SBE Sidebander II Owner's Manual

SBE®

Sidebander II

(MODEL SBE-12CB)

23 CHANNEL SSB/AM

CITIZENS BAND TRANSCEIVER

220 AIRPORT BLVD., WATSONVILLE, CA. 95076

The SBE Sidebander II transceiver is designed and engineered for licensed Class D operation on any of the 23 channels designated as Citizens Band frequencies by the Federal Communications Commission. You are required to read and understand Part 95 of the FCC regulations prior to operation of this unit. Copies of Part 95, covering regulations for the Citizens Band Radio Service are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

You must also obtain a license and call sign before operating your Sidebander II. If you do not have a Class D station license, request an application for a Class D station license for the Citizens Radio Service (FCC form 505) obtainable from any FCC Field office.

WARNING: Transmitter section adjustments must be performed by a qualified technician holding a valid first or second class FCC radiotelephone license.

1.0 GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 The SBE Sidebander II transceiver is a fully solid-state two-way radio intended for use as a Class D station in the Citizens Radio Service. The unit will operate in both a standard full carrier AM mode, as well as fully suppressed A3J Single Sideband mode, upper or lower. The Sidebander II features fully synthesized 23 channel dual conversion receivers for both SSB and AM. The equipment comes complete with microphone, mobile mounting bracket, power cable and crystals installed for all 23 channels.

1.2 General

Channels		23
Frequency Range		26.965 to 27.255 MHz
Frequency Control		Synthesizer
Frequency Tolerance		0.0025%
Frequency Stability		0.001%
Operating Temperature Range		-20°C to 50°C
Humidity		95%
Microphone		Dynamic w/p.t.t. switch and coil cord
Input Voltage		13.8VDC nom. 15.9V max. 11.7V min.
Current Drain	Transmit	AM un-mod. carrier, 1.2A
		SSB, 8W pep output, 2.2A
	Receive	Squelched, 0.3A
		2W audio output, 1.0A
Size		2.2 1/4 "H, 7 1/2 "W, 9 1/2 "D
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Weight		7 pounds
Antenna Connector		UHF, SO-239

1.3 Transmitter

Power Input	AM, 5 watts
	SSB,15 watts, p.e.p.
Modulation	AM, high and low level Class B
Modulation Capability	AM, 100%
Intermodulation Distortion	SSB: 3rd order - 20db
	5th order - 25db
Carrier Supression	SSB: -35db
Unwanted Sideband	-40db

Freq. Response	AM and SSB: 350-2500 Hz
Output Impedance	50 ohms, unbalanced
Automatic Load Control	Adjustable, Holds p.e.p. to 1db increase w/10db increase in audio input
SSB Filter	7.8 MHz, crystal lattice type 6db @ 2.1 KHz 50db @ 5.5 KHz
Output Indicator	Backlighted front panel meter

1.4 Receiver

Sensitivity	SSB: 0.5uV for 10db S+N/N AM: Less than 1.0uV for 10db S+N/N
Selectivity	SSB: 6db @ 2.1 KHz, 50db @ 5.5 KHz AM: 6db @ 3.5 KHz, 60db @ 8KHz
Image Rejection	-50db
I. F. Frequency	7.8 MHz, and 455 MHz
Automatic Gain Control	(AGC): Less than 10db increase in audio output for inputs of 1 to 500,000 microvolts.
Squelch	Adjustable. Threshold less than 1uV
Noise Blanker	Series gate type
Clarifier Range	± 700 Hz
Audio Output Power	3 watts into 8 ohms at 10% Distortortion
Hum and Noise	-35 db
Built-in Speaker	8 ohms, Round
External Speaker (not supplied)	8 ohms. Disables internal speaker when connected

1.5 PA System

Power Output	10 watts into external speaker
External Speaker for PA	8 ohms. When PA-CB switch is in PA, the PA speaker also monitors the receiver

1.6 The Sidebander II complies fully with Part 95 of Volume VI Rules and Regulations of the F.C.C. for Class D mobile operation in the Citizens Band Service.

2.0 INSTALLATION

2.1 Antennas

One of the most important keys to achieve optimum system performance is the installation of a good antenna system. Only a properly matched antenna system will allow maximum power transfer from the 52 ohm transmission line to the radiating element. Most quality antennas previously suitable for use on AM will also be satisfactory for SSB. Due to the nature of an SSB transmitter, the VSWR must be less than 2:1 to insure linear operation of the final amplifier.

The recommended method of antenna tuning is to use as in-line wattmeter or VSWR bridge to adjust the antenna for minimum reflected power on channel 11 in the AM mode. When the antenna system is adjusted for proper matching in the AM mode, no further adjustment for SSB will be necessary.

2.2 Mobile

The Sidebander II is supplied with a universal mounting bracket and microphone holder. The transceiver may be mounted in any plane and on any rigid surface, such as, underneath an automobile dashboard, truck roof or vertically on a boat bulkhead.

DC power should be derived directly from the vehicle's battery in order to minimize voltage losses and ignition interference. The unit is designed for a 12 volt negative ground system. Connect the red wire to the positive (+) battery terminal, black wire to the negative (-). If the transceiver's power lead must be lengthened, use #14 (or larger) wire.

2.2.1 Mobile Antenna

The antenna type best suited for mobile applications is either a base/center loaded or full length quarter wave vertical whip. This type of antenna is non-directional thus assuring minimum signal variation as the vehicle changes direction. If directional capabilities are desired in a mobile installation, it is recommended that only a properly matched pair of antennas and phasing harness be used. A phasing control that allows the operator to

shift antenna phase may also be used providing no reactive component is reflected back to the transmission line. An in-line wattmeter or VSWR bridge may be used to check this characteristic since a reactive component will appear as an increase in the standing wave ratio. A standard antenna connector (type SO-239) is located on the rear panel for convenient connection to a PL-259 cable plug. Type RG-8/U or RG-58/U cable is recommended for transmission line.

2.3 Base Station

For best station operation, the SBE model SBE-3AC Base Station Power Supply is recommended. The supply provides a regulated 13.8 volts DC output with an input voltage of 110-120 volts AC, 50 - 60 Hz.

2.3.1 Base Station Antenna

The Sidebander II may be used with any type of 52 ohm base station antenna. A ground plane vertical antenna will provide the most uniform horizontal coverage. This type of antenna is best suited for communication with a mobile unit. For point-to-point operation where both stations are fixed, a directional beam will usually increase communications range since this type of antenna concentrates transmitted energy in one direction. The beam antenna also allows the receiver to "listen" in only one direction thus reducing interfering signals.

Antenna height is an important factor when maximum range is desired. Keep the antenna clear of surrounding structures or foilage. FCC regulations limit antenna height to 20 feet above an existing structure.

2.4 Public Address

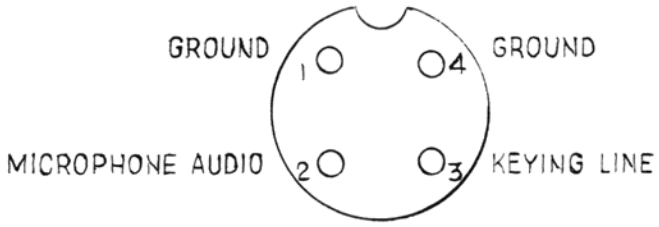
An external 8 ohm, 10 watt speaker may be connected to the phono jack located on the rear panel when the Sidebander II is used as a public address system. The speaker should be directed away from the microphone to prevent acoustic feedback. NOTE: Speakers with less than 10 watt power capability may be damaged in the P.A. mode.

2.5 Remote Speaker

The external speaker jack on the rear panel is used for remote receiver monitoring. The external speaker should have 8 ohms impedance and be able to handle at least 3 watts. When the external speaker is plugged in, the internal speaker is disconnected.

2.6 Alternate Microphones & Installation

For best results the user should select a low impedance dynamic type microphone or a transistorized preamplified microphone. Wiring connections for the alternate microphones are shown in Figure 1 below.



FEMALE MICROPHONE PLUG
REAR VIEW

2.7 Noise Suppression

The ability of the Sidebander II to detect very weak signals will be enhanced if the electrical noise generated by the vehicle is minimized.

The following steps are recommended if excessive electrical noise is present.

Before installing suppression devices, check the condition of the vehicle's ignition wiring. Insure that the spark plug connections are clean and tight and that the wires are seated properly in the distributor cap. Check for wear of the distributor rotor and replace the distributor cap if traces of carbon or signs of arcing are evident. Resistor type spark plugs should be used in place of regular spark plugs. Radio-resistant ignition wire is standard on most late model vehicles and should be installed in vehicles not so equipped.

Alternator noise may be minimized by installation of an alternator line filter available from radio parts distributors.

Installation of bonding straps in the engine compartment will further reduce ignition noise. Install short links of metal strap or heavy shield braid between the engine and frame, engine and fire wall, alternator and frame, exhaust pipe and frame and hood to frame. Extremely high ignition noise levels or noise levels that become worse after a period of time is indicative of deterioration of the vehicle's electrical system.

3.0 OPERATION

3.1 Control Functions

3.1.1 Off/On Volume

Turn clockwise to apply power to the unit and to set the desired listening level.

3.1.2 Squelch

Blanks out unwanted noise when no signals are present. Turn fully counterclockwise then slowly clockwise until the receiver noise disappears. Any signal to be received must now be slightly stronger than the average received noise. Further clockwise rotation will increase the threshold level which a signal must overcome in order to be heard. Only strong signals will be heard at a maximum clockwise setting.

3.1.3 Noise Blanker Switch

This is a dual purpose control designed to tailor receiver performance for a wide range of operating extremes. When the AM mode is in use, the noise blanker switch is placed in the NB position to eliminate impulse and atmospheric noise so that very weak signals may be copied. The switch may normally be expected to be left in the NB position during AM operation in a mobile installation to reduce alternator and ignition noise. The AM receiver sensitivity is the same in both positions of the switch, however, when the noise blanker is energized in AM, a very slight loss of high voice tones might be noticed. During base station operation, the NB switch may be left off when in the AM mode unless a high atmospheric noise level is present.

In the SSB mode the noise blanker switch functions to switch in a different noise blanker circuit in the NB position. In this case, the noise blanker has no effect on receiver fidelity but instead has the effect of enhancing receiver performance by reduction of incoming noise. During normal operation the NB switch in the SSB mode is always left in the NB position.

3.1.4 Channel

Selects the desired channel for transmission and reception on both AM and SSB. Channels 10 thru 15 and 23 may be used for communications between stations operating under different licenses and between units sharing the same licenses. All other channels, except channel 9, may be used only between units operating under the same license. Channel 9 has been reserved by the FCC for emergency communications or immediate protection of property. Channel 9 may also be used to render assistance to a motorist; it is commonly called the HELP channel. This is an FCC rule and applies to both AM and SSB modes of transmission.

3.1.5 Mode

Selects either of the SSB modes (USB or LSB) or standard double sideband AM. Unless the station with which communications is desired is equipped with SSB, the AM mode is normally used. The mode selector switch changes the mode of operation of both transmitter and receiver simultaneously. An explanation of how to determine which mode to use is contained in the following paragraphs under Operating Procedure.

3.1.6 Clarifier

Allows variation of both the transmitter and receiver operating frequencies above and below the assigned frequency. Although this control is intended primarily to tune in SSB signals, it may be used to optimize AM signals as described in the Operating Procedure paragraphs.

3.1.7 RF Gain

Used to adjust the sensitivity of the receiver during AM or SSB reception. When the control is at it's extreme countercloskwise position, the receiver sensitivity will be minimum. At this setting on the gain control only the very strongest signals will be heard. As the control is rotated clockwise weaker signals and noise will be heard. When the control is at it's full clockwise position, sensitivity of the receiver will be maximum.

3.1.8 PA-CB Switch

Selects the mode of operation. The PA function should not be used unless an external speaker is connected as described in Installation Section of this manual. In the CB position, the PA function is disabled and the unit will transmit and receive on the selected frequency.

3.1.9 Press-To-Talk Microphone

The receiver and transmitter are controlled by the press-to-talk switch on the microphone. Press the switch and the transmitter is activated; release switch to receive. When transmitting, hold the microphone two inches from the mouth and speak clearly in a normal voice.

3.1.10 Meter

Indicates received signal strength, relative output power in AM and SSB modes.

3.2 Operating Procedure

3.2.1 There are three types of signals presently in use for communications in the Citizens Band. The Sidebander II receiver is capable of receiving any of these types when the proper mode of operation is selected. When the Sidebander II mode switch is placed in the AM position, standard double sideband full carrier signals will be detected. An SSB signal may be recognized while in the AM mode by its characteristic intermittent pulsing or fluttering and the inability of the AM receiver to produce an intelligible output.

The SSB modes will detect upper sideband and lower sideband to produce an intelligible signal. A single transmitted signal consists only of the upper or the lower sideband and no carrier is transmitted. A double sideband (DSB) signal consists of two sidebands, each sideband being equal in amplitude and equally distant in frequency above and below the operating frequency of the transmitter. The operating frequency is defined as the frequency where the carrier would normally be during AM operation. In AM operation, a carrier, or reference signal, is transmitted along with two sidebands; each sideband being of equal amplitude and equal distance above and below the carrier frequency.

It can be seen that since a single sideband receiver requires only one of the sidebands and no carrier, all modes of transmission may be received since all modes contain at least one sideband. The SSB receiver selects only the required portion of the signal (the sideband) and rejects the carrier and opposite sideband of an AM signal and rejects the opposite sideband of a DSB signal. The method of tuning AM and DSB signals in the SSB mode is explained later on in this chapter.

An SSB signal may only be received when the listening receiver is functioning in the same mode. In other words, an upper sideband signal (USB) may be made intelligible only if the receiver is functioning in the USB position. A lower sideband (LSB) signal will be heard when the receiver is in the USB mode, however, no amount of tuning will make the signal intelligible. The reason for this may be understood if you consider that when in the USB mode, a transmitter's output frequency is in direct proportion to the modulation tone whereas in the LSB mode the transmitter's output frequency is in inverse proportion to the modulating tone. When modulation is applied to the Transmitter's microphone in the USB mode, the transmitter's output frequency is increased whereas in the LSB mode the transmitter's output frequency is decreased. The result in listening to the receiver is that when the mode switch is in the proper position (either USB or LSB), a true reproduction of a sin gle tone of modulation will result, and if the tone is increased in frequency, such as a low pitched whistle to a high pitched whistle, you will hear the increase in the output tone of the receiver. If the incorrect mode is selected, an increase in tone of a whistle applied to the transmitter will cause a decrease in the resultant tone from the receiver. Thus when a voice is used in place of a whistle or tone, in the proper listening mode the voice will be received correctly whereas in the incorrect mode, the voice will be translated backwards and can not be made intelligible by the clarifier control. When listening to an AM or DSB transmission, a correct sideband is heard in either mode since both an upper and lower sideband are received.

Once the desired SSB mode has been selected, frequency adjustment may be necessary in order to make the incoming signal intelligible. The clarifier control allows the operator to vary frequency above and below the exact center frequency of the received signal. If the sound of the incoming signal is