555
CR112	DIODE: Zener, type RD10E
CR113	DIODE: Zener, type RD5.1E
CR114 through CR122	DIODE: Silicon, type 1S1555
CR123 through CR125	DIODE: Germanium, type 1N60
CR130 through CR133	DIODE: Silicon, type 1S1555
CR136 through CR147	DIODE: Silicon, type 1S1555
CRB 101 through CRB104	DIODE: Silicon diode x 4, diode array, cathode common
D101	DISCRIMINATOR: Ceramic, 455 KHz, type SF-D-455D
FL101	FILTER: Crystal, bandpass, 10.7 MHz, ± 15 KHz, type 10F-30A
FL102	FILTER: Ceramic, bandpass, 455 ± 6 KHz, type CFM-455F
FL103	FILTER: LC, bandpass, 146 ± 2 MHz
IC101	INTEGRATED CIRCUIT: Linear, type TA7062P
IC102	INTEGRATED CIRCUIT: Linear, type TA7061P
IC103	INTEGRATED CIRCUIT: Linear, type TA7062P
IC104	INTEGRATED CIRCUIT: Linear, type MPC575-C2
L101	INDUCTOR: Coil, RF, 146 MHz, type 34H-067-691
L105	INDUCTOR: Coil, choke, 2.2 microhenry
L106 and L107	INDUCTOR: Coil, IF, 10.7 MHz, type SB-126
L108 and L109	INDUCTOR: Coil, IF, 455 KHz, type 168D
L110	INDUCTOR: Coil, AFC, 100 microhenry, 3 amp, type SN-10-50
L111	INDUCTOR: Coil, RF, 146 MHz, type 33Y-067-126
L113 and L114	INDUCTOR: Coil, RF, 146 MHz, type 34H-211-566
L115	INDUCTOR: Coil, RF, 146 MHz, type 34H-211-593
L116	INDUCTOR: Coil, RF, 146 MHz, type 34H-211-565
L117	INDUCTOR: Coil, RF, 146 MHz, type 34H-211-593
L118	INDUCTOR: Coil, RF, 146 MHz, type 34H-211-565
L119	INDUCTOR: Coil, RF, type SLP20-003-01
L120	INDUCTOR: Coil, RFC, type SLP20-003-06
L121	INDUCTOR: Coil, RF, type SLP20-003-03
L122	INDUCTOR: Coil, RFC, type SLP20-003-09
L123	INDUCTOR: Coil, RF, type SLP20-003-04
L124	INDUCTOR: Coil, RFC, type SLP20-003-07
L125	INDUCTOR: Coil, RF, type SLP20-003-05
L126	INDUCTOR: Coil, RFC, type SLP20-003-09
L127	INDUCTOR: Coil, RF, type SLP20-003-04
L128	INDUCTOR: Coil, RFC, type SLP20-003-08
L129	INDUCTOR: Coil, RF, type SLP20-003-05
L130	INDUCTOR: Coil, RFC, type SLP20-003-10
L131	INDUCTOR: Coil, RF, type SLP20-003-02
L133	INDUCTOR: Coil, RF, type SLP20-003-02
L134	INDUCTOR: Coil, IF, 10.7 MHz, type SB-126
J101	CONNECTOR: 15 pin, type 129-15-10-281P

SCHEMATIC NO.	DESCRIPTION
C153	CAPACITOR: Electrolytic, 4.7 microfarad, 25 VDC
C154	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C155	CAPACITOR: Ceramic disc, 220 picofarad, 50 VDC
C156	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C157 and C158	CAPACITOR: Electrolytic, 220 microfarad, 16 VDC
C159	CAPACITOR: Polyester film, 0.1 microfarad, 50 VDC
C160	CAPACITOR: Electrolytic, 10 microfarad, 16 VDC
C161	CAPACITOR: Ceramic disc, 0.001 microfarad, 50 VDC
C162	CAPACITOR: Electrolytic, 2.2 microfarad, 25 VDC
C163	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C165	CAPACITOR: Electrolytic, 2.2 microfarad, 25 VDC
C166	CAPACITOR: Polyester film, 0.001 microfarad, 50 VDC
C167	CAPACITOR: Electrolytic, 4.7 microfarad, 16 VDC
C168	CAPACITOR: Electrolytic, 1000 microfarad, 16 VDC
C169	CAPACITOR: Polyester film, 0.022 microfarad, 50 VDC
C170	CAPACITOR: Electrolytic, 1000 microfarad, 16 VDC
C171	CAPACITOR: Ceramic disc, 0.02 microfarad, 25 VDC
C172	CAPACITOR: Electrolytic, 220 microfarad, 16 VDC
C173	CAPACITOR: Ceramic disc, 470 picofarad, 50 VDC
C174	CAPACITOR: Polyester film, 0.0022 microfarad, 50 VDC
C175	CAPACITOR: Ceramic disc, 100 picofarad, 50 VDC
C178	CAPACITOR: Ceramic disc, 220 picofarad, 50 VDC
C179	CAPACITOR: Polyester film, 0.001 microfarad, 50 VDC
C180	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C181 through C183	CAPACITOR: Ceramic disc, 22 picofarad, 50 VDC
C184 through C186	CAPACITOR: Ceramic trimmer, 20 picofarad
C187 through C190	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C191	CAPACITOR: Ceramic disc, 220 picofarad, 50 VDC
C192	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C193	CAPACITOR: Ceramic disc, 3 picofarad, 50 VDC
C194	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C196 through C198	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C199	CAPACITOR: Ceramic disc, 15 picofarad, 50 VDC
C200	CAPACITOR: Ceramic disc, 2 picofarad, 50 VDC
C201	CAPACITOR: Ceramic disc, 15 picofarad, 50 VDC
C202	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C203	CAPACITOR: Ceramic disc, 7 picofarad, 50 VDC
C204	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C205	CAPACITOR: Ceramic disc, 3 picofarad, 50 VDC
C206	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C207	CAPACITOR: Ceramic disc, 3 picofarad, 50 VDC
C208	CAPACITOR: Ceramic disc, 7 picofarad, 50 VDC
C209	CAPACITOR: Ceramic disc, 33 picofarad, 50 VDC
C210	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C211	CAPACITOR: Ceramic disc, 3 picofarad, 50 VDC
C212	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C213	CAPACITOR: Ceramic disc, 3 picofarad, 50 VDC
C214	CAPACITOR: Ceramic disc, 8 picofarad, 50 VDC
C215	CAPACITOR: Ceramic disc, 33 picofarad, 50 VDC
C216	CAPACITOR: Ceramic disc, 5 picofarad, 50 VDC
C217	CAPACITOR: Ceramic trimmer, 20 picofarad
C218	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C219	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C220	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C221	CAPACITOR: Ceramic disc, 100 picofarad, 50 VDC
C222 and C223	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C224	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C225	CAPACITOR: Ceramic disc, 10 picofarad, 50 VDC
C226 and C227	CAPACITOR: Ceramic trimmer, 20 picofarad
C228	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C230	CAPACITOR: Ceramic disc, 100 picofarad, 50 VDC
C231 and C232	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC
C233	CAPACITOR: Electrolytic, 47 microfarad, 16 VDC
C234	CAPACITOR: Ceramic disc, 22 picofarad, 50 VDC
C235 and C236	CAPACITOR: Ceramic trimmer, 20 picofarad
C237	CAPACITOR: Ceramic disc, 0.001 microfarad, 25 VDC
C238	CAPACITOR: Ceramic disc, 0.01 microfarad, 25 VDC

REPEATER OPERATION - For repeater operation, the VHF/One offers the standard ± 600 KHz offsets used on the majority of repeaters in the United States. For operation on a repeater with a transmit frequency which not offset the standard 600 KHz, see the special instructions in Section 5.

Select the repeater's transmit frequency (your receive frequency) on the VHF/One. Set the UP/SMP/DN switch to the desired offset. In general for 30 KHz channels in the 146 MHz range the transmit frequency is offset 600 KHz down from the receive frequency.

Example: Set the display to 146.94
Set the UP/SMP/DN switch to DN
You are operating on the 146.34/146.94 repeater channel.

In general for 30 KHz channels in the 147 MHz range the transmit frequency is offset 600 KHz up from the receive frequency.

Example: Set the display to 147.09
Set the UP/SMP/DN switch to UP
You are operating on the 147.69/147.09 repeater channel.

For 5 KHz or 15 KHz channels the operating frequencies are selected in the same manner, except that the +5 KHz knob is pulled out and the +5 KHz lamp is lighted. However the transmit offset varies up or down in different parts of the country. Therefore you must check with local hams to find the correct offset and repeater channels.

REMEMBER: Please be certain that you are transmitting on the proper frequency.

During transmit the meter shows the relative power output level of the transmitter section. If the meter indicates low output, check the antenna for a proper match. Also during transmit the red transmit lamp is lighted.

With the transceiver's frequency switches and UP/SMP/DN switch in the proper location the VHF/One is ready for transmitting. Simply depress the microphone's transmit switch and talk at your normal level, keeping the microphone approximately 2 or 3 inches from the mouth. In final testing the transceiver's deviation control is adjusted for a normal speaking voice. However if your voice is softer or louder than the average, you may need to have a technician readjust the deviation for your voice. This procedure is described in Section 7.

4.4 PROGRAMMABLE CHANNELS

As a convenience to the operator the VHF/One has two programmable channels which are selected with the MHz/CH switch. You can use these channels for often used frequencies so that they can be quickly selected. The programming procedure is described in Section 5.1. You program the desired receive frequency and it is displayed in the same manner as any of the selectable receive frequencies. As in

normal operation you must set the UP/SMP/DN switch for the desired transmit offset.

The programmable channels can also easily be adapted to accept repeaters with a non standard transmit offset. That procedure is described in Section 5.2.

SECTION 5 PROGRAMMABLE CHANNELS AND NON STANDARD REPEATER OFFSETS

5.1 PRESET CHANNEL PROGRAMMING (See Figure 4)

The last two positions of the MHz/CH switch select two channel receive frequencies which are programmed into the transceiver board using silicon diodes. This feature can be used for commonly used channels or for non-standard repeater offsets as described in Section 5.2.

Use 1S555 type silicon diodes (GE-300 or HEP-R0050 diodes are equivalent) for the program. As an example, select 146.76 as the desired receive frequency. To program that receive frequency into the second channel, locate the bus wire on the programming matrix labeled M2 (select M1 for the first programmable channel). A diode is inserted in the hole labeled 146 (or whatever MHz desired) with the cathode (banded) end closest to the board (as shown in Figure 4).

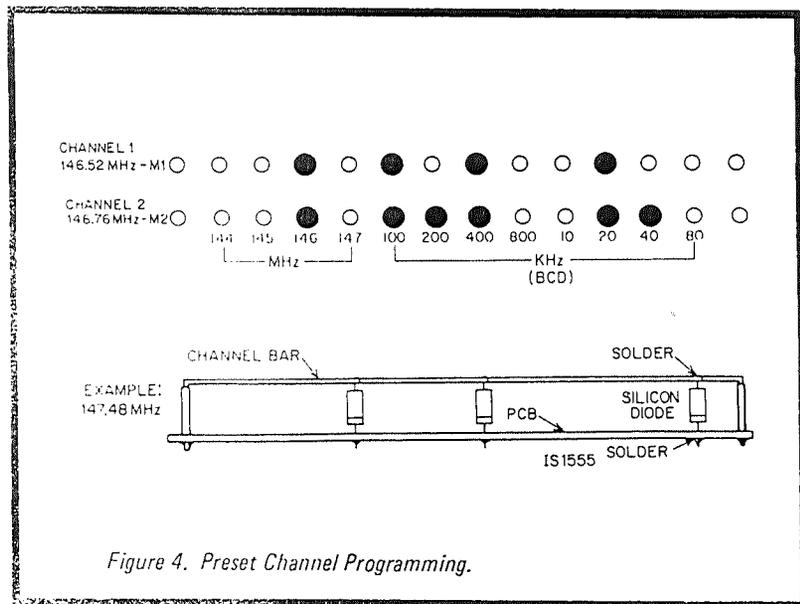


Figure 4. Preset Channel Programming.

SECTION 9 PARTS LIST

9.1 MAIN CHASSIS PARTS

SCHEMATIC NO.	DESCRIPTION
C2	CAPACITOR: Ceramic disc, 0.02 microfarads, 25 VDC. . . .
CR1	DIODE: Silicon, type 3BZ61.
F1	FUSE: 3AG, 5 amp, 250 VAC FUSEHOLDER: In-line DC fuseholder, 3 AG
J1	JACK: Microphone connector, 4-pin
J2	JACK: Antenna connector, UHF type, SO-239
J3	JACK: External speaker connector, RCA mini-plug type
J4	CONNECTOR: Accessory, 9-pin socket
J5	CONNECTOR: DC power cable plug, 2-pin plastic
M1	METER: Signal and power meter, 200 microamp, 650 ohms.
PL1 and PL2	PILOT LIGHT: 12 VDC, 30 ma
Q1	TRANSISTOR: Silicon, NPN, type 2SC509(Y)
R1	POTENTIOMETER: Power/volume control, 10 K ohms, type B, with built in power switch.
R2	POTENTIOMETER: Squelch/+5 KHz control, 10 K ohms, type B, with built in switch (pull on).
R4	RESISTOR: Carbon, 10 K ohm, 1/4 watt, 5%
S1	SWITCH: 100 KHz/10 KHz selector, double axis, rotary
S2	SWITCH: MHz/Channel selector, 2-pole, rotary switch
S3	SWITCH: Repeater switch, DPDT toggle
SP1	SPEAKER: 8 ohms, 0.5 watts

9.2 RECEIVER/TRANSMITTER BOARD (RTU-210SA) PARTS

SCHEMATIC NO.	DESCRIPTION
C101	CAPACITOR: Ceramic disc, 0.001 microfarads, 25 VDC. . . .
C102 through C105	CAPACITOR: Ceramic disc, 0.01 microfarads, 25 VDC. . . .
C106	CAPACITOR: Ceramic disc, 47 picofarads, 50 VDC.
C112	CAPACITOR: Ceramic disc, 0.001 microfarads, 25 VDC. . . .
C113 through C118	CAPACITOR: Ceramic disc, 0.01 microfarads, 25 VDC. . . .
C119	CAPACITOR: Ceramic disc, 100 picofarads, 50 VDC.
C120	CAPACITOR: Ceramic disc, 10 picofarads, 50 VDC.
C121	CAPACITOR: Ceramic disc, 22 picofarads, 50 VDC.
C122	CAPACITOR: Ceramic disc, 0.02 microfarads, 25 VDC.
C123	CAPACITOR: Ceramic disc, 0.001 microfarads, 25 VDC.
C124	CAPACITOR: Polyester film, 0.022 microfarads, 50 VDC.
C125	CAPACITOR: Ceramic disc, 18 picofarads, 50 VDC.
C126 and C127	CAPACITOR: Ceramic disc, 0.01 microfarads, 25 VDC.
C128 through C133	CAPACITOR: Polyester film, 0.022 microfarads, 50 VDC.
C135	CAPACITOR: Polyester film, 0.001 microfarads, 50 VDC.
C136	CAPACITOR: Polyester film, 0.01 microfarads, 50 VDC.
C137	CAPACITOR: Polyester film, 0.001 microfarads, 50 VDC.
C138	CAPACITOR: Polyester film, 0.01 microfarads, 50 VDC.
C139	CAPACITOR: Ceramic disc, 33 picofarads, 50 VDC.
C140	CAPACITOR: Ceramic disc, 150 picofarads, 50 VDC.
C141	CAPACITOR: Ceramic disc, 100 picofarads, 50 VDC.
C142	CAPACITOR: Ceramic disc, 0.01 microfarads, 25 VDC.
C143	CAPACITOR: Polyester film, 0.0022 microfarads, 50 VDC.
C144	CAPACITOR: Electrolytic, 10 microfarads, 16 VDC.
C145	CAPACITOR: Polyester film, 0.033 microfarads, 50 VDC.
C146 through C148	CAPACITOR: Electrolytic, 2.2 microfarads, 25 VDC.
C149	CAPACITOR: Electrolytic, 10 microfarads, 16 VDC.
C150	CAPACITOR: Electrolytic, 2.2 microfarads, 25 VDC.
C151	CAPACITOR: Polyester film, 0.033 microfarads, 50 VDC.
C152	CAPACITOR: Electrolytic, 2.2 microfarads, 25 VDC.

Pin Number	IC-301 SN7400N	IC-302 SN7493AN	IC-303 SN7493AN	IC-304 MC4044P	IC-306 SN74192N	IC-307 SN74192N	IC-308 SN74192N
Pin 1	2.2 VP-P	3.5 VP-P	3.5 VP-P	1.9 VDC	1.5 VDC	1.5 VDC	4.0 VDC
Pin 2	3.5 VP-P	0.0 VDC	0.0 VDC				
Pin 3	3.5 VP-P	0.0 VDC	0.0 VDC	3.5 VP-P			
Pin 4	3.5 VP-P				4.5 VP-P	4.5 VP-P	4.5 VP-P
Pin 5	2.2 VP-P	5.1 VDC	5.1 VDC	1.5 VDC	5.1 VDC	3.9 VDC	3.9 VDC
Pin 6	3.5 VP-P						
Pin 7	0.0 VP-P			0.0 VDC			
Pin 8	2.5 VP-P			2.4 VDC			0.0 VDC
Pin 9	1.4 VP-P			1.5 VDC			1.5 VDC
Pin 10	1.4 VP-P	0.0 VDC	0.0 VDC	1.5 VDC	0.0 VDC	0.0 VDC	0.0 VDC
Pin 11	2.0 VP-P	3.5 VP-P	3.5 VP-P		1.5 VDC	1.5 VDC	1.5 VDC
Pin 12	0.2 VP-P	3.5 VP-P	3.5 VP-P		3.5 VP-P	3.5 VP-P	4.0 VDC
Pin 13	0.2 VP-P				3.9 VDC	3.9 VDC	3.5 VP-P
Pin 14	5.1 VDC	3.5 VP-P	3.5 VP-P	5.1 VDC		3.5 VP-P	3.9 VDC
Pin 15					0.0 VDC	0.0 VDC	0.0 VDC
Pin 16					1.5 VDC	1.5 VDC	1.5 VDC
					5.1 VDC	5.1 VDC	5.1 VDC

The remainder of the program is additive. Diodes are inserted in the holes labeled 400, 200, and 100 to get the desired 700 KHz. And similarly diodes are inserted into the holes labeled 40 and 20 for the additional 60 KHz.

The diode tops are soldered to the bus wire and the bottoms are soldered to the board. The program selects only the receive frequency. The UP/SMP/DN switch selects the transmit offset from the receive frequency. From the selected 146.76 the standard offset would be down for the 146.16/146.76 repeater split.

5.2 NON-STANDARD REPEATER SPLITS (See Figure 5)

The VHF/One is supplied for sale in the United States with a repeater split of ± 600 KHz because that is the accepted standard split in this country. The offset is determined by the frequency of crystals Y102 (Down), Y103 (Simplex), and Y104 (Up). The easiest way to select a different offset is to replace Y102, Y103, or Y104 with a crystal which offers the desired offset.

Crystal Frequency =
 $10.7 \text{ MHz} + (\text{Desired Transmit Frequency} - \text{Desired Receive Frequency})$
 Specifications: HC-25/U holder, 20 pf load capacitance.

If you wish to maintain the standard splits and still have the choice of one or two non-standard splits, you must purchase (or build) and install an accessory oscillator module into one of the programmable channels. This module is called the Tempo VHF/OM, and the desired offset must be specified (for example + 1 MHz). Installing this oscillator module enables the VHF/One to operate on repeaters which utilize an offset different from the standard 600 KHz offset between receive and transmit. The oscillator module can be activated automatically in either or both of the fixed channel positions. For two different offsets two different oscillator modules can be installed.

The module works by replacing the 11.3 MHz (10.7 IF + 600 KHz) upshift oscillator circuit with an alternate (10.7 \pm Desired Shift) and is switched with the the auxilliary switch contacts on the MHz/CH switch. The crystal is determined by the formula described above.

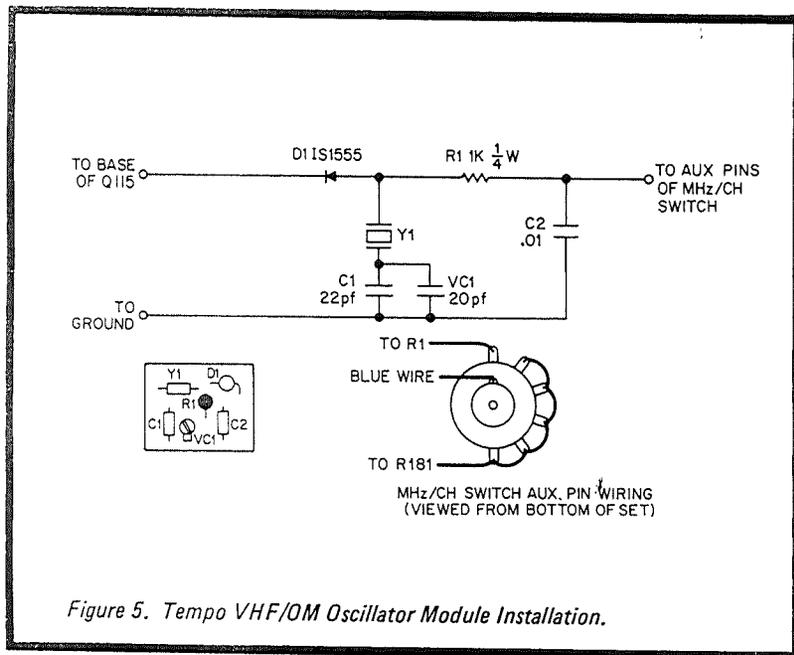
Begin the installation by programming the desired receive frequency as described in Section 5.1.

INSTALLATION -

(Step 1) - Mount the assembled oscillator module in the space directly below C130, C131, and C132 with double stick foam tape.

(Step 2) - Remove the SYV-2A synthesizer module by loosening the four corner screws and swinging the module gently over the front of the transceiver to expose the bottom of the main board.

(Step 3) - Prepare a 6" piece of solid insulated hook-up wire and strip 1" of insulation from one end and jumper the unused, auxilliary 144, 145, 146, 147, and M1 pins



on the MHz/CH switch.

(Step 4) - Locate the blue wire going to the bottom of the main board below R181. Remove this wire and replace it with the other end of the hookup wire used in Step 3.

(Step 5) - Reconnect the blue wire to the vacant common pin of the MHz/CH switch.

(Step 6) - Connect the wire from the junction of R1 and C2 on the oscillator module to the vacant M2 pin on the MHz/CH switch.

(Step 7) - Connect the wire from D1 on the oscillator module to the base of Q115. This is most easily accomplished on the bottom of the main board.

(Step 8) - Connect the remaining ground wire from the oscillator module to a convenient ground on the bottom of the main board. This completes the installation. Replace the synthesizer carefully back into place and put the cabinet back on the transceiver.

The VHF/One is now equipped to operate with a non-standard split in the second fixed channel position. If the same split is required for a second channel the jumper between the 147 and M1 switch contacts should be replaced by a jumper from M1 to M2. Alternatively, a second non-standard split can be used in the first fixed channel position by installing a second oscillator module next to the first one. The ground and D1 wires are paralleled with the first board. The wire from R1 would

8.3 SYNTHESIZER SECTION

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q301 - 2SC784 (O)	8.8 VDC	2.8 VDC	2.3 VDC
Q302 - 2SK19 (GR)	9.0 VDC (drain)	0.0 VDC (gate)	1.5 VDC (source)
Q303 - 2SC784 (O)	9.1 VDC	2.2 VDC	1.6 VDC
Q304 - 2SC784 (O)	9.1 VDC	2.2 VDC	1.6 VDC
Q305 - 2SC372 (O)	4.1 VDC	2.1 VDC	1.4 VDC
Q306 - 2SC372 (O)	8.6 VDC	1.7 VDC	2.4 VDC
Q307 - 2SC372 (O)	8.8 VDC	1.3 VDC	1.3 VDC
Q308 - 2SC784 (O)	8.8 VDC	1.5 VDC	1.6 VDC
Q309 - 2SK19 (GR)	3.0 VDC (drain)	0.0 VDC (gate)	2.0 VDC (source)
Q310 - 2SC372 (O)	3.4 VDC	0.75 VDC	0.0 VDC
Q311 - 2SC372 (O)	2.4 VDC	0.3 VDC	0.0 VDC
Q314 - 2SC373	6.4 VDC	3.2 VDC	2.5 VDC
Q315 - 2SC235 (Y)	12.5 VDC	5.7 VDC	5.1 VDC
Q316 - 2SC373	12.5 VDC	6.4 VDC	5.7 VDC

Test Point TP301	1.0 VRF
Test Point TP302	4.5 VP-P
Test Point TP303	2.5 VP-P (5.12 MHz)
Test Point TP304 - REF	3.5 VP-P (10 KHz)
Test Point TP305 - VAR	3.5 VP-P (10 KHz)

	COLLECTOR		BASE		EMITTER	
Q110 - 2SA562 (Y)	9.2 VDC	8.5 VDC (Sq. closed) 8.8 VDC (Sq. open)	9.2 VDC (Sq. closed) 0.0 VDC (Sq. open)			
Q111 - JA7152 - 2SC1449	12.5 VDC	10.0 VDC	9.3 VDC	9.3 VDC	9.3 VDC	9.3 VDC
Q112 - 2SC373	12.3 VDC	8.0 VDC	7.5 VDC	7.5 VDC	7.5 VDC	7.5 VDC
Q113 - 2SA562 (Y)	12.5 VDC	12.3 VDC	13.0 VDC	13.0 VDC	13.0 VDC	13.0 VDC
Q114 - 2SA489 (Y)	12.5 VDC	13.0 VDC	13.8 VDC	13.8 VDC	13.8 VDC	13.8 VDC
Q115 - 2SC372 (O)	7.5 VDC	3.1 VDC	3.9 VDC	3.9 VDC	3.9 VDC	3.9 VDC
Q116 - 2SA509 (Y)	9.2 VDC	8.6 VDC	9.3 VDC	9.3 VDC	9.3 VDC	9.3 VDC
Q117 - 2SK19 (GR)	8.4 VDC	1.7 VDC	1.35 VDC (source)	1.35 VDC (source)	1.35 VDC (source)	1.35 VDC (source)
Q118 - 2SC784 (O)	8.0 VDC	0.82 VDC	0.0 VDC	0.0 VDC	0.0 VDC	0.0 VDC
Q119 - 2SC741		0.65 VDC	0.0 VDC	0.0 VDC	0.0 VDC	0.0 VDC
Q120 - 2SC1606		0.05 VDC	0.0 VDC	0.0 VDC	0.0 VDC	0.0 VDC
Q121 - 2SC1729		0.0 VDC (gate)	1.15 VDC (source)	1.15 VDC (source)	1.15 VDC (source)	1.15 VDC (source)
Q122 - 2SK19 (GR)	8.2 VDC	0.0 VDC (drain)	0.0 VDC (gate)	0.0 VDC (gate)	0.0 VDC (gate)	0.0 VDC (gate)
Q123 - 2SK19 (GR)	8.2 VDC	0.0 VDC (drain)	0.0 VDC (gate)	0.0 VDC (gate)	0.0 VDC (gate)	0.0 VDC (gate)
Q124 - 2SK19 (GR)	8.6 VDC	0.0 VDC (drain)	0.0 VDC (gate)	0.0 VDC (gate)	0.0 VDC (gate)	0.0 VDC (gate)

Integrated Circuit	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
IC101 - TA7062P	2.3 VDC	0.07 VDC	0.0 VDC	8.3 VDC	8.3 VDC	none	none	none
IC102 - TA7061P	1.9 VDC	1.9 VDC	9.1 VDC	0.0 VDC	8.2 VDC	1.9 VDC	1.9 VDC	none
IC103 - TA7062P	1.5 VDC	0.9 VDC	0.0 VDC	0.9 VDC	2.1 VDC	none	none	none
IC104 - uPC575C2	1.7 VDC	12.3 VDC	11.7 VDC	7.2 VDC	6.0 VDC	12.5 VDC	0.06 VDC	1.7 VDC

run to the M1 contact with no jumpers installed between M1 and M2.

OPERATION AND ALIGNMENT -

With the M2 position programmed to the desired receive frequency and the oscillator module installed as described above, put the UP/SMP/DN switch in the UP position and depress the transmit switch. Adjust VC1 on the oscillator module until the transmit frequency, as measured on an accurate frequency counter, is netted right onto frequency. Operation on the non-standard split is now achieved simply by setting the MHz/CH switch fully clockwise and the UP/SMP/DN switch to the UP position. Should simplex operation be desired on the receive frequency, set the UP/SMP/DN switch to the SMP position.

SECTION 6 CIRCUIT DESCRIPTION

6.1 INTRODUCTION

The VHF/1 Tempo transceiver includes a main chassis, a receiver/transmitter printed circuit board (RTU-210SA), a synthesizer board (SYU-2A), a matrix board, a display unit (DSU-2A), a decoder board (DEU-2A) and an accessory receptacle plug for the SSB (single side band) accessory. This plug is on the right hand side of the main frame. Service, alignment and maintenance is easy because of the open construction.

6.2 SYNTHESIZER STAGE--PHASED LOCKED LOOP

The synthesizer consists of a printed circuit board (SYU-2A). The voltage controlled oscillator (VCO) covers the entire 2 meter band in increments of 10 KHz with an additional offset of 5 KHz for split channels. Plus or minus 600 KHz offset is available for normal repeater operation and no offset is used for simplex operation. The synthesizer is used in both receiving and transmitting.

The reference oscillator is crystal Y302 controlled at 5120 KHz which is divided by 2, 16 and 16 to provide 10 KHz. The location oscillator is crystal Y301 controlled at 14,143.33 KHz and is multiplied by 3 and 3 and then is mixed with the VCO (Q301) which operates from 133.3 MHz to 137.3 MHz. The difference signal from the mixer is injected into the programed 1/N divider chain. This signal is divided by selected ratios to produce 10 KHz increments.

The 10 KHz from the location oscillator (Y301) and the 10 KHz from the reference oscillator (Y302) are compared by the phase detector (IC304). The output of IC304 has a voltage proportional to the phase difference of the two 10 KHz signals which is applied to the VCO by a varicap diode (CR302).

Digital data from the synthesizer is passed on to the decoders (IC401, IC402, and IC403) and then to the display LEDs (DS401 through DS408). This results in a 5 digit red display which reads to 10 KHz plus a 5 KHz indicator.

6.3 TRANSMITTER SECTION

CRYSTAL OSCILLATORS, BUFFERS AND POWER AMPLIFIER

The crystal oscillators (Y102, Y103 and Y104) operate, one at a time, on 10.7 MHz, 10.1 MHz and 11.3 MHz. These three crystals determine whether the 600 split is plus or minus or whether the VHF/1 is operating simplex. Whichever crystal is selected drives the balanced mixer (Q122 and Q123). The synthesizer is mixed with one of the three frequencies in this stage. The output of the mixer is at the signal frequency of 144 MHz to 147.9 MHz. The mixer output drives the amplifier (Q124) which is followed by a bandpass filter which in turn drives three cascaded amplifiers (Q117, Q118 and Q119). Q119 excites the driver (Q120) which in turn excites the 10 watt final amplifier (Q121). A low pass filter is between the power amplifier and the antenna relay.

MICROPHONE AMPLIFIERS

Microphone amplifier (Q108) drives the second microphone amplifier (Q305) which is followed by limiter (CR305 and CR306). The VCO is then modulated by the FM diode (CR301).

6.4 RECEIVER SECTION

R.F. AMPLIFIER

The R.F. amplifier (Q101) is a dual gate mosfet and it exhibits a high resistance to cross modulation. This is followed by a three section helical band pass filter which further increases the resistance to cross modulation.

FIRST MIXER, FIRST LOCAL OSCILLATOR AND FIRST I.F.

The first mixer (Q102) changes the signal to 10.7 MHz. The local oscillator (the synthesizer described in paragraph 6.2) beats against the 144 MHz to 147.9 MHz signal and results in 10.7 MHz. This signal is passed on to a band pass filter (FL101) and then to the first I.F. amplifier (Q103).

SECOND MIXER AND LOCAL OSCILLATOR

This mixer (Q104) changes the 10.7 MHz signal into the second I.F. of 455 KHz. The second local oscillator (Q105) is crystal controlled operating at 10.245 MHz for the output of 455 KHz.

SECTION 8 VOLTAGE MEASUREMENTS.....

8.1 MAIN CHASSIS

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q1 - 2SC509 (Y)	9.0 VDC	8.6 VDC (SMP)	8.0 VDC (SMP)

8.2 TRANSCEIVER SECTION

TRANSISTOR	COLLECTOR	BASE	EMITTER
Q101 - 3SK41 (K)	8.4 VDC (drain)	0.0 VDC (gate 1) 4.7 VDC (gate 2)	0.67 VDC (source)
Q102 - 2SK19 (GR)	8.5 VDC (drain)	0.0 VDC (gate)	1.8 VDC (source) 0.23 VRF (source)
Q103 - 3SK35 (Y)	9.2 VDC (drain)	0.0 VDC (gate 1) 4.7 VDC (gate 2)	0.31 VDC (source)
Q104 - 2SK19 (GR)	6.5 VDC (drain)	0.0 VDC (gate)	2.3 VDC (source) 0.68 VRF (source)
Q105 - 2SC372 (O)	8.8 VDC	2.5 VDC	2.9 VDC 0.78 VRF
Q106 - 2SC372 (O)	1.22 VDC (Sq. closed) 0.15 VDC (Sq. open)	0.05 VDC (Sq. closed) 0.66 VDC (Sq. open)	0.0 VDC
Q107 - 2SC372 (O)	5.3 VDC (Sq. closed) 9.2 VDC (Sq. open)	1.22 VDC (Sq. closed) 0.15 VDC (Sq. open)	0.55 VDC (Sq. closed) 0.05 VDC (Sq. open)
Q108 - 2SC372 (?)	5.9 VDC	2.2 VDC	1.6 VDC
Q109 - 2SC372 (O)	8.5 VDC (Sq. closed) 8.8 VDC (Sq. open)	0.71 VDC (Sq. closed) 0.13 VDC (Sq. open)	0.0 VDC

7.2 TUNING THE FINAL POWER AMPLIFIER STAGES

The transceiver has been factory tuned for optimum power output and should not require additional tuning in the field. Should one of the output transistors fail and require replacement, the following adjustments can be made using a VHF dummy load and a VHF wattmeter.

Adjust the following variable capacitors in sequence for a maximum output reading on the wattmeter: C217, C226, C227, C230, C235, C244, and C245. The power supply voltage should be adjusted for 13.8 VDC for an accurate power reading.

7.3 SYNTHESIZER FREQUENCY ADJUSTMENT

Only two crystals are used to synthesize all the receive frequencies from 144 to 148 MHz, therefore calibration is fairly simple. It should be noted, however, that the accuracy of the transceiver will be no better than the equipment used to calibrate it. For this reason, a high accuracy frequency counter must be used rather than relying on off-the-air signals for a calibration standard.

Loosely couple a frequency measuring device to TP301 on the synthesizer board and adjust C357 for a reading of 14.143333 MHz. Move the frequency counter to TP303 and adjust C365 for a reading of 5.120000 MHz.

With the repeater switch in the simplex position, transmit a 147.00 MHz signal into a dummy load. Adjust C184 for a frequency counter reading of 147.00. Move the switch to the UP position and adjust C186 for a reading of 147.60. Move the switch to the DOWN position and adjust C85 for a reading of 146.40 MHz. This completes the frequency alignment.

7.4 RECEIVER ALIGNMENT

Switch the VHF/One and tune a signal generator to 146.00 MHz. Apply a signal to the antenna jack strong enough to deflect the front panel RF meter. The following adjustments should be made with the proper non-metallic alignment tools to avoid cracking the coil cores, or shorting the circuit.

RF STAGE - Peak L101 and L106 for maximum meter deflection. The bandpass filter, FL103 has been factory sweep-aligned and should not require field adjustment.

10.7 MHz IF - Adjust L104 for a maximum meter reading.

455 KHz IF - Peak L108 and L109 for a maximum meter reading.

SECOND I.F. AMPLIFIERS, DISCRIMINATOR AND SQUELCH

The 455 KHz signal enters the band pass filter (FL102) and then the signal is cascaded by two IC amplifiers (IC101 and IC102). A signal detector (CR105 and CR106) for the "S" meter operates off of the first I.F. amplifier (IC101). Following the last I.F. amplifier (IC102) is the discriminator (D101, CR107 and CR108). The discriminator feeds the audio amplifier (Q107) and noise amplifier (IC103) and the noise detector (CR109 and CR110). The squelch control (Q106) follows the noise detector and re-enters the signal channel at the audio amplifier (Q107).

AUDIO AMPLIFIER

The first audio amplifier (Q107) is squelched by Q106. Amplifier Q107 is followed by the last audio amplifier (IC104) with external jack (J3) for an external speaker. This output is also available at the accessory plug (J4) and the microphone jack (J1) for a handset.

POWER SUPPLY

The required power supply is a nominal 13.8 volts at 0.3 amperes for receiving and 3.5 amperes for transmitting. This power will normally be supplied by either an auto battery or a well regulated supply from the A.C. power mains. The VHF/1 and the input voltage is polarity protected by a diode (CR1) connected across the power leads. In the event of reversed polarity, the diode will blow the 5 ampere fuse (F1) located in the positive lead of the power supply.

The voltage is regulated to 12, 9, 9 and 5 volts by zener diodes controlling pass transistors. These voltages are used throughout the VHF/1 for various requirements.

SECTION 7 ALIGNMENT AND ADJUSTMENTS

7.1 ADJUSTING THE MICROPHONE LEVEL

A deviation meter is required for these adjustments. Advance the deviation control, R326 on the synthesizer board, to maximum. Talk into the microphone at a normal level (with the deviation meter attached to the transceiver's output) and adjust the microphone level potentiometer, R153 on the main board, for about 6 KHz deviation. Whistle or shout into the mike and lower R326 to a point where deviation does not exceed 5 or 6 KHz.

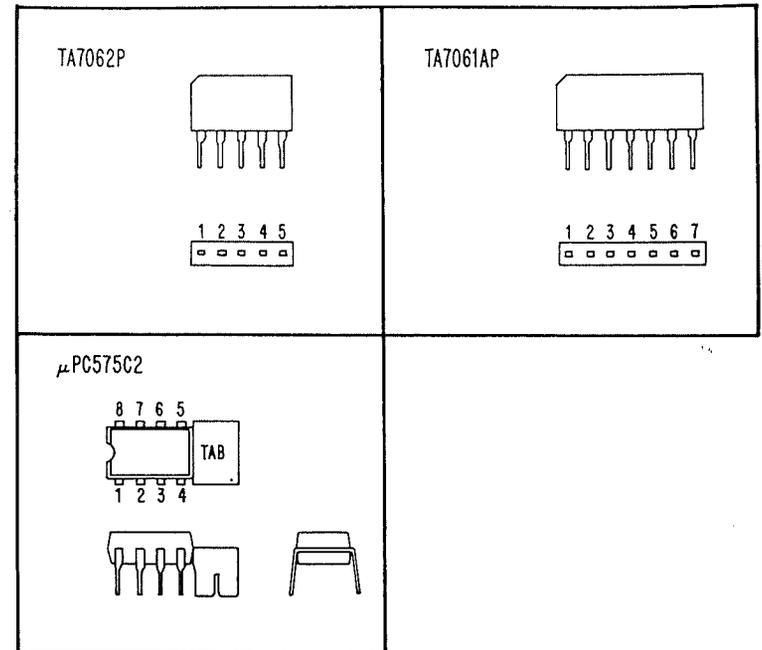
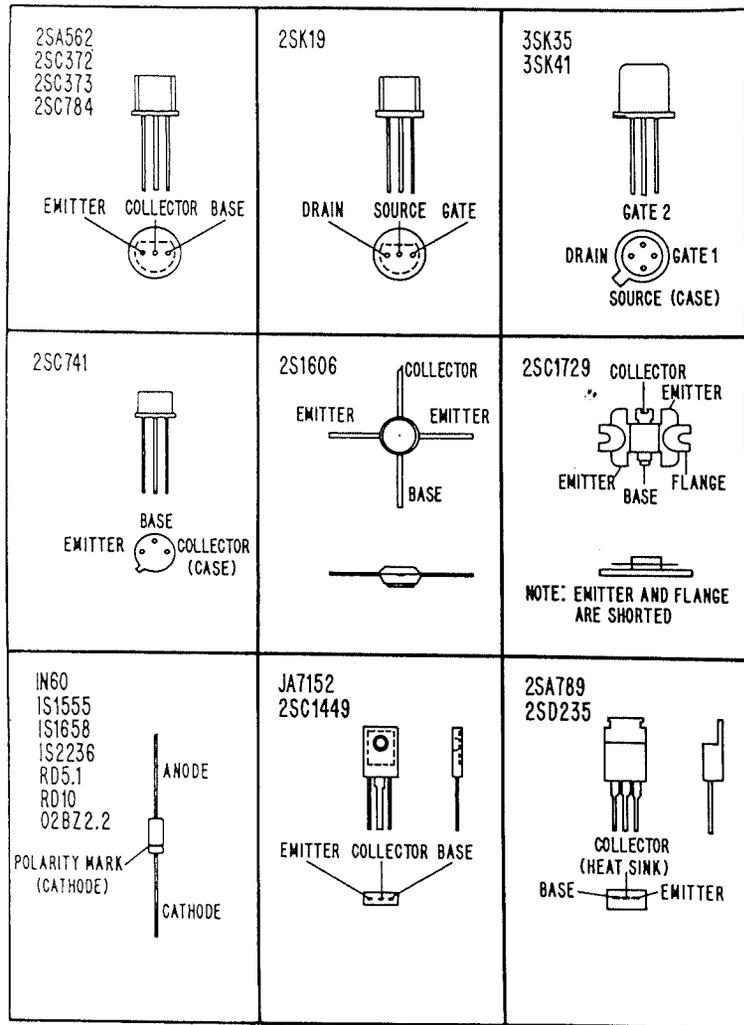


Figure 6. Semiconductor Diagrams.