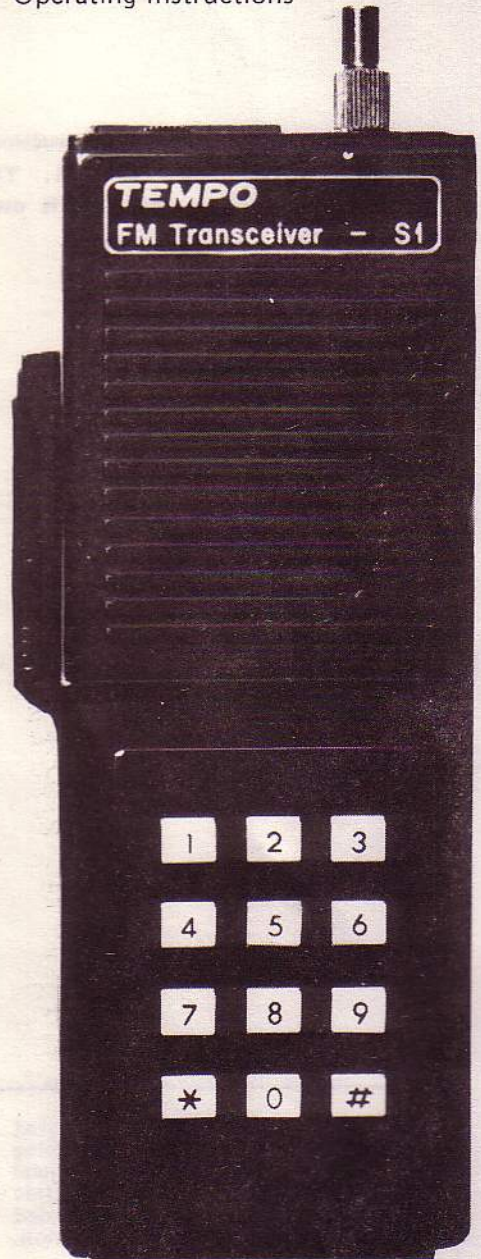


Tempo S1

Synthesized Hand Held Transceiver  
Operating Instructions





Please read the operating instructions completely before using the S1. The transceiver can be damaged if it is used improperly.

**CAUTION:** The S1 can be operated outside the amateur band by forcing the stops on the MHz thumbwheel switch. Operation of the S1 outside the amateur band is not recommended and is prohibited by FCC regulation.

## TEMPO S1 PLL SYNTHESIZED HAND HELD TRANSCEIVER

### OPERATING INSTRUCTIONS

#### GENERAL DESCRIPTION

The Tempo S1 VHF hand held transceiver is a phase locked loop synthesized 800 channel unit capable of operation between 144 and 148 MHz in 5 KHz steps. The S1 includes the following features:

Direct frequency readout in 5 KHz steps controlled by thumbwheel and slide switches.

Low current drain — 17 ma receiver standby and 400 ma transmit.

LED battery monitor and transmit indicator.

Built-in telescoping quarter wave telescoping antenna.

Slide switch selectable  $\pm 600$  KHz transmit offset or simplex operation.

High impact resistant Lexan case.

A full line of accessory items including:

TS-HA - Helical Antenna

TS-CC - Leather Holster

TS-MC - Cigarette Lighter Charger

S30 - 30 watt matching amplifier

S1T - Installed 12 button TTP

A full line of optional touch tone pads. A full line of optional tone control accessories.

#### UNPACKING THE TEMPO S1

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

The following accessories are packed inside the box with the Tempo S1. Make sure that all of these have been included.



- 1 Operating Manual
- 1 Earphone
- 1 Battery Charger

## SPECIFICATIONS

### GENERAL

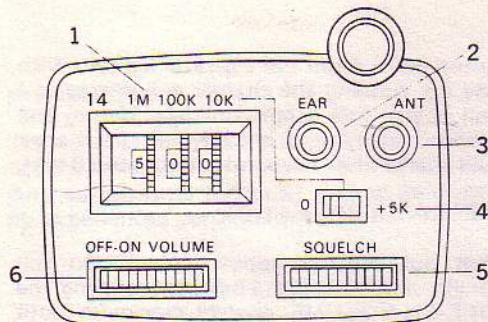
Frequency Coverage. . . . . 144 to 148 MHz  
 Frequency Generation . . . . . PLL Synthesizer  
 Channels . . . . . 800 (every 5 KHz)  
 Power Requirements . . . . . 9.6 VDC  
     400 ma during transmit  
     17 ma during receive standby  
 Battery Pack. . . . . 8 cell nicad pack  
     with 250 ma/hr capacity  
 Antenna Impedance. . . . . 50 ohms nominal  
 Dimensions . . . . . 40 x 62 x 165 mm  
     1.6 x 2.5 x 6.5 inches  
 Weight. . . . . 400 grams (16 oz)

### TRANSMITTER

RF Output. . . . . 1.5 watts nominal  
 Transmit Offset. . . . .  $\pm 600$  KHz/simplex  
 Deviation. . . . .  $\pm 5$  KHz  
 Harmonics . . . . . better than 60 dB down  
 Spurious Response. . . . . better than 60 dB  
     down out of band, better than  
     70 dB down in band

### RECEIVER

Sensitivity . . . . . better than .3 mv  
     for 20 dB SINAD  
 Selectivity . . . . . 80 dB  $\pm 30$  KHz  
 Intermodulation . . . . . 60 dB down or better  
 Image and Spurious Ratio . . . . . .65 dB  
 Audio Output. . . . .  $\frac{1}{2}$  watt with less than  
     10% distortion



1. Thumbwheel switches for selection of MHz, 100 KHz, and 10 KHz.
2. Earphone Jack for external 8 ohm earphone - accessory supplied.
3. External Antenna Jack for connection to a 50 ohm external antenna.
4. Slide switch for 5 KHz offset. In the 0 position the 1 KHz frequency is 0 and in the +5 K position the 1 KHz frequency is 5 KHz added to the readings on the thumbwheels.
5. Squelch Control.
6. On/Off volume switch.
7. Charging jack is not shown and is located on the back panel of the transceiver.
8. Transmit Offset switch is also on the back panel of the transceiver.
9. The red LED on the front of the S1 lights during transmit. It also lights and stays on during receive when the batteries need charging.

## OPERATION

### CHARGING THE BATTERIES

The battery pack should be charged before operation of the transceiver. To obtain the longest life from the NICAD battery pack, it is best to recharge the batteries when the red battery/transmit indicator comes on in the receive mode. To charge the unit, insert the charging plug into the CHG jack on the rear panel of the S1. Then plug the charger into a 110 VAC outlet. The time required for a full charge of an uncharged battery pack is approximately 10 hours. The S1 may be operated while being charged without any adverse effect on the radio or the battery pack.

The TS-MC accessory cigarette lighter charger will charge the batteries in your



automobile, from the cigarette lighter. With the car running the charger will charge at a full charge rate (approximately 35 ma) and when the engine is not running the charger will charge at a trickle rate (less than 10 ma).

## RECEIVER OPERATION

Pull out the telescoping antenna to full length and turn the S1 on by rotating the OFF-ON-VOLUME control clockwise until a click is heard. The click indicates that the set is on and further adjustment of the control sets the desired volume level. Adjust the SQUELCH control clockwise until the rushing noise from the receiver is quieted. Select the frequency of operation using the top panel thumbwheels and +5 KHz switch. Set the back panel offset switch to transmit simplex, +600 KHz, or -600 KHz. Repeater frequency information may be obtained from the ARRL Repeater Directory or a similar publication.

## TRANSMIT OPERATION

**CAUTION:** Be certain that the offset switch on the back panel is in the correct position so that you are not transmitting on an incorrect frequency or out of the band!

To transmit, press the PTT lever on the left side of the S1. When the lever is fully depressed the red LED on the front panel will glow. Hold the speaker grill to your mouth and speak in a normal tone of voice to modulate the transceiver. For best results, keep the rig very close to your mouth.

**CAUTION:** Reception of excessively strong signals may damage the RF amplifier transistor. Exercise caution when operating close to a mobile or fixed station running in excess of 100 watts output or the receiver may be damaged.

**CAUTION:** Do not transmit with the antenna down or without an antenna. The PA transistor can be damaged by transmitting with a poor antenna. Only transmit into a resonant antenna or a 50 ohm dummy load.

## MAINTENANCE AND STORAGE

Avoid placing the transceiver in direct sunlight or in an environment where the temperature exceeds 60 degrees C or the humidity

exceeds 95%.

The case of the transceiver should not be opened except by an experienced technician. Any adjustments to the S1 should be made by experienced personnel.

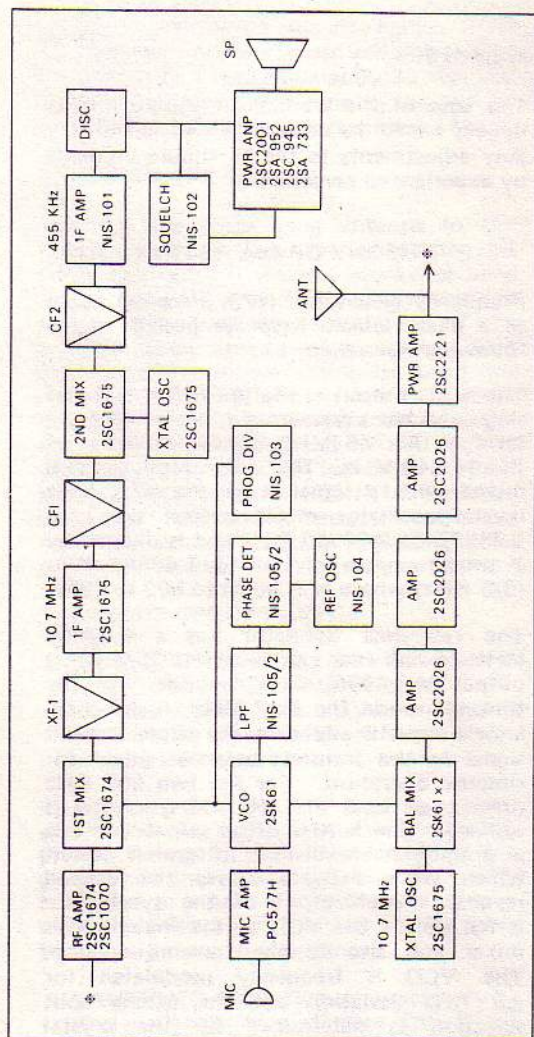
## THEORY OF OPERATION

Frequency generation takes place by means of a phase locked loop synthesizer in the following manner.

The VCO output is multiplied by a tripler stage and has a frequency range of 44.4333 MHz to 45.765 MHz for full coverage of 144 to 148 MHz. The VCO output signal is mixed with a signal from the 43.1 MHz crystal oscillator mixer output signal of 1.33333 to 2.66500 MHz and is divided by a programmable divider to 1.66666 KHz (5/3 KHz) where N is equal to 800 to 1599.

The reference oscillator has a 6.82666 MHz crystal and 1.66666 KHz (5/3 KHz) output by 4096 division ratios. In the transmit mode the 10.7 MHz crystal oscillator output is added to the tripler output signal in the transmit balanced mixer for simplex operation. For the two 600 KHz offsets, an 11.3 and 10.1 MHz crystal is utilized. The 5 KHz offset switch controls a programmable divider integrated circuit which when activated gives the desired results. The output of the synthesizer is fed out of the VCO to the first receiver mixer and also to the transmit section. The VCO is frequency modulated for  $\pm 5$  KHz deviation and the proper split selection is determined by the crystal switch at the 2SC1675 oscillator. The mixed output signal is fed through a series of three buffer amplifiers and finally to the 2SC2221 final amplifier stage. See the Block Diagram. For the receiver, the VCO signal is fed to the receiver first mixer and the signal is mixed with the incoming amateur band signals from the receiver amplifier. The resultant mixed signal is passed through the 10.7 MHz filter into the IF amplifier and into the second 10.7 MHz filter for increased selectivity. The signal then passes into the second mixer where it is mixed with the output of the local oscillator (10.245 MHz). The difference is fed through a third filter at 455 KHz and into a further IF amplifier and then into the discriminator for detection. The signal





S1 BLOCK DIAGRAM

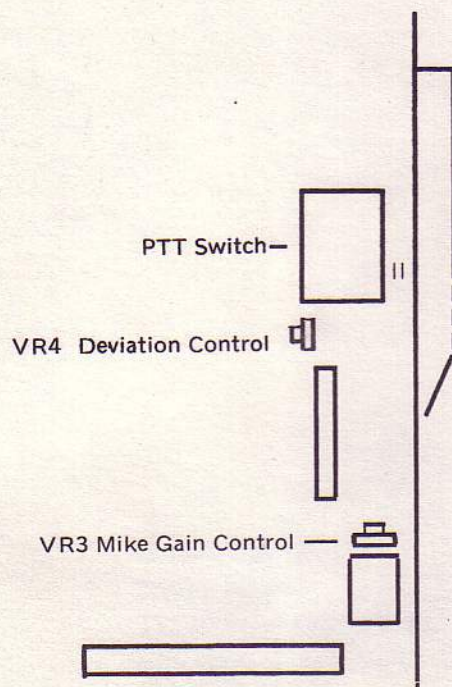
is fed to both the squelch and audio stages for the final conversion to audio.

## OPERATING ADJUSTMENTS

### TRANSMIT AUDIO LEVEL

The S1's audio level and deviation have been factory adjusted for normal levels. If further adjustment is necessary, you need a good quality FM deviation meter. For best results the monitor should have a built-in oscilloscope to watch the transmitted audio pattern.

The diagram below shows the location of VR4, the deviation control. Adjust this potentiometer for a maximum  $\pm 5$  KHz swing under full modulation. At this point, observe the audio pattern on the service monitor to ascertain if the S1 is transmitting background noise when the transmitter is keyed with no voice modulation. If this is the case, adjust microphone gain potentiometer VR3 until the background noise indication disappears from the scope. If there is another receiver available, listen to the transmitted audio to determine if all of the background noise has disappeared.



S1 Main Transceiver Board



**CAUTION:** When screwing the antenna into the S1 transceiver case DO NOT exert too much force or try to tighten too tight—damage to case may result.

**CAUTION:** DO NOT OPEN the S1 case unless absolutely necessary. The S1 circuit is very complicated and can be damaged by non-experienced personnel. The equipment warranty can not cover damage caused by negligent servicing.

Distributed by:  
Henry Radio  
11240 West Olympic Bl.  
Los Angeles, CA 90064  
(213) 477-6701