SUPERSCOPE®

CITIZEN
BAND
TRANSCEIVER

Model CB-640
SERVICE DATA

— Mar. 1977 —

SUPERSCOPE INC.
20525 NORDHOFF STREET
CHATSWORTH, CALIFORNIA · 91311 · U.S.A.

TECHNICAL SPECIFICATIONS

General

Channels	40
Frequency Range	26.965 ~ 27.405 MHz
Frequency Control	PLL Synthesizer
Frequency Tolerance	±0.002%
Operating Temperature Range	-30 ~ +50°C
Microphone	Plug-in Dynamic Type (CMP22)
Operating Voltage	13.8V DC Nominal Positive or Negative Ground)
Current Drain	
Transmit	AM full mod. 1.5A
Receive	Squelched 0.3A
Size	7-9/16[W] x 2-7/16[H] x 9-1/16[D] (inch)
Weight	4.6 Pounds
Semi-Conductors	9 Integrated Circuits
	2 Field Effect Transistors
	45 Transistors
	53 Diodes
	1 Thermistor
Meter	8 LED Meter Readout

Transmitter

Power Output	4 watts
Modulation	AM
Modulation Capability	100% max. with the Superscope CMP22 Microphone
Frequency Response	300 Hz ~ 3 kHz
Spurious Emission	-60 dB
Output Impedance	50Ω unbalanced

Receiver

Sensitivity	Less than 0.5 μV for 10 dB (S + N)/N
Adjacent Channel Rejection (Selectivity)	60 dB at ±10 kHz
Image Rejection	50 dB
IF Frequency 1st	9.785 MHz
2nd	455 kHz
AGC	Less than 10 dB change in Audio Output for inputs from 10 to 100,000 μV
Squelch	Adjustable; threshold less than 1 μV to 100 μV
Audio Output Power (Maximum)	6W into 8Ω Load
Frequency Response	300 Hz to 3 kHz
Built-in Speaker	8Ω, 4" round
Delta Tune Range	±1.5 kHz continuously adjustable
RF Gain Control	20 dB Attenuation continuously adjustable

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SECTION I CIRCUIT DESCRIPTION

1.1 PLL SYNTHESIZER

1.1.1 Functions of PLL Synthesizer

The output of the local oscillator which selects a transmission or reception RF channel is determined by the PLL (phase-locked loop) Synthesizer. The PLL LSI contains a 1/N Programmable Counter, 1/1024 Divider, Phase Detector and Low-Pass Filter.

The 1/N Programmable Counter is controlled by an 8-bit code fed out of the PLL LSI. The 8-bit code determines the "N" value from among 91 (CH1) to 145 (CH40) as specified by the 40CH Selector (Rotary) switch. The 8-bit codes used in the PLL Synthesizer are charted below.

1.1.2 Operation of PLL Synthesizer (for example of CH19)

Figure 1 is a block diagram for the PLL Synthesizer circuit, the operation of which will be described in the following paragraphs. Also, refer to Figure 12, the "Overall Block Diagram", page 13.

1. The VCO (Voltage-Controlled Oscillator) produces a signal of 17.18 to 17.72 MHz, which is determined by the varicap capacitance controlled by a DC voltage.
2. If the VCO oscillates a 17.30 MHz signal, for example, the signal passes through the Buff (Q202) and is injected into the Mix (Q204). At the same time, the 16.27 MHz signal from the Osc (Q201) is fed into the Mix, which mixes the two signals. The Mix outputs the difference signal between the two signal frequencies, or 1.03 MHz (= 17.30 MHz - 16.27 MHz). The 1.03 MHz difference signal passes through the Amp (Q210) and enters the 1/N Programmable Counter. As the "N" value is 113 for CH19, the frequency of the signal entering the Phase Det is 9.115 kHz (= 1,030 kHz/113).
3. On the other hand, a standard 10 kHz signal produced through the 1/1024 Divider from the 10.24 MHz 2nd Local Osc enters the other input of the Phase Det. The Phase Det compares 9.115 kHz with 10 kHz and feeds to the LPF (Low-Pass Filter) the output pulse the width of which is in proportion to the difference of the two signals.
4. The output pulse is converted to DC voltage by the LPF. The DC voltage changes the voltage applied to the varicap in the VCO, that is, serves to raise the VCO output frequency up. The VCO output frequency is phase-locked when the 1/N frequency of the signal entering Phase Det becomes exactly 10 kHz. In other words, the VCO output frequency is automatically voltage-controlled even if it tends to become high low.
5. Consequently, the output frequency of the Buff (Q203) is always kept at 17.4 MHz (19CH).
6. The 17.4 MHz output is used as the 1st local frequency in the reception mode of operation. The output is also mixed with the Offset Osc output (9.785 MHz) to con-

8-Bit Code Chart

CH	T/R FREQ. (MHz)	N	BINARY CODE 1	2	3	4	5	6	7	8	PLL OUT (MHz)
1	26.965	91	1	1	0	1	1	0	1	0	17.18
2	26.975	92	0	0	1	1	1	0	1	0	17.19
3	26.985	93	1	0	1	1	1	0	1	0	17.20
4	27.005	95	1	1	1	1	1	0	1	0	17.22
5	27.015	96	0	0	0	0	0	1	1	0	17.23
6	27.025	97	1	0	0	0	0	1	1	0	17.24
7	27.035	98	0	1	0	0	0	1	1	0	17.25
8	27.055	100	0	0	1	0	0	1	1	0	17.27
9	27.065	101	1	0	1	0	0	1	1	0	17.28
10	27.075	102	0	1	1	0	0	1	1	0	17.29
11	27.085	103	1	1	1	0	0	1	1	0	17.30
12	27.105	105	1	0	0	1	0	1	1	0	17.32
13	27.115	106	0	1	0	1	0	1	1	0	17.33
14	27.125	107	1	1	0	1	0	1	1	0	17.34
15	27.135	108	0	0	1	1	0	1	1	0	17.35
16	27.155	110	0	1	1	1	0	1	1	0	17.37
17	27.165	111	1	1	1	1	0	1	1	0	17.38
18	27.175	112	0	0	0	0	1	1	1	0	17.39
19	27.185	113	1	0	0	0	1	1	1	0	17.40
20	27.205	115	1	1	0	0	1	1	1	0	17.42
21	27.215	116	0	0	1	0	1	1	1	0	17.43
22	27.225	117	1	0	1	0	1	1	1	0	17.44
23	27.255	120	0	0	0	1	1	1	1	0	17.47
24	27.235	118	0	1	1	0	1	1	1	0	17.45
25	27.245	119	1	1	1	0	1	1	1	0	17.46
26	27.265	121	1	0	0	1	1	1	1	0	17.48
27	27.275	122	0	1	0	1	1	1	1	0	17.49
28	27.285	123	1	1	0	1	1	1	1	0	17.50
29	27.295	124	0	0	1	1	1	1	1	0	17.51
30	27.305	125	1	0	1	1	1	1	1	0	17.52
31	27.315	126	0	1	1	1	1	1	1	0	17.53
32	27.325	127	1	1	1	1	1	1	1	0	17.54
33	27.335	128	0	0	0	0	0	0	0	1	17.55
34	27.345	129	1	0	0	0	0	0	0	1	17.56
35	27.355	130	0	1	0	0	0	0	0	1	17.57
36	27.365	131	1	1	0	0	0	0	0	1	17.58
37	27.375	132	0	0	1	0	0	0	0	1	17.59
38	27.385	133	1	0	1	0	0	0	0	1	17.60
39	27.395	134	0	1	1	0	0	0	0	1	17.61
40	27.405	135	1	1	1	0	0	0	0	1	17.62

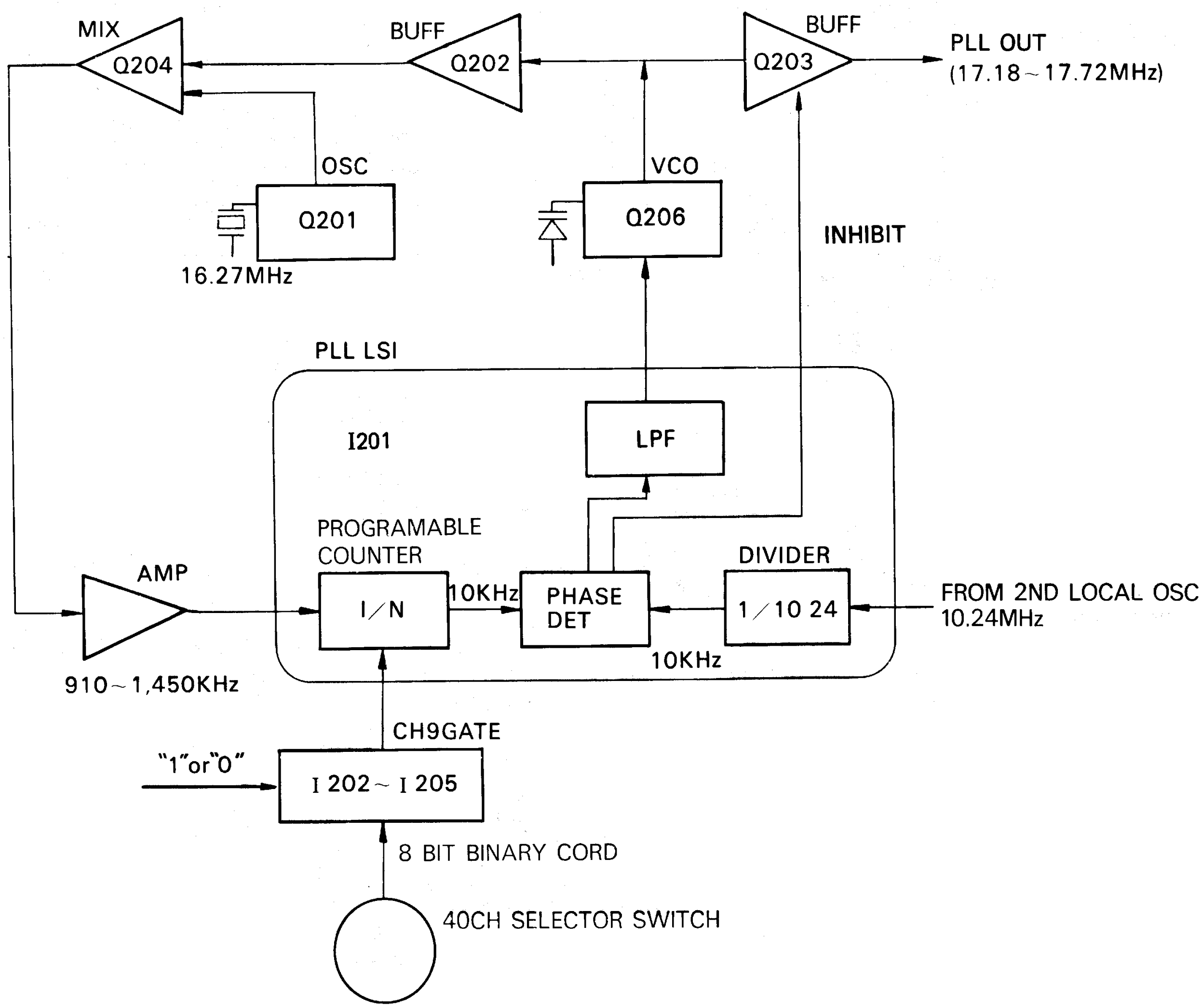


Figure 1. Block Diagram for PLL Synthesizer Circuit.

vert to the 19CH transmission frequency in the transmission mode of operation. The 17.4 MHz output is the reference frequency both for the reception and transmission.

7. The CH9 Gate (I202 through I205), which is placed between the 40CH Selector Switch and 1/N Programmable Counter control terminal, controls the binary code of the 1/N Programmable Counter with use of the Scan Gate signal ('1' or '0') from the CH9 Scan circuit. That is, if the Scan Gate signal is at '1', the binary code formed by the 40CH Selector Switch enters the 1/N Programmable Counter irrespective of the CH9 Gate. The CB-640 Transceiver runs in the channel selected by the 40CH Selector Switch. If the Scan Gate signal is at '0', on the other hand, the CH9 binary code is forcibly brought to the 1/N Programmable Counter wherever the 40CH Selector Switch is positioned.

1.2 TRANSMITTER SECTION

This section will describe the operation of the Transmitter Section in the CB-640 in reference to Figure 12, the "Overall Block Diagram", page 13.

1.2.1 Mix (Mixer)

The Mix (Q402) adds the 17.18 to 17.72 MHz 1st local signal produced by the PLL Synthesizer circuit and the 9.785 MHz signal produced by the Offset Osc (Q401) to convert to the CB signal ranging from 26.695 (CH1) to 27.405 MHz (CH40). The four LC stages (L402 through L405) are placed to eliminate possible near-by spurious.

1.2.2 RF Power Amps (Radio-Frequency Power Amplifiers)

The CB signal is shaped and magnified through the Baff Amp (Q403) and is further magnified by the Pre-Amp (Q404). Furthermore, it is power-magnified by the Driv (Q405) and Final Amp (Q406). There are provided two low-pass filter stages which eliminate possible harmonic waves. The "clean" RF signal, then, is fed to the TX Ant.

1.2.3 Modulator

The AF signal from the Mic passes through the Mic Amps (Q603, Q605) and Limiter (D604, D605) and is fed to the Power Amps used in common with the Receiver section. The AF signal is magnified through the Power Amps and is injected into the Drive (Q405) and Final Amp (Q406) of the Transmitter RF Power Amps.

1.2.4 Mic Amp & Limiter (Microphone Amplifier and Limiter)

The AF signal from the Mic enters and is magnified the Mic Amps (Q603, Q605) and comes through the Limiter (D604, D605) to the AF Amp Driv (Q313). The first-stage Mic Amp (Q603) output is also magnified by the ALC Amp (Q614) and is converted to DC voltage by Det (D602, D603). The DC voltage is further magnified by DC Amp (Q602) and is connected to the Att (base of Q401).

When a loud signal comes from the Mic to the Mic Amp circuit, immediately the ALC Amp operates to drop the Mic Amp (Q603) gain down. Further, the Limiter clips the strong signal. That is, the CB-640 Transceiver has double AF amplifier safety device.

1.2.5 Inhibit Sw & DC Amp (Inhibit Switch and Direct-Current Amplifier)

The Inhibit Sw (Q409) and DC Amp (Q408) is a preventive circuit that keeps any transient wave from being transmitted when a transmission channel is changed over another channel. A special circuit devised in the Rotary Switch serves to ground the base of Q408 when the selected channel is moved to another. The grounded base turns Q409 off to prevent the +B voltage from being applied to the Pre-Amp (Q404).

1.3 RECEIVER SECTION

This section will describe the operation of the Receiver Section in the CB-640 in reference to Figure 12, the "Overall Block Diagram", page 13.

1.3.1 RF Amp & 1st Mix (Radio-Frequency Amplifier and First Mixer)

The RF Amp (Q305) magnifies the input 27 MHz CB signal and delivers it to the 1st Mix (Q306). The 1st local signal oscillated by the PLL Synthesizer circuit, also, enters the 1st Mix. The 1st Mix mixes the two signals to convert to the 1st IF of 9.785 MHz.

1.3.2 2nd Mix (Second Mixer)

The 2nd Mix (Q307) receives the 9.785 MHz 1st IF signal and the 2nd local signal as the inputs. It mixes the two signals to convert to the 2nd IF of 455 kHz.

1.3.3 2nd IF Amp & AM Det (Second Intermediate-Frequency Amplifier and AM Detector)

The 2nd IF Amp, consisting of two IF amplifier stages, magnifies the 455 kHz 2nd IF signal passed through the 455 kHz Filter. It delivers the 455 kHz signal to the AM Det (D303, D304). The Det demodulates the signal to detect the AF signal.

1.3.4 AF Amp (Audio-Frequency Amplifier)

The AF Amp consists of a VOL control, Preamp (pre-amplifier, Q312), Driv (driver, Q313), PAs (class B power amplifiers, Q314, Q315) and Spk (speaker). The VOL controls the AF signal level. The Pre-Amp magnifies the AF signal. The Driv and PAs further magnify the AF signal. The Spk produces the AF signal sound.

1.3.5 Squelch

The Squelch circuit makes use of change of emitter voltage of the RF Amp (Q305) to open or close the circuit itself. If an RF signal comes in the RF Amp, that is, the AGC Det (D311) produces the AGC voltage, which lowers the emitter voltage of the RF Amp (Q305), or decreases the base voltage of Q310 in the Squelch circuit. This raises the base voltage of Q311 up. This voltage increase serves as the base bias for the AF Pre-Amp (Q312). The bias enables Q312 to operate normally to pass the AF signal to the Driv (Q313).

1.3.6 NB (Noise Blanker)

The Noise Blanker circuit, consisting of three 23 MHz Noise Amp stages (I301, Q301, Q302) and Switch (Q303), eliminates ignition noises generated by cars and similar machines. If the pulsating ignition noise enters the RX Ant, the Noise Amps magnify and deliver the noise pulse to the base of Q303 to switch Q303. The emitter of Q303 shortcircuits the 2nd Mix Coil. This inhibits the noise pulse from passing to the following stages as long as the existing of the noise pulse.

The noise Blanker can be turned off by disconnecting the Noise Amps from the +B line.

1.3.7 ANL (Automatic Noise Limiter)

The ANL (D302) circuit eliminates the noises contained in the AF signal. The circuit allows only the sound signal to pass forward, but cuts the noise out. The "ANL" switch shortcircuits D302 when set at the "off" position.

1.3.8 RF Gain Control

The RF Gain Control (Q321, D306) is a system which attenuates the RF signal coming into the RF Amp. When the RF GAIN control is turned to increase the DC voltage, this raises the base voltage of Q321 up. Then, Q321 becomes conductive, which attenuates a strong incoming RF signal. At the same time, the increased DC voltage flows through D306, which damps the RF Coil (L303) down. This increases the attenuation effect.

1.3.9 Delta Tune

The Delta Tune circuit finely changes the frequency of the crystal-controlled 2nd Local Osc (Q316). The varicap (D320), which is connected in series with the crystal in the 2nd Local Osc, varies the DC voltage applied to the crystal.

1.3.10 Scan Circuit

This subsection will describe the operation of the Scan Circuit in the Receiver Section in reference to Figure 2 below. Also, refer to Figure 12 , the "Overall Block Diagram", page 13.

(1) Voltage at Point A

The DC voltage picked up of the emitter of the 2nd Mix (Q307) changes with the AGC voltage. The DC voltage, that is, decreases with the AGC action when an incoming RF signal enters the RX Ant. The DC voltage is inverted and magnified through the DC Amp (Q318 through Q320) and at point S, is in:

"High" state for existence of the RF signal.

"Low" state for absence of the RF signal.

The Schmitt Trigger output is set in the "high" (around 4.5V) or "low" (around 0V) state according as the RF signal comes in the RF Ant or not. The voltage at point A is in the "high" or "low" state with presence or absence of the RF signal, accordingly.

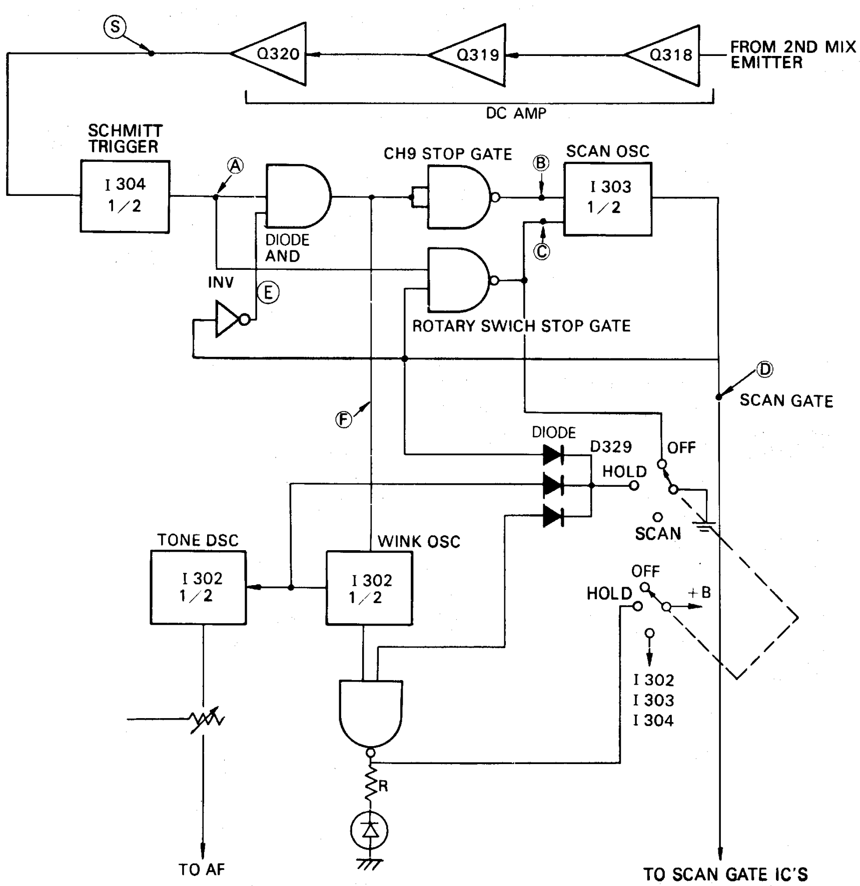


Figure 2. Block Diagram of Scan Circuit.

(2) Scan Osc

1. If the SCAN lever switch is in the SCAN position, the Scan Osc (I303(½)) runs for no RF signal. The Scan Gate at point D repeats the "high" or "low" state. The Scan Gate controls in the 8-bit code program the PLL frequency which is of the channel selected by the 40CH Selector Switch for the "high" state or of CH9 for the "low" state.
2. The Scan Osc stops when the state at point B is set "low". Point D, then, holds the "low" state.
3. The Scan Osc, also, stops when the state at point C is set "low". Point D, then, holds the "high" state.

(3) Operations in Receiving RF Channel Signals

1. If the Receiver catches the CH9 signal, it can receive the signal with the Scan Gate at point D being in the "low" state. The state at point A, then, becomes "high". The "low" state at point D is inverted by the Inv, or the state of its output at point E becomes "high". As the two inputs of the diode AND gate are in the "high" state, its output is "high". This output is inverted by the CH9 Stop Gate to the "low" state, which is input to point B. This holds the output state at point D "low", allowing the Scan circuit to be locked for CH9 reception until the CH9 signal goes out.

   On the other hand, in the above state that the diode AND Gate output at point F is "high" with the CH9 signal received at the SCAN position, the "high" state resets the Wink Osc stop state, or allows it to oscillate. The wink Osc output, then, flashes the CH9 LED (Light-Emitting Diode) Indicator. The output, also, allows the Tone Osc to run intermittently.

   The Rotary CH (40CH Selector) Switch Stop Gate output at point C holds the "high" state as its inputs are "high" at point A and "low" at point D.
2. If the Receiver has a channel signal selected by the Rotary Switch, the Scan Gate is in the "high" state, which allows the channel signal to be received. The state at point D is also "high". These states are input to the Rotary Switch CH Stop Gate, setting its output to the "low" state. The Scan Osc output (Scan Gate), therefore, is held "high", or locked, until the channel signal goes off. (Refer to Item (2), the "Scan Osc", 3). page 5).
3. If the Receiver has no channel signal to be received, the state at point A is "low" and the diode AND Gate output at point F is "low". The state at point B, therefore, becomes "high". As the Rotary Switch CH Stop Gate output also is "high", the both states at points B and C become "high". This allows the Scan circuit to continue scanning.

(4) CH9 Hold Position

In the state that the SCAN switch is in the HOLD position, the Scan Circuit is disconnected from the +B line so that it cannot scan the channel signals. As the Scan Gate at point D grounded through D329 always holds "low", the Scan Circuit keeps the CH9 program. The Transceiver, therefore, is capable of transmitting or receiving the CH9 signal. Note that the CH9 LED Indicator illuminates as the +B voltage is applied to it through the resistor R391.

(5) OFF Position

In the state that the SCAN switch is in the OFF position, point C is grounded and point D is held "high". The channel selected by the Rotary Switch can be transmitted or received.

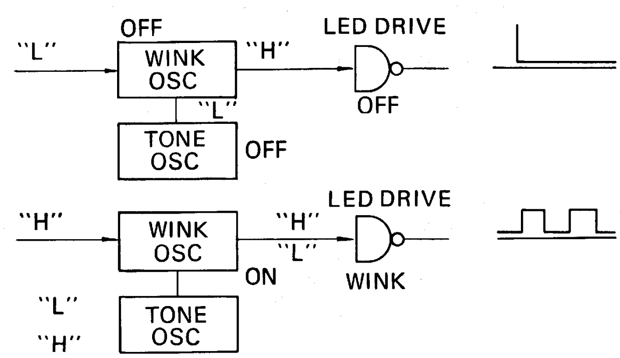


Figure 3. Operation of Wink Osc When Its Input Is "Low" and "High".

1.4 7-LED S/RF READOUT CIRCUIT

This section will describe the 7-LED S/RF Readout circuit in the CB-640 consisting of three DC Amp stages (Q207, Q208, Q209), in reference to Figure 12, the "Overall Block Diagram", page 13.

1.4.1 Operation As S Indicator

The base voltage of Q207 is changed with the emitter voltage of the 1st Mix (Q306). If a RF channel signal comes in the RX Ant and provides the AGC voltage to Q306, this drops its emitter voltage down. The current flowing through Q207, then, rises up to decrease the base voltage of Q208. This increases the base voltage of Q209. The number of the LED lights connected in series with the emitter of Q209, then, changes in response to the change of the emitter current. That is, the Readout circuit can serves as the S Meter (Signal-Strength Meter).

1.4.2 Operation As RF Power Indicator

In the transmission mode of operation, the RF forward power is picked up by the PW board (P302) CM Coupler and is connected to the base of Q207. The following operation is similar to that of the DC Amp stages described in Section 1.4.1 above. For checking the SWR (Standing Wave Ratio), the RF reverse power is picked up.

SECTION II ALIGNMENT INSTRUCTIONS

2.1 LIST OF ALIGNMENT INSTRUMENTS

Receiver Section

1. Standard signal generator I for CB transceiver only, 40 channels, 27 MHz.
2. Standard signal generator II, 23 MHz.
3. Oscilloscope.
4. Distortion meter.

Transceiver Section

1. Dummy load I, 50Ω, 5W.
2. Dummy load II, 250Ω, 5W.
3. Linear coupler, 0 to 1,200 MHz.
4. Spectrum analyzer, 0 to 1,200 MHz (Model HP8554).
5. Power meter, 5W (Model Bird 4317).
6. Synchroscope.
7. Modulation meter (Model TF2304).

General

1. RF VTVM, 27 MHz.
2. Digital voltmeter, DC.
3. AF Generator.

2.2 CRYSTAL OSCILLATOR ALIGNMENT

The CB-640 has three crystal oscillators. If they are not aligned at their respective oscillation frequencies, it can neither transmit nor receive a signal properly.

2.2.1 Adjusting the 2nd Local Osc (10.240 MHz)

a. Measuring instruments used: Frequency counter of 10 mV sensitivity.
b. Check point: J336, to which the frequency counter is to be connected through 5 to 15 pF capacitor.
c. Caution: Make certain that the DELTA TUNE control is at the center click position.
d. Procedures
   1. Set the CB-640 in the reception mode of operation.
   2. Adjust C375 (20 pF trimmer) until the frequency counter precisely reads 10.240 MHz.
   3. In turn, depress the microphone PTT SW in to set the CB-640 in the transmission mode of operation.
   4. Adjust R351 until the frequency counter also reads 10.240 MHz.

2.2.2 Adjusting the TX Offset Osc (9.784 MHz)

a. Measuring instruments used: Frequency counter of 10 mV sensitivity.
b. Check point: TP-03 (emitter of Q401), to which the frequency counter is to be connected through 5 to 15 pF capacitor.
c. Procedures
   1. Depress the microphone PTT switch in to set the CB-640 in the transmission mode of operation.
   2. Adjust C418 (20 pF trimmer) until the frequency counter precisely reads 9.785 MHz.

2.2.3 Adjusting the PLL Local Osc (16.27 MHz)

a. Measuring instrument used: Frequency counter of 10 mV sensitivity.
b. Check point: TP-04 (emitter of Q201), to which the frequency counter is to be connected through 5 to 15 pF capacitor.
c. Procedures
   1. Set the CB-640 in the reception mode of operation.
   2. Adjust C202 (20 pF trimmer) until the frequency counter precisely reads 16.270 MHz.

2.3 PLL SYNTHESIZER ALIGNMENT

The CB-640 uses a PLL (Phase-Locked Loop) Synthesizer circuit to generate highly stable local oscillator energy. It is therefore very important to align the PLL Synthesizer circuit correctly.

2.3.1 Adjusting the VCO

a. Measuring instruments used: (1) Digital voltmeter (in 10V range) and (2) frequency counter of 10 mV sensitivity.
b. Check point: TP-02 and J207.
c. Procedures
   1. Connect the digital voltmeter to TP-02 (+) and GND (-).
   2. Set the CB-640 in the reception mode of operation.
   3. Set the Channel Selector switch to the CH40 position.
   4. Adjust L201 for 3.0V read on the digital voltmeter.
   5. In turn, connect the frequency counter to J207.

6. To assure that the PLL output frequencies of all the channels are stable, check them for deviation in accordance with the "8-bit Code Chart", page 1 .
   For example, check CH1 for 17.18 MHz and CH20 for 17.42 MHz.

2.3.2 Adjusting the Output Level

a. Measuring instrument used: RF VTVM.
b. Check point: J333.
c. Procedures
   1. Connect the RF VTVM to J333.
   2. Set the CB-640 in the reception mode of operation.
   3. Set the CH SELECTOR to the CH19 position.
   4. Adjust L203 and L204 until the RF VTVM reads a maximum level. (The RF output is to be around 1.6V.)

2.4 TRANSMITTER SECTION ALIGNMENT

For aligning the Transmitter Section, interconnect instruments with the CB-640 as illustrated in Figure 4 below.

2.4.1 Adjusting the TX Power Stages

a. Measuring instruments used: (1) AF generator, (2) RF VTVM, (3) power meter (50Ω, above 5W), (4) dummy load (50Ω, above 5W), (5) Spectrum analyzer, (6) Digital voltmeter, (7) modulation meter, and (8) oscilloscope.
b. Check point: TP-01.
c. Caution: This adjustment is to be based on the condition that the PLL Synthesizer and TX Offset Osc tune in to their correct frequencies.
d. Procedures
   1. Set the Channel Selector to the 19CH position.
   2. Connect the RF VTVM to TP-01.
   3. Adjust in the order of L402, L403, L404, and L405 until the RF VTVM reads a maximum level.
   4. Set the Channel Selector to CH1.
      Adjust L402 for maximum output.
   5. Set the Channel Selector to CH40.
      Adjust L405 for maximum output.
   6. Repeat this adjustment several times.
   7. In turn, disconnect the RF VTVM.
   8. Adjust in the order of L406, L407, L409, and L410 until the power meter reads a maximum level. (The RF power is to be around 4.5W.)
   9. Also, repeat this adjustment several times.
   10. In turn, change the Channel Selector to the CH1 and CH40 positions to see a RF power difference between CH1 and CH40.
   11. If the RF power difference between CH1 and CH40 is over 0.2W, adjust L406 precisely until the difference becomes minimum.
   12. Return the Channel Selector to the CH19 position.
   13. Adjust the potentiometer R501 in the Regulator until the power meter reads 3.8W.
   14. Check the RF powers in CH1, CH10, CH19, CH30, and CH40 to assure that they meet the conform to the Specification.
   15. In turn, observe the spectrum analyzer to assure that the near-by spurious and harmonics are below -60 dB.

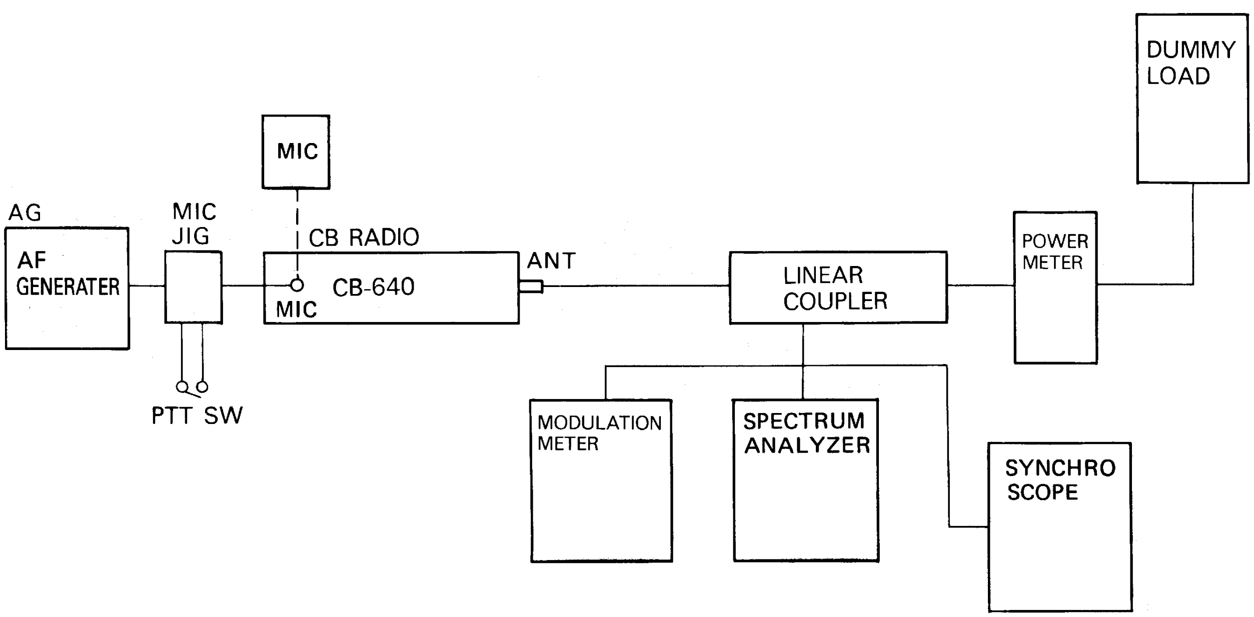


Figure 4. Interconnection for Adjusting the Transmitter Section.

2.4.2 Adjusting the Mic Amp

a. Measuring instruments used: See Section 2.4.1.
b. Procedures
   1. Set up the measuring instruments as illustrated in Figure 4.
   2. Set the Channel Selector to the CH19 position.
   3. Set the CB-640 in the transmission mode of operation.
   4. Apply 1 kHz, 30 mV input from the AF generator to the MIC terminal. The oscilloscope will show the envelope modulation waveform.
   5. Adjust R613 until the modulation meter reads 90% modulation.
   6. In turn, reduce the microphone input level until the modulation meter reads 50% modulation.
   7. Check the microphone input level to assure that it conforms to the specified valve.
   8. Make certain that the modulation does not exceed 100% even by raising that level by 20 dB.

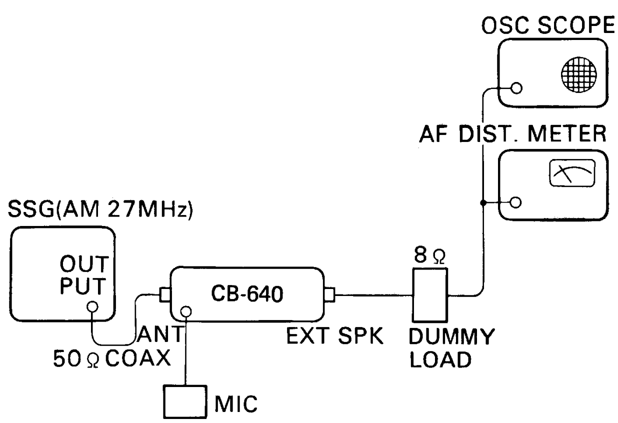
2.5 RECEIVER SECTION ALIGNMENT

For aligning the Receiver Section, interconnect instruments with CB-640 as illustrated in Figure 5 below.

a. Measuring instruments used: (1) Standard signal generator (27 MHz), (2) 8Ω AF dummy load, (3) oscilloscope, (4) AF distortion meter, and (5) high-impedance digital voltmeter.
b. Caution: Before alignment, make certain that the CB-640 controls are set at the following positions unless otherwise specified.
   - RF GAIN: Fully clockwise.
   - DELTA TUNE: Center click position.
   - SQL: Fully counterclockwise.
   - NB: OFF
   - CH9/SCAN: OFF
   - ANL: OFF
   - Channel Selector: CH19

2.5.1 Adjusting the AGC Voltage

a. Measuring instrument used: High-inpedance digital voltmeter.
b. Check point: J402.
c. Procedures
   1. Connect the digital voltmeter to J402 and ground.
   2. Adjust R347 until the digital voltmeter reads 1.2V.



CAUTION

Do not press the MIC PTT SW (microphone push-to-talk switch) in the set-up shown as the SSG (standard signal generator) could break down.

Figure 5. Interconnection for Adjusting the Receiver Section.

2.5.2 Adjusting the Sensitivity

Procedures
1. Set the CB-640 in the reception mode of operation.
2. Set the standard signal generator (SSG) to 1 kHz, 30% modulation and to the output level for a proper input to the CB-640.
3. Adjust in the order of L303, L304, L305, L306, L307, L308, and L309 for best sensitivity, or maximum AF output.

NOTE

During adjustment, it is advisable to adjust the SSG output level to keep the signal-to-noise ratio around 10 dB.

2.5.3 Adjusting the Tight Squelch

Procedures
1. Turn the SQL control fully clockwise.
2. Adjust the potentiometer R251 until the squelch circuit operates to release the cut-off state of the CB-640, or to allow this to output the AF sound when the SSG output is 100 μV at 1,000 Hz, 30% modulation.

2.5.4 Adjusting the Noise Blanker

a. Measuring instruments used: (1) RF VTVM and (2) SSG (23 MHz).
b. Check point: TP-05 (base of Q301).
c. Procedures
   1. Connect the SSG output to the RX Ant.
   2. Set the SSG frequency to 23 MHz.
   3. Connect the RF VTVM to TP-05, or the base of Q301.
   4. Adjust L301 and L302 until the RF VTVM reads maximum.

2.5.5 Adjusting the CH9 Scan Hold Level and Beep Tone Level

Procedures
1. Set the CB-640 in the reception mode of operation.
2. Set the CB-640 controls as follows.
   CH SELECTOR: CH19.
   CH9/SCAN: SCAN.
   SCAN THRESHOLD at rear panel: Fully counterclockwise.

3. Set the SSG channel selector to the CH9 position and its output level to 2.5μV.
4. Adjust the potentiometer R395 until the channel scanning is held to CH9 when the beep tone is produced and the CH9 LED indicator flashes.
5. Reduce the SSG output level, or the level input to the CB-640, to "0" to assure that the CH9 holding is reset and the channels are scanned.
6. Again, increase the SSG output level gradually to assure that CH9 is held with it reaching 2.5μV.
7. In turn, turn the SCAN THRESHOLD control at the rear panel fully clockwise.
8. Increase the SSG output level to assure that CH9 is held with 50 to 500μV input to the CB-640.
9. Adjust R381 until the beep tone level becomes 0.5W.

2.6 S/RF POWER INDICATOR ALIGNMENT

2.6.1 Adjusting the LEDs for Indicator

a. For set-up, see Figure 5, the "Interconnection for Adjusting the Receiver Section".

b. Procedures
1. Set the SSG RF output level to 50μV for S9 at CH19 with the SSG modulation turned off.
2. Adjust R242 until the output (J222) of Q209 in the DC Amp becomes 6V.
3. Increases the SSG RF output level to 100μV to assure that the S9 LED turns on. Also, reduce it to zero (0) to assure that the S4 LED goes off.

NOTE

Illumination of the S9 LED is referred to as a definition that the successive LED (+20dB up) goes off and the LED's up to S9 light up. This applies to the LED indications in the following description.

WARNING

IN THE RECEPTION SET-UP, NEVER PRESS THE MICROPHONE PUSH-TO-TALK SWITCH FOR TRANSMISSION, OR A HIGH POWER SIGNAL ENTERS THE SSG, RESULTING IN BREAK-DOWN.

2.6.2 Adjusting the LEDs for RF Power Indicator

a. For set-up, see Figure 4, the "Interconnection for Adjusting the Transmitter Section".

b. Procedures
1. Set the CB-640 Channel Selector to the CH19 position (of course, keeping the SCAN switch at the OFF position) and the SWR-CAL-PWR switch to the PWR position.
2. Press the Mic PTT switch in to assure that the RF output power is 3.8W as specified.
3. In turn, ground J344 to stop the output power and proceed as follows.
4. Adjust R241 until the LED adjacent to the left-most one goes off.

NOTE

The left-most LED lights up to indicates the 'power-on' condition as long as the power is supplied to the CB-640.

5. Disconnect J344 from the ground to release the power stop state.
6. Keeping the CB-640 in no-modulation condition, adjust R254 until the left-hand four LEDs, or the five LEDs with the left-most LED added, light up.
7. Modulate the CB-640 to 100% to assure that all the LEDs, including Nos. 6 and 7 LED, light up.
8. In turn, to check the operation of the LEDs as the SWR Meter, set the SWR-CAL-PWR switch to the CAL position.
9. Adjust the CAL control until the LEDs light up to the CAL point (No. 5 LED).
10. Throw the switch to the SWR position to assure that the LEDs indicating over 1.5 SWR do not light.
11. In turn, replace the 50Ω dummy load by the 250Ω for 5 SWR.
12. In the CAL position, adjust CAL control until the LEDs light up to the CAL point (No. 5 LED).
13. Turn the switch to the SWR position.
14. Adjust R441 until the LEDs light up to the No. 3 LED, which indicates 5 SWR.