Pearce Simpson Puma 23B Owners Manual

PEARCE-SIMPSON
DIVISION OF GLADDING CORP.

PUMA 23B

SECTION 1
GENERAL INFORMATION

DESCRIPTION

Your new PEARCE-SIMPSON PUMA 23B is a compact, all-transistorized, 23 channel Citizens Band Transceiver. This radio, because of its low current drain, is ideally suited for mobile operation from a 12.6 negative ground DC power source. A 12 VDC power cord and a mounting cradle are included with your PUMA 23B. To provide the crystal-controlled, 23 channel operation, PEARCE-SIMPSON utilizes an all-transistor HetroSync™ circuit.

The receiver is a sensitive superheterodyne circuit featuring: Dual conversion, low noise RF stage, adjustable squelch, automatic noise limiting, S-meter, ceramic filter, external speaker jack, and instantaneous selection of any of the 23 crystal controlled channels.

The transmitter section is designed around highly reliable silicon transistors and the HetroSync™ circuit. This circuit makes use of the output of two crystal-controlled oscillators which are mixed together to produce the desired frequency. The transmitter final is a conservatively rated high gain RF power transistor.

SPECIFICATIONS

GENERAL:

Channels:	23 Crystal-Controlled
Size:	5-7/8" Wide × 2" High × 7-1/4" Deep
Weight:	3 Pounds
Antenna:	52-Ohm Coaxial
Primary Power:	Input Voltage-13.8 VDC (EIA Standard)

TRANSISTOR COMPLEMENT:

TR-1	2SC394	: RF Amplifier
TR-2	2SC394	: 1st Receiver Mixer
TR-3	2SC839	: 37 MHz. 1st Local
TR-4	2SC372	: 2nd Receiver Mixer
TR-5	2SC372	: 10 MHz. 2nd Local
TR-6	2SC372	: 455 KHz. IF Amplifier
TR-7	2SC372	: 455 KHz. IF Amplifier
TR-8	2SC373	: Squelch Amplifier
TR-9	2SC372	: 1st AF Amplifier
TR-10	2SC733	: 2nd AF Amplifier
TR-11	2SC1173	: AF Power Amplifier
TR-12	2SC1173	: AF Power Amplifier
TR-13	2SC372	: Transmit Oscillator
TR-14	2SC372	: Transmit Mixer
TR-15	2SC735	: Transmit Buffer
TR-16	2SC1226	: Transmit Driver
TR-17	2SC756	: Transmit Final
TR-18	2SC733	: Modulation Lamp Amplifier

DIODE COMPLEMENT:

D-1	CD37A	: Receiver AF Amplifier Protector
D-3	CD37	: Mode Switching
D-4	1N60	: Transmit Power Meter Detector
D-5	1N60	: S Meter Detector
D-6	1N60	: Detector
D-7	CD37	: ANL Gate
D-8	CD37	: Varistor
D-9	1N60	: AMC Detector
D-10	SR1K-1	: Modulation Stabilizer
D-11	CD37	: Mode Switching
D-12	CZ-092	: Receiver Voltage Regulator
D-13	SR1K-1	: Protector

RECEIVER:

Frequency Range	: 26.965 MHz. — 27.255 MHz.
Sensitivity	: 0.3 μV for S + N/N using 1,000 Hz., 30% Modulation
Selectivity	: 6 db band width 5 KHz 50 db band width 20 KHz.
Cross Modulation	: 75 db for 10 μV desired
Spurious Rejection	: 60 db minimum
Adjacent Channel Rejection	: 50 db minimum
Squelch Range	: Adjustable from 0.5 μV — 1,000 μV
Automatic Noise Limiter	: Built in
1st I.F. Frequency	: 10.7 MHz. for center frequency
2nd I.F. Frequency	: 455 KHz.
P.A. Maximum Audio Output Power	: 5W
Audio Output Power for 10% Distortion	: 3.5W
Speaker	: 3-5/8"

TRANSMITTER:

Frequency Range	: 26.965 MHz. — 27.255 MHz.
Carrier Frequency Stability	: 0.003%, −30° C to +65° C
Output Power	: 3.5W into 52 ohm with 13.8 V DC power supply
Modulation Capability	: 100%
Spurious & Harmonics Suppression	: 55 db minimum
Emission	: 8A3

FREQUENCIES AVAILABLE FOR CLASS D OPERATION

Channel	MHz	Channel	MHz	Channel	MHz
1	26.965	9	27.065*	17	27.165
2	26.975	10	27.075*	18	27.175
3	26.985	11	27.085*	19	27.185
4	27.005	12	27.105*	20	27.205
5	27.015	13	27.115*	21	27.215
6	27.025	14	27.125*	22	27.225
7	27.035	15	27.135	23	27.255*
8	27.055	16	27.155		

*Channels available for communications between units of different stations. (In accordance with FCC Part 95 .41 (d) (2))

WARNING

Operation of this equipment requires a valid station license issued by the Federal Communications Commission. Do Not transmit with your equipment until you have received your license. Illegal operation can result in severe penalties. Be certain that you have read Part 95 of the FCC Rules and Regulations before operating your station.

License applications are to be made on FCC Form 505 available from your nearest FCC field office. (A copy of this form is included with your new transceiver.)

You are required to maintain a current copy of Part 95 of the FCC Rules as a part of your station records. Copies of Part 95 are available from: Superintendent of Documents GPO Washington, DC, 20402, for a fee of $3.50.

Your station license is to be posted in accordance with paragraph 95.101 of the Rules and an executed Transmitter Identification Card (FCC Form 452-C) is to be attached to each transmitter. (A copy of this form is included with your new transceiver.)

SECTION 2
INSTALLATION & INITIAL ADJUSTMENT

IMPORTANT

BEFORE DISCARDING ANY OF THE PACKING MATERIALS, EXAMINE THEM CAREFULLY FOR ITEMS YOU MAY HAVE OVERLOOKED.

MOBILE STATION INSTALLATION

MOUNTING

For mobile installation, the mounting cradle is designed to serve as a means of mounting your PUMA 23B in any position which is convenient. After you have determined the most convenient location, hold the PUMA 23B and cradle in the exact location desired. If nothing interferes with mounting it in the desired position, remove the cradle from the PUMA 23B and use it as a template to mark the location for the mounting bolts. Before drilling the holes, make certain nothing will interfere with the installing of the mounting bolts.

POWER CONNECTION

The PUMA 23B is constructed to be used in vehicles using either positive or negative ground. The red lead is the positive lead and the black lead is the negative lead. If the existing wiring is used, be sure that it is heavy enough to prevent voltage drop to the radio. A good source of battery voltage is at the accessory connection on the ignition switch. Using this as a power source insures the radio will be off when the ignition switch is in the off position and power will be supplied to the radio when it is in the on or accessory position.

ANTENNAS

Your PUMA 23B has been adjusted at the factory to give optimum performance using a 52-ohm antenna. There are a number of 52-ohm antennas available for mobile citizens band use.

For an automobile installation, a whip may be used with good efficiency because the automobile acts as a counterpoise and reduces detuning effects.

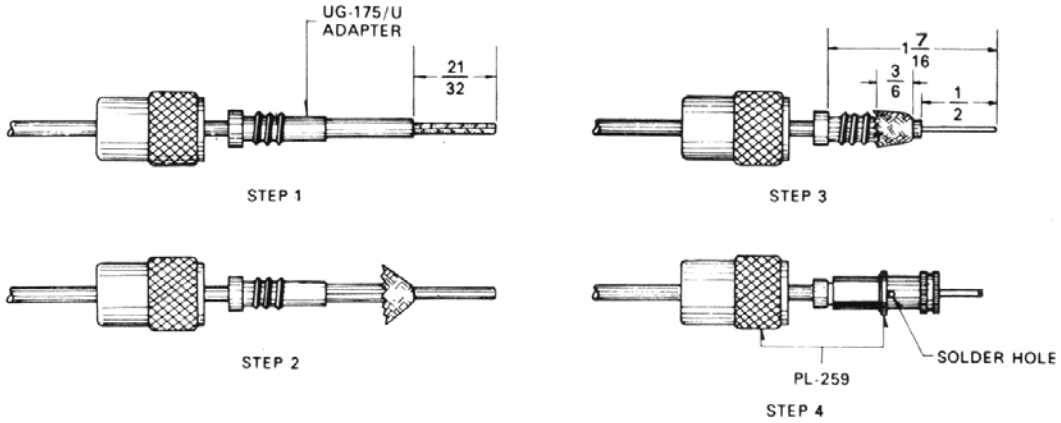
The most efficient and practical installation is a full quarter wave whip mounted on the left rear deck of fender top midway between the rear window and bumber.

The so-called "short whip" is a less efficient antenna because the radiation area is reduced. However, full use of its capability may be achieved since a shorter antenna may be mounted in a more advantageous position on an automobile, such as in the middle of the top.

There are also newer mobile antennas on the market which are made to replace the entertainment radio antenna and are similar in appearance. These antennas serve three purposes: AM and FM entertainment broadcast reception and Citizens Band transmission and reception.

For a marine installation, the full-length quarter wave whip antenna is very efficient, however it requires radials which make it hard to mount in small boats. Another excellent antenna is the coaxial sleeve type which requires no radial. A similar antenna is the center loaded 1/2 wave which is about the same as the full length 1/4 wave whip and it requires no radials. Care must be used when choosing one of the shortened type antenna as considerable variation in efficiency will be found between the various makes and models. As a general rule, avoid those with short radiating elements because the greater the radiating area, the stronger the radiated signal will be.

Your PEARCE-SIMPSON dealer is prepared to offer advice and will help you choose the most desirable antenna for your needs.



ASSEMBLING ANTENNA PLUG TO RG-58U
OR OTHER ¼" COAXIAL CABLE

Figure 1

TRANSMISSION LINE

To connect an antenna to the transceiver, a 52-ohm coaxial transmission line is required.
See Figure 1 for assembling connector to RG-58/U coaxial cable.

INSTALLATION ADJUSTMENTS

The output circuit of the PUMA 23B transmitter has been factory adjusted to operate into any good 52-ohm antenna. No attempt should be made to tune the transmitter to the antenna. Instead, the antenna should be adjusted to present the lowest possible SWR (Standing Wave Ratio). A very low SWR means that the antenna is operating at maximum efficiency and will also mean that it is adjusted to 52 ohms. An improperly adjusted antenna causes standing waves to appear on the feed line. Since this feed line is a fixed 52 ohms, and cannot be adjusted, this mismatch appears at the transmitter. If the transmitter is adjusted to compensate for this mismatch, both it and the antenna will no longer be operating at peak efficiency. Since the transmitter has already been adjusted for 52 ohms output and the coaxial feed line has a fixed 52-ohm value, the only remaining element to be adjusted to this value is the antenna itself. When receiverd, the antenna is probably cut as near as is possible to this value. The mounting location on the vehicle or building and surrounding objects affect the antenna however, and requires that it be adjusted to compensate for them.

Many of the newer Citizens Band antennas provide means of adjusting them for lowest SWR. Instructions for doing so are included with the antenna. For such antennas as the full quarter wave length whip, it is necessary to carefully vary the length until the lowest SWR is obtained. For all adjustments to the antenna, connect an SWR meter in the feed line to the antenna.

The PUMA 23B will work into an antenna system having an SWR as high as 3:1. For best communications, you will want this figure as near 1:1 as possible so that the antenna will be operating at its best efficiency.

NOISE SUPPRESSION

The PUMA 23B contains automatic noise limiter built in and input power filtering. In most vehicular installations, the noise suppression for the entertainment radio will be sufficient. Vehicles and boats not having this suppression may require that it be installed. In most cases, installation of distributor suppressors and generator condensers will be sufficient. In severe cases, the services of a qualified technician may be required. See your PEARCE-SIMPSON dealer for advice.

SECTION 3
OPERATING INSTRUCTIONS

CONTROLS AND INDICATORS

There are three controls and one indicator on the front panel of your PUMA 23B. (See Figure 2).

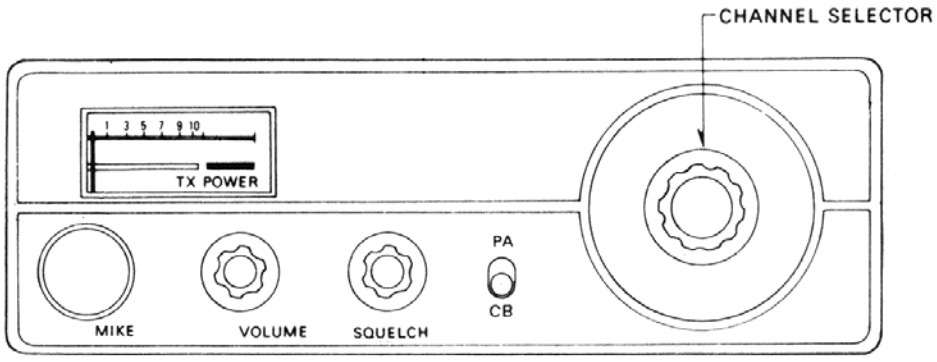


Figure 2

CHANNEL SELECTOR

The Channel Selector Switch has 23 operating positions. This switch sets both transmit and receive frequenceis simultaneously by switching the proper crystals into the PEARCE-SIPSON HetroSync™ circuit for any of the 23 CB channels.

SQUELCH CONTROL

The Squelch Control is used to silence background noise (atmospheric or man-made noise) in the absence of a received radio signal. In the full counterclockwise position, the PUMA 23B is unsquelched (no noise silencing at all). In the fully clockwise position, the unit is squelched for even very strong signals.

VOLUME CONTROL AND ON-OFF SWITCH

This control turns the power ON and OFF and adjusts the loudness of received signals.

PEARCE-SIMPSON'S EXCLUSIVE FIVE-WAY METER

This meter is exclusively designed by Pearce-Simpson to work in five different ways. Those functions are as follows:

1. An indicator of the received signal. A change of one S unit indicates a change of 6 db in signal level. The metering circuit is calibrated so that for 100 microvolts, the S-meter will read S9.
2. An indicator of RF output power.

3. A receiver-on indicator: when the receiver is on, the meter lights up in amber color.
4. A transmitter-on indicator: when the transmitter is on, the meter lights up in red color.
5. Modulation indicator: the meter fluctuates in brilliant red when the transmitter is modulated.

PA-CB SWITCH

This switch is to select the operating mode of either CB or PA.

OPERATING THE PUMA 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 PUMA 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 the loss of weak signals. With the squelch properly adjusted, only a transmitter operating ón the channel to which your PUMA 23B is tuned will be heard. With no transmitter operating, 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 the reply.

When listening to a weak signal, adjust your delta tune switch for strongest signal. The automatic noise limiter will ordinarily be kept on. When under conditions of low noise you may wish to turn it off for extra sensitivity.

SECTION 4
MAINTENANCE & SERVICING

CIRCUIT DESCRIPTION

Your PUMA 23B consists of the following circuits: the PEARCE-SIMPSON HetroSync™ circuit, which provides the receiver injection frequencies and the transmitter carrier frequency; a dual conversion superheterodyne receiver; and an AM-modulated transmitter. It is powered from 13.8V DC source. (See Block Diagram and schematic.)

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 37.600 to 37.850 MHz master oscillator (TR3), 10.140 to 10.180 MHz receive oscillators (TR5), 10.595 to 10.635 MHz transmit oscillator (TR13) and a transmit mixer (TR14). In the transmit function, the output of the master oscillator (TR3) and the transmit oscillator (TR13) are fed into the transmit mixer (TR14). 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 9 as an example. The two input frequencies are 37.700 MHz and 10.635 MHz. The mixer outputs are 37.700 MHz, 10.635 MHz, 48.335 MHz and 27.065 MHz. The other frequencies present at much lower levels are the harmonics of the two input frequencies such as 21.270 MHz, 31.905 MHz, 42.540 MHz, etc. In addition to these, will be the sum and difference frequencies from the mixing of the various harmonic and fundamental frequencies. Of all these frequencies, only one falls within the passband of the transmitter. This is 27.065 MHz which is the carrier frequency for Channel 9. The nearest unwanted frequency to the carrier frequency is at least 0.955 MHz away and outside of the transmitter pass band is adequately suppressed.

TRANSMITTER CIRCUIT

The transmitter circuit makes use of the carrier frequency signal output of the transmit mixer (TR14), which is part of the HetroSync™ circuit. The signal is amplified by the buffer (TR15), which is a voltage amplifier, whose output is fed to the driver (TR16). Bandpass transformers T11 through T13 provide the selectivity to select the desired carrier frequency from the mixer (TR14) output. The driver is a low level Class C power amplifier which supplies the necessary RF power at the carrier frequency to drive the final power amplifier (TR17). The final supplies RF power to the antenna through a double pi-matching network. The function of the modulator is to put the intelligence on the carrier. To do this, the microphone changes sound (mechanical energy) to electrical energy which is an audio

frequency signal. Mic amplifier (TR 9) and audio driver (TR 10) amplify this signal and drive the audio power amplifier (TR11 & TR12). 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 amplitude modulation.

RECEIVER CIRCUIT

The receiver in the PUMA 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 (TR1) and fed into 1st receiver mixer (TR2). The 27.065 MHz signal is mixed with 37.700 MHz injection from the HetroSync^{R} circuit. The 10.635 MHz 1st IF output from the 1st receiver mixer is fed into the 2nd receiver mixer (TR4) along with the 10.180 MHz injection from the HetroSync^{TM} circuit. The 455 KHz 2nd IF output from the 2nd receiver mixer is amplified by the IF amplifiers TR6 and TR-7. Then, the signal is detected by detector diode 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 (TR9). 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 (TR10). TR10 in turn, feeds the audio to the audio power amplifier (TR11 & TR12) which drives the speaker.

WARNING

FCC Rules require that ALL transmitter adjustments, other than those supplied by the manufacturer as front panel operating controls, be made by or under the supervision of the holder of an FCC issued 1st or 2nd class radio operator's license.

Replacement or substitution of crystals, transistors, regulator diodes or any other part of a unique nature, with parts other than those recommended by the manufacturer may cause violation of the technical regulations of Part 95 of the FCC Rules or violation of the Type Acceptance requirments of Part 2 of the Rules.