# OPERATING THE TOMCAT 23B

**CAUTION**

DO NOT PUSH TRANSMIT SWITCH WITHOUT FIRST CONNECTING A 52-OHM ANTENNA OR DUMMY LOAD.

Rotate SQUELCH CONTROL fully counterclockwise.

Rotate the VOLUME CONTROL clockwise, to apply power, and advance the VOLUME CONTROL until noise or signal is heard in the speaker. (Since your TOMCAT 23B uses all transistors, no warmup time is required.)

With no signal present, rotate the SQUELCH CONTROL clockwise to a position in which no noise is heard. Advance this control only far enough to prevent noise from being heard. Advancing it too far may result in a weak station being unable to open the squelch. Since the squelch has been adjusted, with no signal present, then when a station transmits on the channel to which your TOMCAT 23B is tuned, the squelch circuit will open and the station will be heard. When the station stops transmitting and no signal is received, the squelch gate will be closed and all sound will be "Turned Off". Sometimes noise will build up as a result of a passing truck, etc. If this happens, the SQUELCH CONTROL should be advanced just far enough to keep the circuit closed during these noise peaks.

Rotate the CHANNEL SELECTOR to the desired channel.

Adjust the volume as desired for the station you are listening to.

To transmit, hold the microphone 2 to 3 inches from your mouth. Normally, it is best to hold it so that you talk across it rather than directly into it. This will prevent the sound of your breathing being transmitted. Hold the Push-to-Talk button on the microphone in, and speak in a normal conversational level.

When your transmission is completed, release the button on the microphone and listen for your reply.

# SECTION 4
# CIRCUIT DESCRIPTION

## HETROSYNC™ CIRCUIT

PEARCE-SIMPSON's method of frequency synthesis makes use of 14 crystals to provide crystal-controlled, 23 channel coverage on both transmit and receive functions. The circuit is composed of 16.965 to 17.215 MHz master oscillator (Q2), 9.545 to 9.585 MHz receive oscillators (Q1), 10.000 to 10.040 MHz transmit oscillator (Q3) and transmit mixer (D12). In the transmit function the output of the master oscillator (Q2) and the transmit oscillator (Q3) are fed into the transmit mixer (D12). The two fundamental frequencies are combined in the mixer, whose output will contain the two frequencies fed in, plus the sum of the two and the difference of the two, as well as combinations of the harmonics of the input.

We use only the difference frequency, Let us take Channel 1 as an example. The two input frequencies are 16.965 MHz and 10.000 MHz. The mixer outputs are 16.965 MHz, 10.000 MHz, 6.965 MHz and 27.065 MHz. The other frequencies present at much lower levels are the harmonics of the two input frequencies such as 20.000 MHz, 30,000 MHz, 40.000 MHz, etc.

In addition to these, will be the sum and difference frequencies from the mixine of the various harmonic and fundamental frequencies. Of all these frequencies, only one falls within the pass band of the transmitter. This is 27.065 MHz which is the carrier frequency for Channel 9.

## TRANSMITTER CIRCUIT

The output carrier frequency of the mixer is made from the above mentioned theory. The signal is amplified by the buffer (Q15) which is a voltage amplifier, which output is fed into the RF Pre-Driver (Q16). Band-pass transformer (L48 & T8) provide the selectivity to select the desired carrier frequency from the mixer output. The driver is a low level Class C power amplifier which supplies the necessary RF power to drive the final RF power amplifier (Q18). The final RF output power is supplied to the antenna through a double pi-matching networks.

The function of the modulator is to put the intelligence on the carrier. To do this, the microphone changes the sound to electrical energy which is an audio frequency signal. This signal is amplified by Mic amplifier (Q11) and Audio Driver (Q12), and is drived to Audio Power Amplifier (Q13 & Q14). This audio power amplifier varies the supply voltage fed to the driver and signal at an audio rate. This Variation of the supply voltage varies the amplitude of the carrier output thus producing the amplitude modulation.

## RECEIVER CIRCUIT

The receiver in the TOMCAT 23B is a dual conversion superheterodyne circuit. Channel 9 (27.065 MHz) will be used as an example to show how the receiver circuit works. A signal at 27.065 MHz is received at the antenna and amplified by RF amplifier (Q4) and fed into 1st receiver mixer (Q5). The 27.065 MHz signal is mixed with 17.065 MHz injection from the Hetro-Sync circuit. The 10.000 MHz 1st IF output from the 1st receiver mixer is fed into the 2nd receiver mixer (Q6) along with the 9.545 MHz injection from the HetroSync circuit. The 455 Kc 2nd IF output from the 2nd receiver mixer is amplified by the IF amplifiers Q7 and Q8. Then, the signal is detected by detector diode D5, D6 to remove the audio from the IF carrier. The audio is coupled from the detector through the automatic noise limiter network to the 1st receiver audio amplifier (Q10). This amplifier also acts as a squelch gate. If the squelch control has been properly adjusted, this amplifier is biased off and will not allow any noise to be passed. When a signal is received, the amplifier is biased on and audio is allowed to be passed on to the 2nd audio driver (Q12). Q12 in turn, feeds the audio to the audio power amplifier (Q13 & Q14) which drives the speaker.

## ALIGNMENT-TRANSMITTER

A. EQUIPMENT REQUIRED:

a) RF Output Power meter (50 ohm, 5 watts)
b) Frequency counter
c) DC milli ampere meter (500/1000 mA)
d) Power supply (DC 13.8V)
e) Field strength meter.
f) RF V.T.V.M.
g) AF signal generator

B. PROCEDURE:

Remarks: Warm up the unit and test equipments at least 15 minutes before starting alignment.
RF output meter or 50 ohm dummy load must be connected to antenna jack.
Coupling to frequency counter should be as loose as possible, to prevent frequency drift by connection.

| STEP | SET CONDITION | CONNECTIONS | ADJUSTMENT | REMARKS |
|---|---|---|---|---|
| 1 | Transmitting no modulation CH13 | RF VTVM to Base Q15 | L4 & T8 | Adjust for max. output |
| 2 | Same as Step 1 | RF output power meter to antenna jack | T9, T10 L6,L8,L10 | Adjust for 4W output |
| 3 | Same as Step 1 | Field Strength to ant. Jack | VC1 | Adjust for min. point to element suprious radiation near 54MHz. |
| 4 | Same as Step 1 | Same as Step 1 | VR6 | Adjust so that needle of meter on the unit advances a little bit into red zone and comes over '+" between 9 and 10 as calibrated on meter face. |
| 5 | Same as Step 1 | Frequency counter to ant.through a suitable attenuator | | Check frequency of all channels |

## ALIGNMENT-RECEIVER

A. EQUIPMENT REQUIRED:

a) Signal Generator: 27MHz Band.
1.000Hz, 30% AM Modulation and
Output Impedance 50 ohm.

b) AF Output Meter (V.T.V.M.)

c) Power supply (DC 13.8V)

d) Dummy load (8 ohm, 5 watts, Resistive)

B. PROCEDURE:

Remarks: Warm up the unit and test equipments at least 15 minutes before staring alignment.

Output level: Keep signal generator output low enough to prevent AGC overload.
(Below appox. 2 volts on output meter)

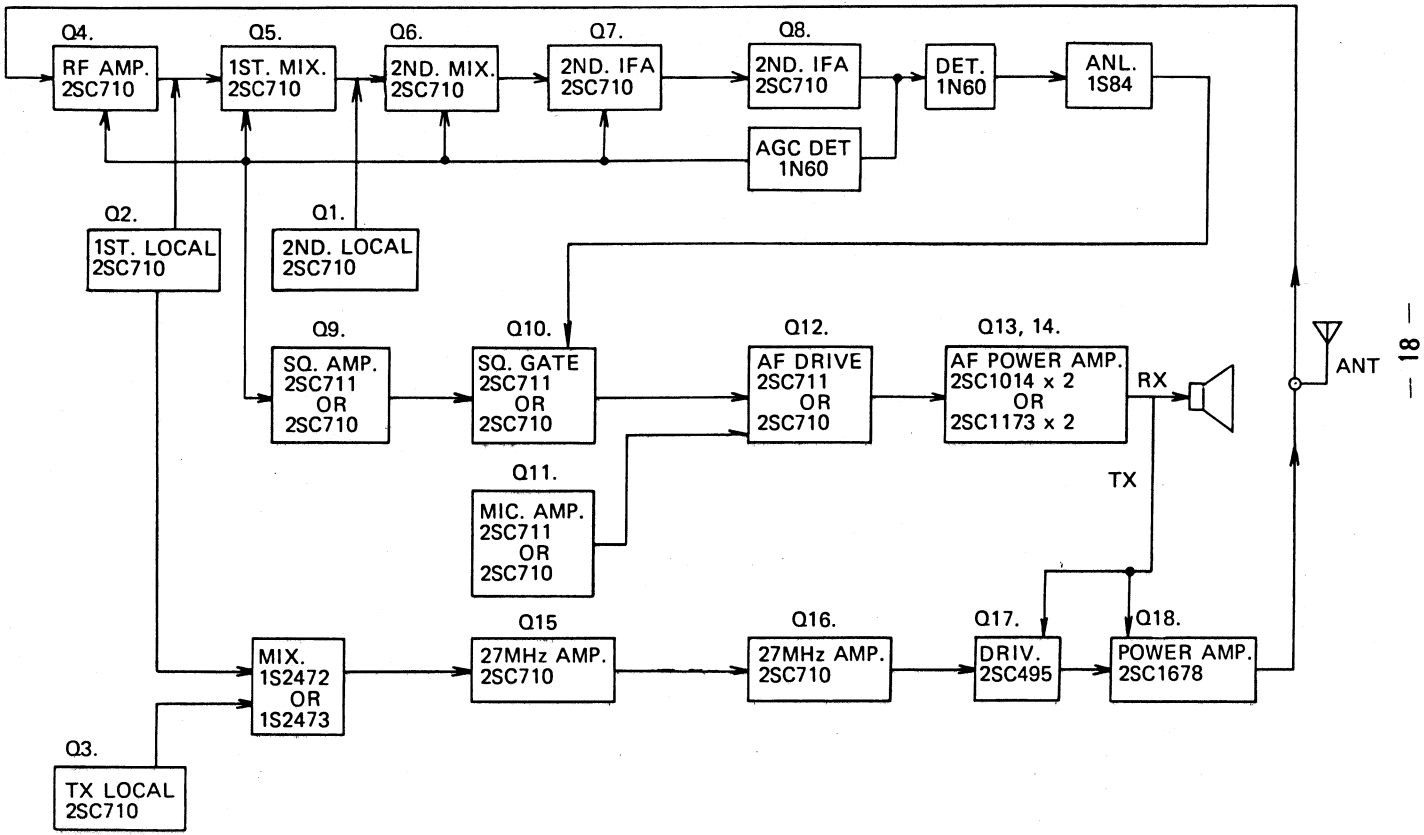
| STEP | SG Connection & Frequency | Set Condention | Output Meter Condition | Adjustment | Remarks |
|---|---|---|---|---|---|
| 1 | To antenna Jack (J1). Freq: 27.115MHz | SQ: Min. VOL: Max. DELTA TUNE: 0 ANL: OFF | To EXT. SP. jack (J3). | T1,T2,L1, L2,T3,T4, T5 | Adjust for max. point |
| 2 | Same as Step 1. and output level 300 $\mu$V | SQ: Max. VOL: Max. ANL: OFF | Same as Step 1. | VR 3 | Adjust for a open squelch point |
| 3 | Same as Step 1. and output level: 100 $\mu$V | Same as Step 1. | Same as Step 1. | VR 5 | Adjust for "S-9" on "S" meter of the unit. |
| 4 | Repeat the above adjustments, in order to make sure that adjustments have been made correctly. | | | | |

# SECTION 5
# REPLACEMENT PARTS

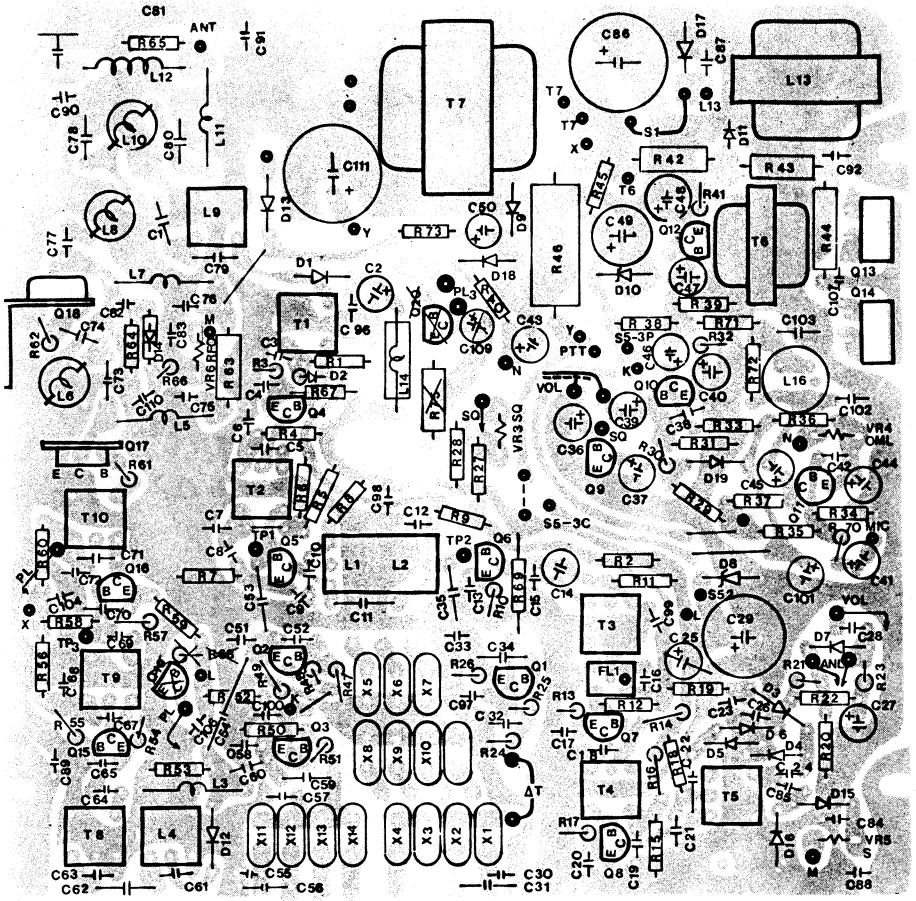
## CAPACITORS

| SYMBOL | DESCRIPTION | | |
|---|---|---|---|
| C-11 | 1pF | 50VDC | Mica |
| C-82 | 3pF | 50VDC | Mica |
| C-53, 54 | 5pF | 50VDC | Mica |
| C-35 | 5.6pF | 50VDC | Mica |
| C-61 | 10pF | 50VDC | Mica |
| C-60 | 20pF | 50VDC | Mica |
| C-67, 73 | 24pF | 50VDC | Mica |
| C-1, 5, 16, 63 | 30pF | 50VDC | Mica |
| C-32, 33, 51, 57 | 35pF | 50VDC | Mica |
| C-81 | 75pF | 50VDC | Mica |
| C-22, 58, 74 | 100pF | 50VDC | Mica |
| C-80 | 130pF | 50VDC | Mica |
| C-78 | 140pF | 50VDC | Mica |
| C-71 | 150pF | 50VDC | Mica |
| C-52 | 220pF | 50VDC | Mica |
| C-79 | 300pF | 50VDC | Mica |
| C-34, 59, 115 | 500pF | 50VDC | Mica |
| C-24, 26, 64, 69, 77, 85, 87 | 0.001μF | 50VDC | Ceramic |
| C-3, 4, 6, 7, 8, 9, 10, 12, 38, 42, 65, 68, 70, 72, 75, 76, 96, 97, 98, 99, 100, 104, 106, 108, 112 | 0.01μF | 50VDC | Ceramic |
| C-83, 88, 89, 90, 91, 92, 93, 105 | 0.047μF | 50VDC | Ceramic |
| C-28 | 0.01μF | 50VDC | Mylar |
| C-13, 15, 17, 18, 19, 20, 21, 23, 84 | 0.01μF | 50VDC | Mylar |
| C-102 | 0.05μF | 50VDC | Mylar |
| C-103 | 0.1μF | 50VDC | Mylar |
| C-107 | 0.22μF | 50V | Mylar |
| C-62 | 1pF | 50VDC | Gimic |
| C-14 | 1500pF | 50VDC | Plastic film |
| VC-1 | 5016-020 | 13pF | Variable Ceramic Trimmer |
| C-27 | 0.22μF | 50VDC | Electrolytic |
| C-41, 47 | 0.47μF | 50VDC | Electrolytic |
| C-37, 39, 45, 46 | 1μF | 50VDC | Electrolytic |
| C-36, 43, 50 | 4.7μF | 25VDC | Electrolytic |
| C-2, 25, 40, 44, 116 | 10μF | 16VDC | Electrolytic |
| C-48 | 100μF | 16VDC | Electrolytic |
| C-49, 101 | 220μF | 16VDC | Electrolytic |
| C-86, 29 | 1000μF | 16VDC | Electrolytic |

# TOMCAT 23B BLOCK DIAGRAM



# PC BOARD DETAIL



# SCHEMATIC DIAGRAM