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PEARCE-SIMPSON
DIVISION OF GLADDING CORP.

BOBCAT 23D

SECTION 1
GENERAL INFORMATION

DESCRIPTION

Your new PEARCE-SIMPSON BOBCAT 23D is a compact, all-transistorized, 23 channel Citizens Band Transceiver. This radio, because of its low current drai ited for mobile operation from a 13.8 DC power source. A 12V D cord and a mounting cradle are included with your BOBCAT 23D. To provide the crystal-controlled, 23 channel operation, PEARCE-SIMPSON utilizes an all-transistor Hetro-Sync™ 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 Hetro-Sync™ circuit. This circuit makes use of the output of two crystal-controlled oscillators which are beat 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 x 2" High x 7-1/4" Deep
Weight:	3 Pounds
Antenna:	52-Ohm Coaxial
Primary Power:	Input Voltage-13.8 VDC (EIA Standard)

TRANSISTOR COMPLEMENT:

Q-1	2SC710	: 9MHz 2nd. Local Osc.
Q-2	2SC710	: 17MHz 1st. Local Osc.
Q-3	2SC710	: 10MHz Transmitter Local Osc.
Q-4	2SC710	: RF Amplifier
Q-5	2SC710	: Receiver 1st. Mixer
Q-6.	2SC710	: Receiver 2nd. Mixer
Q-7	2SC710	: 455KHz 2nd. IF Amplifier
Q-8	2SC710	: 455KHz 2nd IF Amplifier
Q-9	2SC711 or 2SC710	: Squelch Amplifier
Q-10	2SC711 or 2SC710	: Squelch Gate & AF Amplifier
Q-11	2SD77 or 2SD187	: Mic Amplifier
Q-12	2SC711 or 2SC710	: AF Driver
Q-13	2SC1014 or 2SC1173	: AF Power Amplifier
Q-14	2SC1014 or 2SC1173	: AF Power Amplifier
Q-15	2SC710	: Transmitter Amplifier
Q-16	2SC710	: Transmitter Amplifier
Q-17	2SC495	: Transmitter Driver
Q-18	2SC1678	: Transmitter Power Amplifier
Q-19	2SC711 or 2SC710	: Receiver Lamp Driver
Q-20	2SC711 or 2SC710	: Transmitter Lamp Driver

DIODE COMPLEMENT:

D-1	WG1012 or WG713	:	Antenna Switching
D-2	1N60FM	:	Protector
D-3	1N60FM	:	AGC Detector
D-4	1N60FM	:	AGC Detector
D-5	1N60FM	:	Signal Detector
D-6	1N60FM	:	Signal Detector
D-7	1S84	:	A.L.C. Gate
D-8	BZ090	:	Voltage Stabilizer
D-9	1N60FM	:	Modu. Limiter Detector
D-10	BZ090	:	Voltage Stabilizer
D-11	1S1211	:	Bias Stabilizer
D-12	1S2472 or 1S2473	:	Transmitter Mixer
D-13	1N4002	:	Protector
D-14	1N60FM	:	Transmitter Meter Detector
D-15	1N60FM	:	S Meter Detector
D-16	1N60FM	:	S Meter Detector
D-17	1N4002	:	Protector
D-18	VD1211	:	Modulation Limiter Detector
D-19	1N60FM	:	Muting at Transmit

RECEIVER:

Frequency Range	:	26.965 MHz.– 27.255 MHz.
Stensitivity	:	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 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	:	2-3/4 Inch

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

DO NOT TRANSMIT WITH YOUR EQUIPMENT UNTIL YOU HAVE RECEIVED YOUR LICENSE FROM THE FCC. Illegal operation can result in severe penalties. Be sure that you have read and understand Part 95 of the FCC Rules and Regulations before operating your station.

FREQUENCIES AVAILABLE FOR CLASS D OPERATION

Channel	MHz	Channel	MHz	Channel	MHz
	26.965	9	27.065*	17	27.165
	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	27.235*
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, D.C., 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.)

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 license.

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

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 serves as a means of mounting your BOBCAT 23D in any position and attitude which will be convenient to the user. After you have determined the most convenient location in your vehicle, hold the BOBCAT 23D, mounted in the cradle, in the exact location desired. If nothing will interfere with mounting it in the desired position, remove the cradle from the BOBCAT 23D and use it as a template to mark the location for the mounting bolts. Before drilling the holes, make sure nothing will interfere with the installing of the mounting bolts.

POWER CONNECTION

The red lead is to be connected to the positive voltage source. The black lead is connected to the negative voltage source. If existing wiring is used, make 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 turned "OFF", and power will be supplied to the radio when it is in the "ON" or "ACCESSORY" position. In a negative ground vehicle, the accessory switch will usually be a positive source. In a positive ground vehicle, the accessory switch will usually be a negative source.

NOTE: Do not connect the power leads "backwards", i.e. red lead to negative and black lead to positive. (The radio is reverse polarity protected so that if you make an error in connecting the leads, SUBSTANTIAL damage will be prevented, however, the fuse will blow. It is essential that the proper fuse be used to maintain this protection. The proper fuse rating is 2 Amperes.)

ANTENNAS

Your BOBCAT 23D has been adjusted at the factory to give optimum performance using a 52-ohm antenna. There are a of number 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 mounting location also has a great effect on the efficiency.

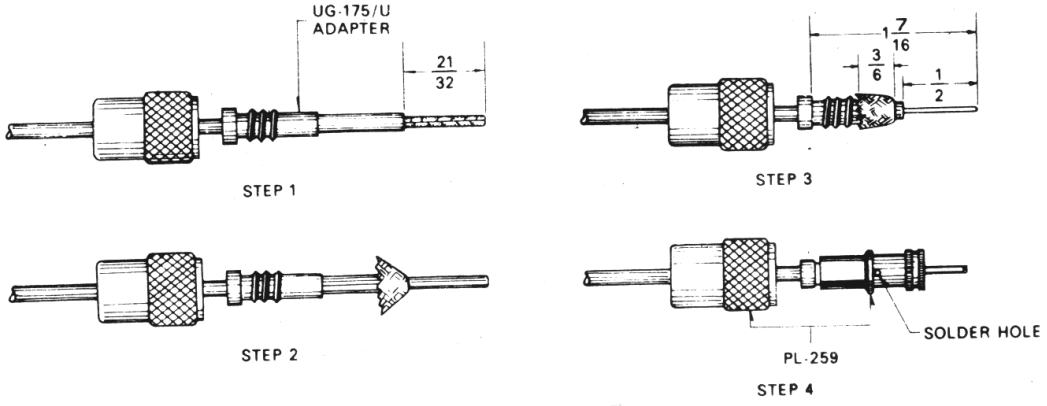
The most efficient and practical installation is a full quarter wave whip mounted on the left rear deck of fender top midway between the rear window and bumber.

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 never 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. With some of these antennas, it is possible to simultaneously transmit on CB and receive on AM broadcast with interaction. These antennas are quite efficient for all three types operation when properly adjusted.

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 1/4" COAXIAL CABLE

Figure 1

TRANSMISSION LINE

To connect an antenna to the transceiver, a 52-ohm coaxial transmission line is required. RG-8/U coax is recommended for length in excess of 50 feet and RG-58/U coax is recommended for length less than 50 feet to connect to the transceiver. The RG-8/U requires a PL-259 type connector and the RG-58/U coax requires a PL-259 connector with a UG-175/U adaptor. (See Figure 1 for assembling connector to RG-58/U.)

INSTALLATION ADJUSTMENTS

The output circuit of the BOBCAT 23D 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 received, 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 BOBCAT 23D 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 BOBCAT 23D 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

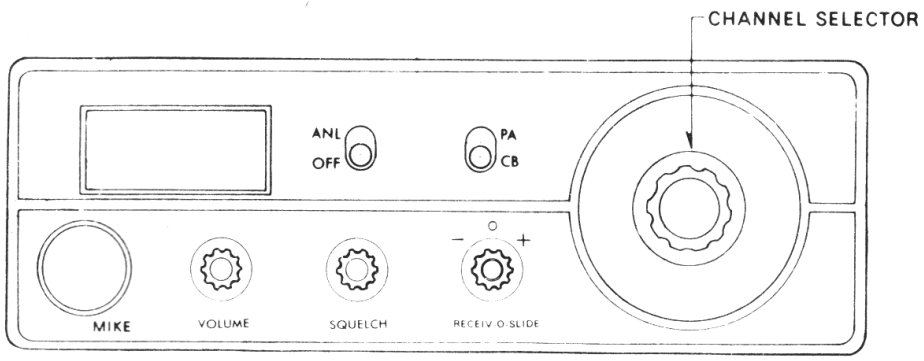


Figure 2

CHANNEL SELECTOR

The Channel Selector Switch has 23 operating positions. This switch sets both transmit and receive frequencies simultaneously by switching the proper crystals into the PEARCE-SIMPSON 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 counter-clockwise position, the BOBCAT 23D 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.

ANL SWITCH

Slide the ANL switch to ANL position. It will activate the automatic noise limiter in the audio circuits.

RECEIVE-O-SLIDE

This permits pinpoint tuning of receiver for reception of off-frequency stations. Every signal will come in sharp and clear.

OPERATING THE BOBCAT 23D

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 BOBCAT 23D uses all transistors, no warm up 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 BOBCAT 23D 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.
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 BOBCAT 23D 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 16.965 to 17.215MHz master oscillator (Q2), 9.545 to 9.585 MHz receive oscillators (Q1), 10.000 to 10.040 MHz transmit oscillator (Q3) and a 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, 42.540 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 transmitter circuit makes use of the carrier frequency signal output of the transmit mixer (D12), which is part of the HetroSync™ circuit. The signal is amplified by the buffer (Q15), which is a voltage amplifier, whose output is fed to the Predriver (Q16). Bandpass transformers L4 through T8 provide the selectivity to select the desired carrier frequency from the mixer (D12) 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 (Q18). The final supplies RF power to the antenna through a double pi-matching network. The primary purpose of a transmitter is to transmit intelligence from one place to another. 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 (Q11) and audio driver (Q12) amplify this signal and drive the audio power amplifier (Q13 & Q14). This audio power amplifier varies the supply voltage fed to the driver and signal at on 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 BOBCAT 23D 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 HetroSync^{R} 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^{R} 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 CH 13	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 spurious 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