



VBC-2A

Basic Repeater

Controller

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VBC-2A User Guide

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Thank you for your purchase of the VBC-2A Repeater Controller. The controller has been design with state-of-the-art technology. Please take a few minutes to study this manual carefully before putting it in to operation.

If you find an error in this document or if there are any unclear statements, we would like to hear about it. Please send your comments to comments@cmdtechnologies.com .

Support for the controller is available by either e-mail or telephone. Include with your questions the date that you purchased your controller, the product number, and your phone number with the best time to call if you would like us to answer your question by telephone. Send to support@cmdtechnologies.com.

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Introduction

The VBC-2A Repeater Controller provides the basic control functions needed for a repeater. These functions include: Time Out Timer, Hang Time, Squelch Time, Courtesy Beep Control, CW ID selection and others that are in the features list. The front panel indicators show the current status of the repeater. The VBC-2A is manufactured using the latest state-of-the-art surface mount device technology. All the control is contained in a Xilinx Complex Programmable Logic Device (CPLD). The VBC-2A is housed in a small, attractive aluminum enclosure that fits about anywhere.

The VBC-2A Repeater Controller is ideal for both permanent or portable field type setups, e.g., emergency, club field day functions, public services such as parades, bike tours, festivals and many other public service events, as well as Homeland Security operations.

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Features

- Up to 3 different Callsigns maybe programmed and selected
- DTMF Control Functions
 - Single (normal) Courtesy Beep
 - Double (Emergency) Beep
 - Transmitter On/Off
- 3-minute Time Out Timer
- User Adjustable Functions
 - CW Speed
 - CW Tone
 - Courtesy Tone Speed
 - Courtesy Tone
 - Hang Time
 - Squelch Tail Time
 - Delay between squelch tail and courtesy beep
 - Repeater Audio Level
 - Courtesy Tone Audio Level
 - CW ID Audio Level
- Setup Feature
 - Push Button to simulate Carrier Operated Squelch (COS) input for off-line setup
- Front Panel Indicators
 - Receiver On Lamp
 - Transmitter On Lamp
 - Transmitter Enable/Disable Lamp
 - DTMF Detection Lamp
 - Double (Emergency) Courtesy Beep Lamp
 - Power On Lamp
- Front Panel Controls
 - Power On Push Button
 - System Reset Push Button
 - Transmit Enable/Disable Toggle Switch
 - Manual ID Push Button
 - CW ID Callsign Selection Switch
- 13.8 VDC at ~.250 Amps Power 2.5mm connector (mating connector supplied)
- Input/Output Connections
 - DB-25M Male 25 pin connector (mating connector supplied)
 - Isolated Relay PTT contacts available
 - Normally Opened, Normally Closed, and Common PTT Relay contacts available
 - COS or Carrier Operated Relay (COR) input
 - Receiver Audio Input
 - Transmit Audio Output
- Anodized Aluminum Enclosure

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Specifications

- Input Power 12.0 to 15.0 Volts DC
- Input Current Inrush ~.400 Amps
Steady state ~.210 Amps
- COS Positive Pulse
- Audio Input >1K Ohms
- Audio Output ~2K Ohms
- PTT Output Relay Contacts, N.O., N.C., and
Common are provided
- CW ID Speed Adjustable Range 9 Hz to 24 Hz
(~11 WPM to ~29 WPM)
- CW Tone Adjustable Range 550 Hz to 2.8 KHz
- Courtesy Beep Speed Adjustable Range 10 Hz to 100 Hz
- Courtesy Beep Tone (Single Beep) Adjustable Range 570 Hz to 2.8 KHz
8.5 Hz to 25 Hz (.118 sec to .040 sec.)
(Double Beep) 17 Hz to 50 Hz (.058 sec. to .020 sec.)
- Squelch Tail Time (Delay 1) Adjustable Range .250 Hz to 1.85 Hz
(4 sec. to .540 sec.)
- Hang Time (Delay 2) Adjustable Range .125 Hz to .673 Hz
(8 sec. to 1.48 sec.)
- Audio Monitor Output 8 Ohm – Typical
- Callsign Storage 27C256 EPROM

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Description of Operation

The VBC-2A is a basic repeater controller that provides the repeater system with the necessities to control a repeater system. The VBC-2A is very well suited for temporary setups in remote locations, emergency situations, special events, or as an auxiliary system for clubs and organizations.

The VBC-2A consists of four (4) sections: the Input/Output Section, the Audio Section, the Timing and Control Section, and Power Section.

The Input/Output Section consists of a DB-25 male connector that serves as the interface to the outside world. The DB-25 connector has the connections for the following:

- Audio Input
- Audio Output
- Carrier Operated Squelch or Relay (COS or COR)
- Push to Talk (PTT), Normally Opened Contact (N.O.)
- Push to Talk (PTT), Normally Closed Contact (N.C.)
- Push to Talk (PTT), Common Contact (Com.)

The Audio Section consists of a series of low noise operational amplifiers that have several purposes. One of the purposes is to condition the incoming repeater receiver audio. Another purpose is to mix with the incoming audio the controller-generated courtesy beep tones and the CW ID tones. The mixed audio signal is fed to the audio output connection located on the I/O connector.

The Timing and Control Section consists of several timing circuits that are located inside and outside the Xilinx Complex Programmable Logic Device (CPLD). The timing circuits, such as the Squelch Tail and the Hang Time, are controlled by the user through variable potentiometers. The timing circuits contained inside the CPLD are not user adjustable and are based on a 10 MHz stable time base. This means that the timing functions, such as the 10-minute CW ID timer and the 3-minute Time Out Timer, are going to be very accurate.

The user has control over the following controller functions:

- CW ID Tone
- CW ID Speed in Words per Minute (WPM)
- Courtesy Tone
- Courtesy Tone Speed
- Squelch Tail Time
- Hang Time

All the above functions are changeable by variable resistors located on the controller Printed Circuit Board (PCB).

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Description of Operation (Continued)

When the power is first applied to the VBC-2A Repeater Controller there is a short delay while the system is initializing itself, then the XMIT ENABLE lamp will light if the Xmit Disable switch is not activated. At this point the VBC-2A Repeater Controller is ready for operation. This same action will happen when the front panel RESET push button switch is activated.

When a Carrier Operated Squelch (COS) signal is received, the front panel REC lamp will light and remain lit while the COS line from the receiver is active. The REC lamp will respond to the incoming COS signal regardless of the operational status of the controller.

The VBC-2A Repeater Controller has what CMD Technologies calls a “polite” CW ID. The “polite” CW ID works as follows: During any 10-minute period, if the repeater has been in use, the “polite” CW ID will ID only if the controller is not in use at the ID time. If the controller is in use at the ID time, the controller will wait until the next 10-minute period to ID. If the controller has been inactive during a 10-minute period the controller will not ID at the 10-minute ID time period.

When the front panel MANUAL ID push button switch is activated, the selected CW ID is sent out. This operation will not affect the 10-minute ID timer. The MANUAL ID can be activated at any time.

When the front panel Double Beep or Emergency lamp is lit this indicates that the correct DTMF code has been received and that the Double Beep will be used as the courtesy beep. When the Double Beep lamp is not lit, this indicates that a single beep will be used for the courtesy beep.

The front panel DTMF lamp will only light when it receives the **STAR (*)** tone. If any other tone is received first, the DTMF lamp will not light, nor will the VBC-2A controller respond. The front panel DTMF lamp lighting indicates that a valid DTMF tone sequence has been received and that the controller will respond to the codes.

The Dual Tone Multi-Frequency (DTMF) detection circuitry compares the DIP Switch settings with the incoming DTMF tones. If a match is made, the appropriate action is taken. The command sequence must begin with a **STAR (*)** and end with a **POUND (#)**. Also, during a command sequence the carrier should not drop. If the carrier does drop, the DTMF command sequence will have to start again from the beginning.

The following are the remote control functions and how they are used:

Double Beep is a toggle function. That is, the same code is used to turn the Double Beep on and off. **The Factory default code is: *AB20#.**

Description of Operation (Continued)

Repeater Off has one code associated with it. When activated, the repeater will stop transmitting after the current squelch tail and hang time have expired. **The Factory Default code is: *AB10#.**

Repeater ON has one code associated with it. When activated, the repeater will start transmitting again, assuming it was previously off. When the repeater is turned on, the current CW ID will be sent, indicating that the repeater is back on the air. **The Factory Default code is: *AB50#.**

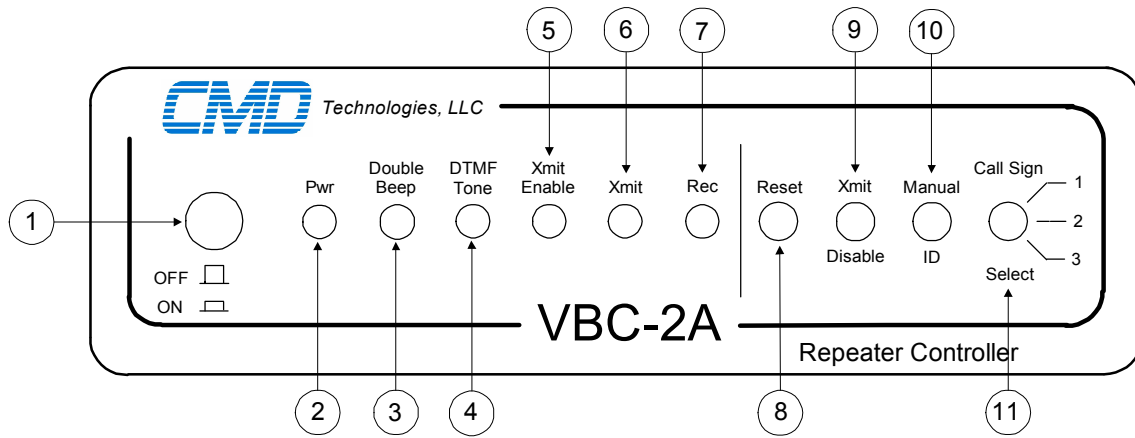
The user can change the numerical command codes as described later in the manual. The ***AB** code prefix and the **#** code suffix are set in the controller firmware and are not user changeable. Likewise, the 10-minute timer and the polite ID are set in the controller firmware and are not user changeable.

The Callsign Select control allows the user to select between one of three CW Callsigns. These callsigns are stored in the onboard 27C256 EPROM, which is provided. The callsigns are coded for use with the VBC-2A controller and can be entered by using the provided software program. The CALLSIGNS program will prompt the user to enter the Primary Callsign and, optionally, two other callsigns. The program will store the callsigns in a printable TXT file and then format the data in VBC-2A compatible data structure in Intel Format that can be used with any standard EPROM programmer.

The user also may request that CMD Technologies program the EPROM. To do this, just send an email to support@cmdtechnologies.com with the callsigns in the order you wish them to be programmed. Please include your credit card number and your return address. The cost for this service is \$20.00 USD. Or, use the CMD Technologies website products page to do the same.

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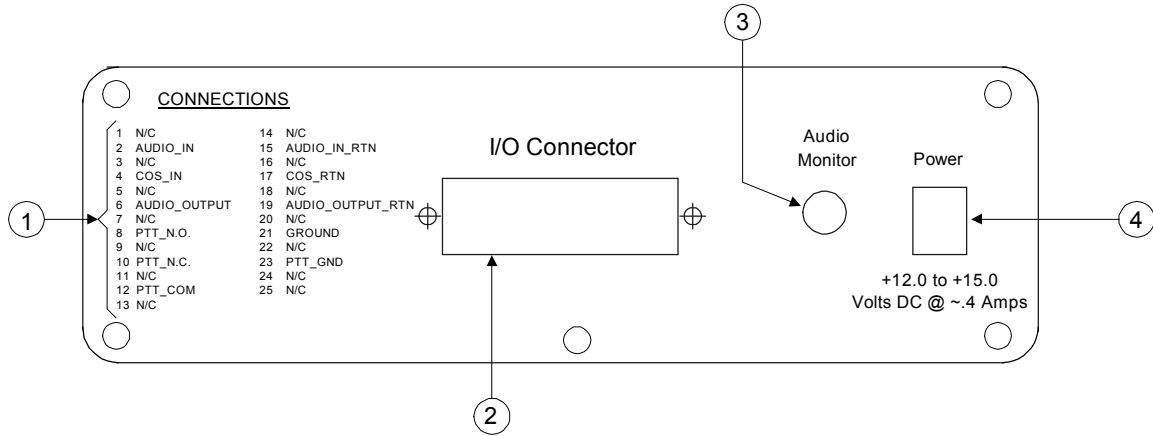
Front Panel Indicators and Controls



- | | |
|--------------------------------|--|
| ① Power Switch | Applies DC Voltage to the Controller |
| ② Power On Indicator | Indicates that DC Voltage has been applied to the controller |
| ③ Double Beep Indicator | Indicates that the Double Beep courtesy tone is in use. When blinking, this indicates that an invalid DTMF code has entered into the DTMF Switches |
| ④ DTMF Tones | Indicates that the controller is receiving a valid DTMF tone |
| ⑤ Xmit Enable Indicator | Indicates that the controller is actively able to key the repeater transmitter |
| ⑥ Xmit Indicator | Indicates that the controller is keying the repeater transmitter |
| ⑦ Rec. Indicator | Indicates a receive signal is detected from the repeater receiver. This is the Carrier Operated Squelch (COS) |
| ⑧ Reset Switch | This push button is System Reset. When depressed, resets all timing functions and releases all ongoing functions |
| ⑨ Xmit Disable | This Toggle Switch disables the controller from activating the repeater transmitter |
| ⑩ Manual ID | Depressing this push button causes the selected CW ID to be sent |
| ⑪ Call Sign Select | Allows the selection of the CW ID call sign from one of three (3) selections |

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Rear Panel Connections



①	I/O Connection List	1 N/C	14 N/C
		2 AUDIO_IN	15 AUDIO_IN_RTN
		3 N/C	16 N/C
		4 COS_IN	17 COS_RTN
		5 N/C	18 N/C
		6 AUDIO_OUTPUT	19 AUDIO_OUTPUT_RTN
		7 N/C	20 N/C
		8 PTT_N.O.	21 GROUND
		9 N/C	22 N/C
		10 PTT_N.C.	23 PTT_GND
		11 N/C	24 N/C
		12 PTT_COM	25 N/C
		13 N/C	

- ② **I/O Connector** Input and Output Connector, DB25
- ③ **Audio Connector** Repeater Audio Monitor Jack
- ④ **Power Input Connector** Input Power Connector, 12 to 15 Volt DC at ~.4 Amps

Jumper, Test Point Descriptions and Settings

There are several jumpers that need to be set for your particular repeater control situation. The jumpers are as follows: (Figure 1)

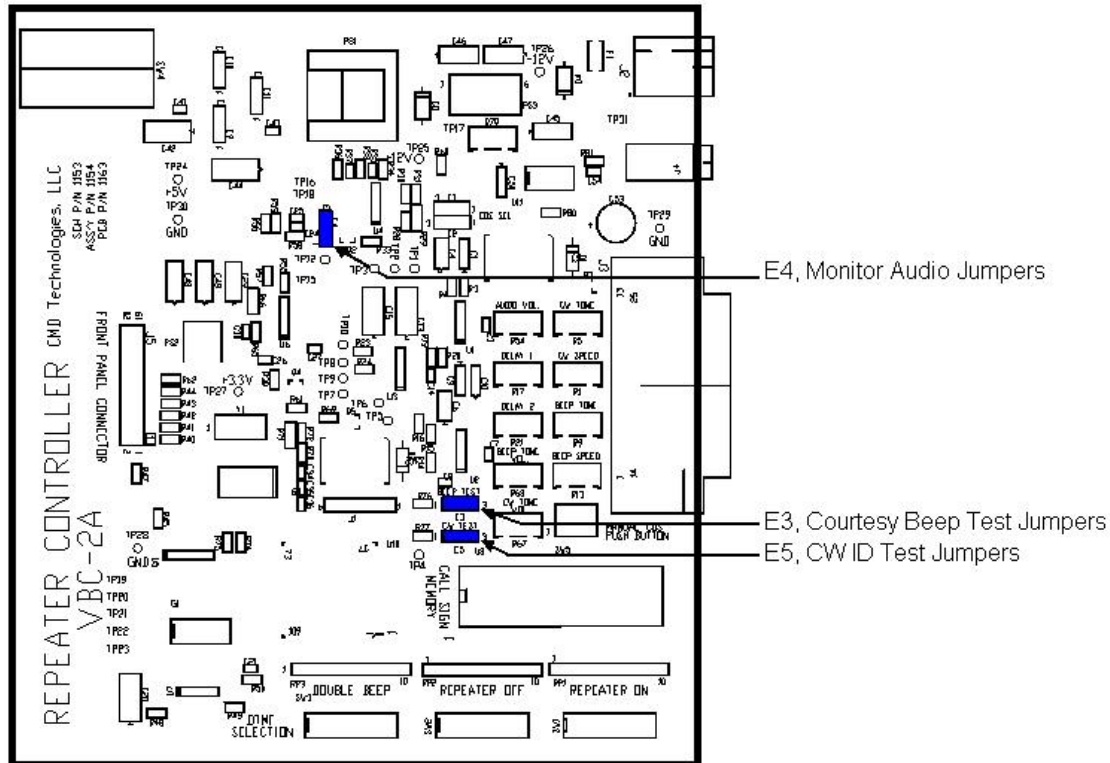


Figure 1

Jumpers

E1 and E2 are used for factory testing.

E3 is to Test the Courtesy Beep Volume, Tone, and Speed

E4 is to select either Squelched or Un-Squelched Audio Monitor Volume

E5 is to Test CW ID Volume, Tone, and Speed (WPM)

Test Points (TP)

TP 2 CW ID Speed

TP 3 CW ID Tone

TP 5 Courtesy Tone

TP 6 Courtesy Tone Speed

TP 8 Squelch Tail Timing (Delay 1)

TP 10 Hang Time (Delay 2)

TP 12 Carrier Operated Squelch (COS)

Jumper, Test Point Descriptions and Settings (Continued)

Jumper Settings E1 and E2

E1 and E2 are used for factory testing. Therefore, they should not be used or the shorting jumpers changed.

Jumper Settings E3 Test Courtesy Beep Volume, Tone, and Speed

E3-2 to E3-3 is for normal controller operation (Default)

E3-1 to E3-2 is the TEST position

Jumper Setting E4 Audio Monitor Squelch Selection

E4-1 to E4-2 is the Audio Monitor Squelched position (Default)

E4-2 to E4-3 is the Audio Monitor Un-Squelched position

Jumper Setting E5 Test CW ID Volume, Tone, and Speed

E5-2 to E5-3 is for normal controller operation (Default)

E5-1 to E5-2 is the TEST position

Description of Jumper and Test Point Usage

Jumper E3 Courtesy Beep, Squelch Tail, and Hang Time

Courtesy Beep

E3 (Ref. Figure 1) is a test/setup jumper setting that will assist in setting up the repeater courtesy beep tone frequency. When the jumper is placed in the test position, the courtesy tone frequency will be audible at the Audio Monitor output but does not activate the repeater transmitter. Use potentiometer R9 to change the tone frequency, potentiometer R13 (Ref. Figure 3) to adjust the speed of the courtesy beep, and potentiometer R68 to adjust the volume of the courtesy beeps. (Ref. Figure 4).

Test point 5 (TP 5) (Ref. Figure 2) is associated with the Courtesy Beep Tone Oscillator. This frequency range is between 570 Hz to 2.8 KHz. The Courtesy Tone increases with clockwise (CW) rotation of R9. Counterclockwise (CCW) rotation will decrease the frequency of oscillation.

Test point 6 (TP 6) (Ref. Figure 2) is associated with the Courtesy Beep Speed. Speed of the courtesy beep is the time with which the tone of the courtesy beep is audible. Clockwise (CW) rotation of R13 will increase the oscillator frequency. Counterclockwise (CCW) rotation will decrease the frequency of oscillation.

Jumper, Test Point Descriptions and Settings (Continued)

Squelch and Hang Time Timing

Squelch and Hang Time Adjustments are made with potentiometers R17 and R21 (Ref. Figure 3). R17 is used to adjust the Squelch Tail timing. The range of the timing is .250 Hz to 1.85 Hz or 4 seconds to 584 milliseconds. R21 is used to adjust the Hang Time timing. The range is .125 Hz to 1.48 Hz or 4 sec. to .540 sec.

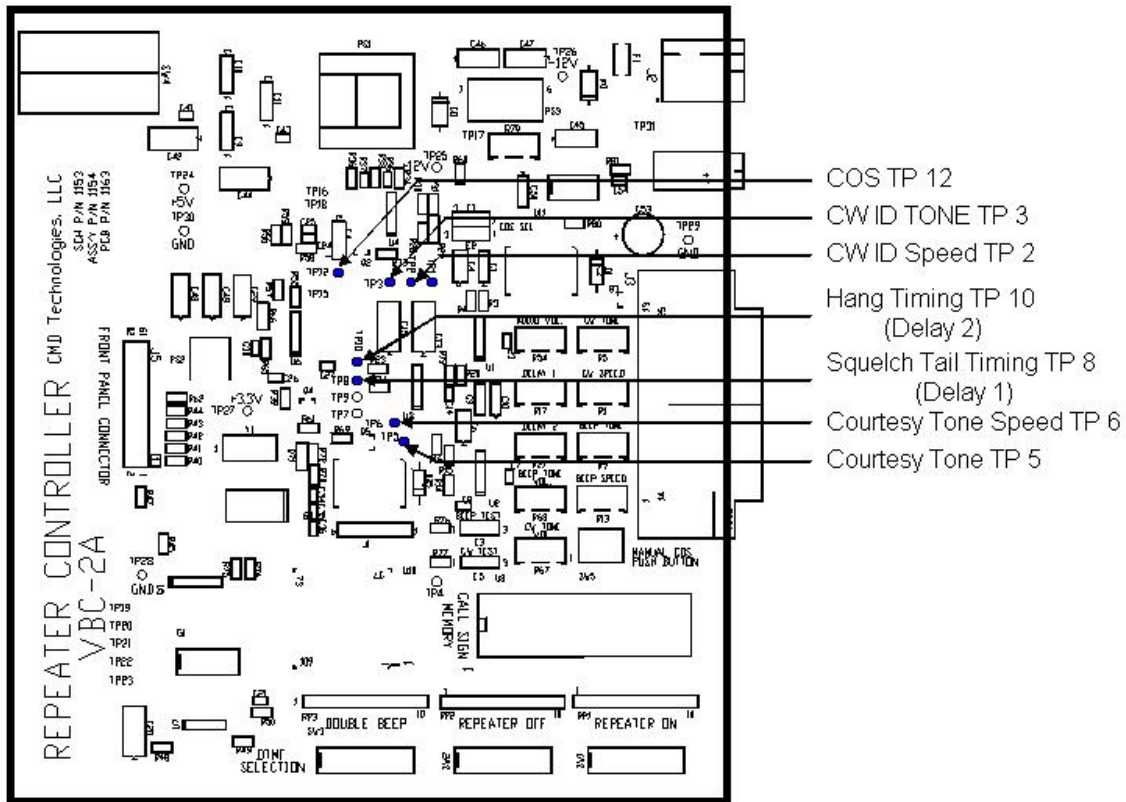


Figure 2

Jumper E4 Monitor Audio Squelch Selection

E4 (Ref. Figure 1) selects whether or not to leave the monitor audio on all the time, passing the repeater audio to the monitor audio speaker. E4 can be positioned to allow the repeater audio to be heard only when the COS is active. This position will help eliminate all unnecessary audio hiss and other possible annoying audio that may come through the repeater receiver between repeater uses.

Jumper, Test Point Descriptions and Settings (Continued)

Potentiometer R79 is used to adjust the volume level of the Audio Monitor output. (Ref. Figure 4 for the location of R79.)

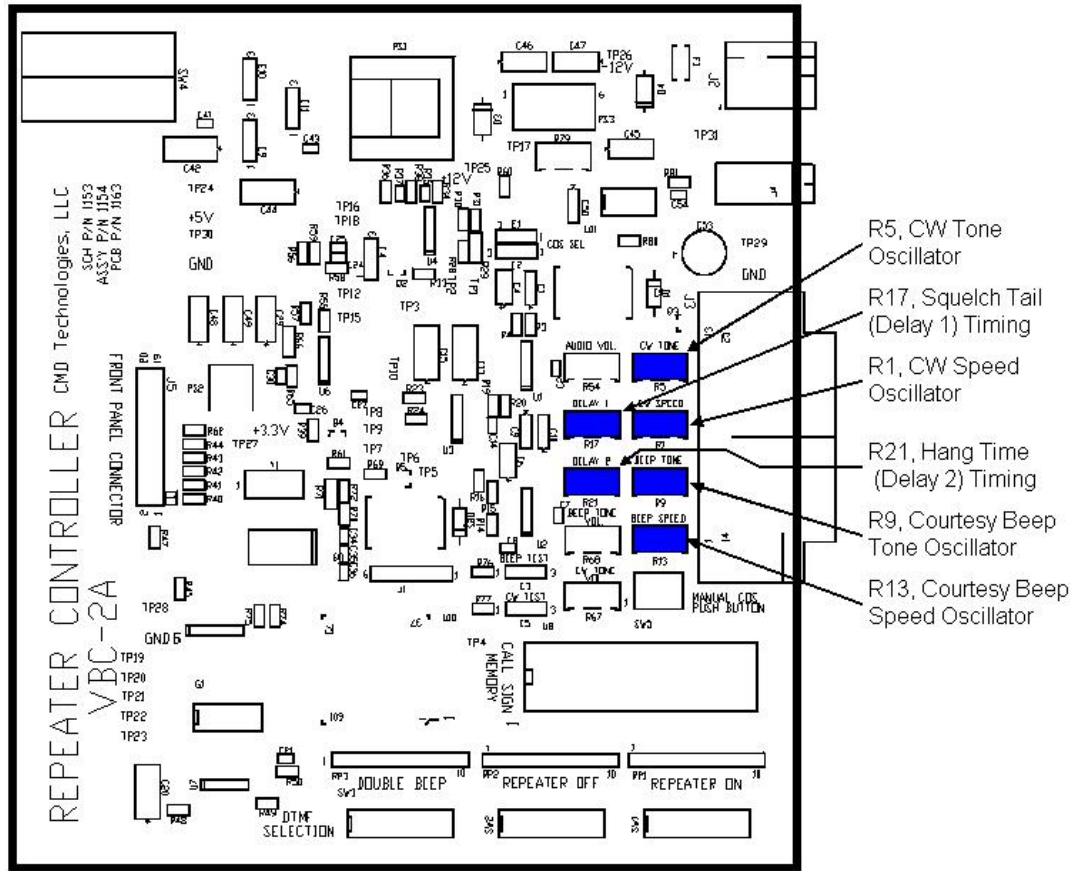


Figure 3

Jumper E5 Test CW ID Tone, Speed and Volume

E5 (Ref. Figure 1) is a test/setup jumper setting that will assist in setting up the repeater CW ID Tone Frequency, Speed and Volume. When the jumper is placed in the test position, the CW ID tone frequency will be audible at the Audio Monitor output but will not activate the repeater transmitter. Use potentiometer R1 to change the tone frequency, potentiometer R5 (Ref. Figure 3) to adjust the speed of the CW ID, and potentiometer R67 to adjust the volume of the CW ID. (Ref. Figure 4)

Test point 3 (TP 3) (Ref. Figure 2) is associated with the CW ID Beep Tone Oscillator. This frequency range is between 550 Hz to 2.8 KHz. Clockwise (CW) rotation of R9 will increase the oscillator frequency. Counterclockwise (CCW) rotation will decrease the frequency of oscillation.

Jumper, Test Point Descriptions and Settings (Continued)

Test point 2 (TP 2) (Ref. Figure 2) is associated with the CW ID Speed. Speed of the CW ID is the time with which it takes to generate a DIT in Morse Code. All CW ID timing is frequency of oscillation.

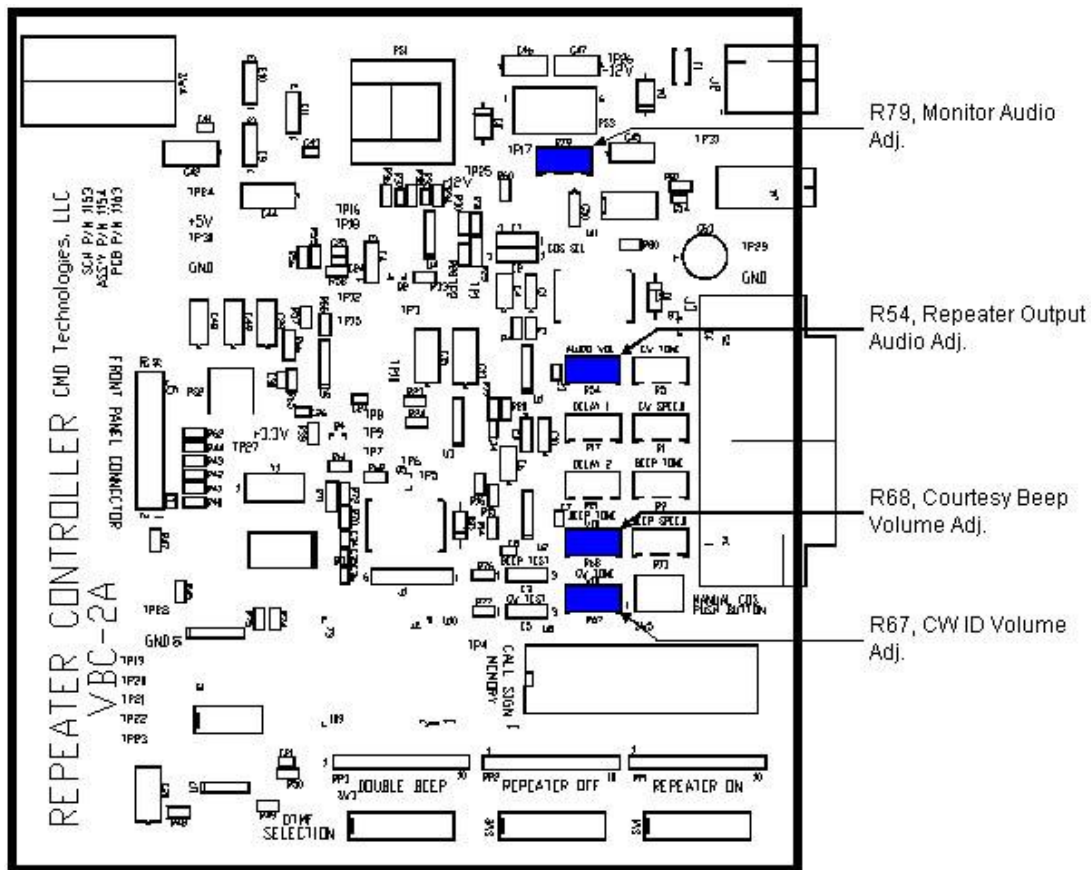


Figure 4

TP 12 Carrier Operated Squelch (COS)

Test point 12 (TP 12) is associated with the COS signal. At TP 12 the signal will always be a +3.3 Volt level. When the repeater receiver has an incoming receive signal the COS signal goes to ground at TP 12 and will stay at ground level until the COS signal is released.

Power Test Points:

TP 24 +5 Volt DC	TP 25 +12 Volt DC
TP 26 -12 Volt DC	TP 27 +3.3 Volt DC
TP 28 GND	TP 29 GND
TP 30 GND	

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Controller Setup

The VBC-2A Repeater Controller comes with mating connectors for the Power and the I/O. Connect between 12.0 VDC to 15.0 VDC at ~.250 Amps to the power connector.

I/O Connections

The supplied I/O connector is a DB25S (socket or female connector). Using the list below or the list on the back panel of the controller, wire the I/O connector to your repeater receiver and transmitter. It is recommended that shielded cable 20 or 22 gauge, either solid or stranded conductor, be used. Connect the shield of the cable to any of the RTN or GND pins on the I/O connector.

I/O Connection List:

1.	N/C	14.	N/C
2.	AUDIO_IN	15.	AUDIO_IN_RTN
3.	N/C	16.	N/C
4.	COS_IN	17.	COS_IN_RTN
5.	N/C	18.	N/C
6.	AUDIO_OUTPUT	19.	AUDIO_OUTPUT_RTN
7.	N/C	20.	N/C
8.	PTT_N.O.	21.	GROUND
9.	N/C	22.	N/C
10.	PTT_N.C.	23.	PTT_GND
11.	N/C	24.	N/C
12.	PTT_COM	25.	N/C
13.	N/C		

N/C = No Connection

Power Connections

The supplied power connector is a 2.5 mm plug. Connect the center pin to the positive side of the power source and connect the outer ring to the ground or return side of the power source. Use 18 or 20 gauge wire for these connections.

Setting up Controller for Operation

For the setup procedure it will be very helpful, although not necessary, to have an external 8 ohm speaker connected to the Audio Monitor jack on the rear panel. Having an external speaker connected will allow the controller to be set up almost completely without being connected to the repeater.

The adjustment or setup of these timing adjustments may be accomplished in two ways; “by ear” or using an oscilloscope. The first discussion will be making the adjustments using the “by ear” method and then with an oscilloscope.

To perform the following CW ID setup adjustments, move jumper E5 from the normal factory position of E5-2 to E5-3 to the test position of E5-1 to E5-2. In other words, move the jumper toward the front of the controller. When the setup adjustments are complete, return the jumper E5 to the normal position of E5-2 to E5-3.

Also, refer to Figures 2, 3, and 4 for positions of the potentiometers and the associated test points.

CW ID Adjustment

CW ID Tone Adjustment uses jumper E5 and variable potentiometers R1, R5, and R67.

CW ID Tone Frequency Adjustment without using an oscilloscope (“by ear”)

With jumper E5 in the test position, you should hear a tone coming from the external speaker and/or the repeater transmitter. To adjust the frequency of this tone, use R5 and turn the adjustment screw clockwise (CW) to increase the tone frequency and counterclockwise (CCW) to decrease the tone frequency. The tone frequency range is from 550 Hz to 2.8 KHz. **The Factory Default is 1.2 KHz.**

CW ID Tone Frequency Adjustment using an oscilloscope

Set the oscilloscope vertical displacement to 2 volts per centimeter and the time base to 20 milliseconds per division and connect the scope probe to TP 3 and the scope ground to a test point that is labeled GND. The waveform will be a square wave type signal at approximately 5 volts in amplitude. Measure the tone frequency from the rising edge of one pulse to the rising edge of the next. Use the following formula to find the frequency. Use R5 and turn the adjustment screw clockwise (CW) to increase the tone frequency and counterclockwise (CCW) to decrease the tone frequency. The tone frequency range is from 550 Hz to 2.8 KHz. **The Factory Default is 1.2 KHz.**

$$\text{Frequency} = \frac{1}{\text{Time in Milliseconds}}$$

Setting up Controller for Operation (Continued)

If you know the time in milliseconds for the CW ID tone, then use the following formula:

$$\text{Time in Milliseconds} = \frac{1}{\text{Frequency}}$$

CW ID Speed without using an oscilloscope (“by ear”)

With jumper E5 in the normal position (E5-2 to E5-3), in other words, the jumper toward the rear panel of the controller, push the **MANUAL ID** button that is located on the front panel. This will cause the currently selected CW ID to be sent out. To increase or decrease the speed at which the CW ID is sent, adjust R1 clockwise (CW) to increase the speed and counterclockwise (CCW) to decrease the speed. **The Factory setting is approximately 10.8 Hz or 13 words per minute (WPM).**

CW ID Speed using an oscilloscope

Set the oscilloscope vertical displacement to 2 volts per centimeter and the time base to 20 milliseconds per division and connect the scope probe to TP 2 and the scope ground to a test point that is labeled GND. The waveform will be a square wave type signal with approximately 5 volts in amplitude. Measure the CW ID speed frequency from the rising edge of one pulse to the rising edge of the next and use the following formula to find the frequency. To increase or decrease the speed at which the CW ID is sent, adjust R1 clockwise (CW) to increase the speed and counterclockwise (CCW) to decrease the speed. **The Factory setting is approximately 10.8 Hz or 13 words per minute (WPM).**

$$\text{Frequency} = \frac{1}{\text{time in milliseconds}}$$

Using the word PARIS as the standard to determine CW code speed, the following calculation is used to convert the frequency measured at TP 2 to Word per Minute (WPM).

$$\text{WPM} = \frac{\text{Frequency in Hertz}}{.833}$$

If the Word per Minute is known and the frequency is the unknown, use the following calculation.

$$\text{Frequency in Hertz} = .833 \times \text{WPM}$$

Setting up Controller for Operation (Continued)

CW ID Tone Volume Adjustment

Jumper E5 is in the normal position from the factory, so move jumper E5 from the normal position (E5-2 to E5-3) to the test position (E5-1 to E5-2). In other words, move the jumper toward the front of the controller. You should hear a tone coming from the external speaker and/or the repeater transmitter. To adjust the volume of the CW ID, use R67 and turn the adjustment screw clockwise (CW) to decrease the volume and counterclockwise (CCW) to increase the CW ID volume. The volume should be checked again through the repeater to insure the proper setting.

Test the CW ID settings

To check the settings, return jumper E5 to the normal position of E5-2 to E5-3 and press the **MANUAL ID** push button that located on the front panel. Repeat this section until you are satisfied with the settings.

Courtesy Tone, Speed, Volume, Squelch Tail Timing, and Hang Time setup

To perform the following Courtesy Beep and Delay Timing setup adjustments, move jumper E3 from the normal factory position of E3-2 to E3-3 to the test position of E3-1 to E3-2. In other words, move the jumper toward the front of the controller. When the setup adjustments are complete, return jumper E3 to the normal position of E3-2 to E3-3.

Also, refer to Figures 2, 3, and 4 for positions of the potentiometers and the associated test points.

Courtesy Beep Tone Adjustment

Courtesy Beep Tone Adjustment uses jumper E3 and variable potentiometers R9, R13, and R68

Courtesy Tone Frequency Adjustment

With jumper E3 in the test position, you should hear a tone coming from the external speaker and/or the repeater transmitter. To adjust the frequency of this tone, use R9 and turn the adjustment screw clockwise (CW) to increase the tone frequency and counterclockwise (CCW) to decrease the tone frequency. The tone frequency range is from 570 Hz to 2.8 KHz. **The Factory Default is 1.5 KHz.**

Setting up Controller for Operation (Continued)

The Courtesy Beep Tone is a subjective adjustment. That is, it depends on what the user wants to hear in terms of the tone frequency.

If an oscilloscope is available, you can adjust very accurately the tone frequency. Set the oscilloscope vertical displacement to 2 volts per centimeter and the time base to 20 milliseconds per division and connect the scope probe to TP 5 and the scope ground to a test point that is labeled GND. The waveform will be a square wave type signal at approximately 5 volts in amplitude. Measure the Courtesy tone frequency from the rising edge of one pulse to the rising edge of the next and use the following formula to find the frequency.

$$\text{Frequency} = \frac{1}{\text{time in milliseconds}}$$

Courtesy Tone Speed

With jumper E3 in its normal position (E3-2 to E3-3), in other words, the jumper toward the rear panel of the controller, push the **MANUAL COS** button that is located on the PCB board next to the EPROM socket. This will cause the Courtesy Beep to be heard from the Audio Monitor speaker and/or through the repeater. To increase or decrease the speed at which the Courtesy Beep is sent, adjust R13 clockwise (CW) to increase the speed and counterclockwise (CCW) to decrease the speed. **The Factory Default is 30.3 Hz.**

The Courtesy Beep Tone Speed is a subjective adjustment. That is, it depends on what the user wants to hear in terms of speed.

If an oscilloscope is available, you can adjust very accurately the Courtesy Beep speed. Set the oscilloscope vertical displacement to 2 volts per centimeter and the time base to 20 milliseconds per division and connect the scope probe to TP 6 and the scope ground to a test point that is labeled GND. The waveform will be a square wave type signal with approximately 5 volts in amplitude. Measure the Courtesy Beep speed frequency from the rising edge of one pulse to the rising edge of the next and use the following formula to find the frequency.

$$\text{Frequency} = \frac{1}{\text{time in milliseconds}}$$

Courtesy Beep Tone Volume Adjustment

Jumper E3 is in the normal position from the factory, so move jumper E3 from the normal position (E3-2 to E3-3) to the test position (E3-1 to E3-2). In other words, move the jumper toward the front of the controller. You should hear a tone coming from the external speaker and/or the repeater transmitter. To adjust the volume of the Courtesy Beep, use R68 and turn the adjustment screw clockwise (CW) to increase the volume and

Setting up Controller for Operation (Continued)

counterclockwise (CCW) to decrease the Courtesy Beep volume. The volume should be checked again through the repeater to insure the proper setting.

Squelch Tail and Hang Time Timing setup

Jumper E3 is in the normal position from the factory, so move jumper E3 from the normal position E3-2 to E3-3 to the test position E3-1 to E3-2. In other words, move the jumper toward the front of the controller.

The adjustment or setup of the Squelch Tail timing and the Hang Time timing may be accomplished in two ways: “by ear” or using an oscilloscope. The first discussion will be making the adjustments using an oscilloscope, then “by ear.” Jumper E3 should be in the test position so that you hear the courtesy beep tone coming from the external speaker and/or the repeater transmitter.

Squelch Tail Timing Adjustment using an oscilloscope

It is suggested that you unplug the Audio Monitor speaker at this time to eliminate the possibly annoying tone from the monitor speaker if the oscilloscope method is used to make the adjustments.

Use R17 and test point TP 8 for this adjustment. The range of the Squelch Tail delay is .250 Hz to 1.85 Hz or 4 sec. to .540 sec. Turning R17 clockwise (CW) will shorten the time delay and turning counterclockwise (CCW) will lengthen the time delay. **The Factory setting is 1.67 Hz or 598 milliseconds.**

Test the Delay settings

To check the setting, return jumper E3 to the normal position of E3-2 to E3-3 and press the **MANUAL COS** push button located next to the EPROM socket. Repeat this section until you are satisfied with the delay setting.

Squelch Tail Timing Adjustment without using an oscilloscope (“by ear”)

With the jumper E3 in the normal position (E3-2 to E3-3), in other words, the jumper toward the rear panel of the controller, push the **MANUAL COS** button that is located on the PCB board next to the EPROM socket. This will cause the system to operate like the normal repeater. Upon release of the **MANUAL COS** push button the Squelch Tail delay, the Courtesy Beep, and then the Hang Time delay will be performed. Use R17 to adjust the Squelch Tail timing “by ear.” Turning R17 clockwise (CW) will shorten the time delay and turning R17 counterclockwise (CCW) will lengthen the time delay. Press the **MANUAL COS** to check the setting. Repeat this section until you are satisfied with the delay setting.

Setting up Controller for Operation (Continued)

Hang Timing Adjustment using an oscilloscope

It is suggested that you unplug the Audio Monitor speaker at this time to eliminate the possibly annoying tone from the monitor speaker if the oscilloscope method is used to make the adjustments.

Use R21 and test point TP 10 for this adjustment. The range of the Hang Time delay is .125 Hz to .673 Hz or 8 sec. to 1.48 sec. Turning R21 clockwise (CW) will shorten the time delay and turning R21 counterclockwise (CCW) will lengthen the time delay. **The Factory setting is .450 Hz or 2.2 sec.**

To check the setting, return jumper E3 to the normal position of E3-2 to E3-3 and press the **MANUAL COS** push button that located next to the EPROM socket. Repeat this section until you are satisfied with the delay setting.

Hang Time Timing Adjustment without using an oscilloscope (“by ear”)

With jumper E3 in its normal position (E3-2 to E3-3), in other words, the jumper toward the rear panel of the controller, push the **MANUAL COS** button that is located on the PCB board next to the EPROM socket. This will cause the system to operate like the normal repeater. Upon release of the **MANUAL COS** push button the Squelch Tail delay, the Courtesy Beep, and then the Hang Time delay will be performed. Use R21 to adjust the Squelch Tail timing “by ear.” Turning R17 clockwise (CW) will shorten the time delay and turning R17 counterclockwise (CCW) will lengthen the time delay. Press the **MANUAL COS** to check the setting. Repeat this section until you are satisfied with the delay setting.

Remote Commands

Remote Control DTMF settings

The VBC-2A has three (3) functions that are controlled remotely: Double Beep or Emergency Beep, Repeater Transmitter Off, and Repeater Transmitter On. The codes that are used for the remote control are set by a series of DIP Switches that are located on the main VBC-2A controller Printed Circuit Board (PCB). These switches are labeled Double Beep, Repeater Off, and Repeater ON.

The remote control function codes consist of the following sequence: STAR (*), Security Code 1, Security Code 2, Control Digit 1, Control Digit 2, Pound (#).

The **DIP SWITCHES** consist of three (3) 8-position switches, one for each function, as shown in figure 5. Each switch has two (2) sections. Each section consists of four (4) switches.

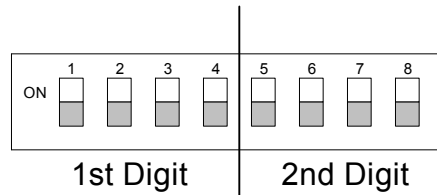
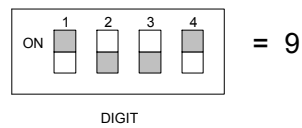
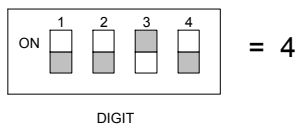
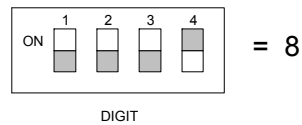
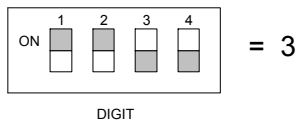
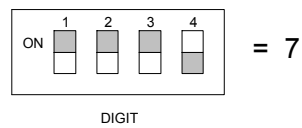
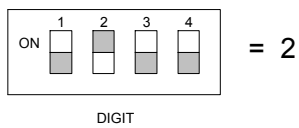
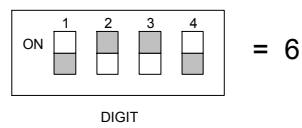
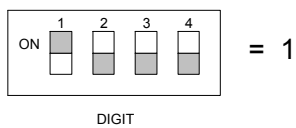
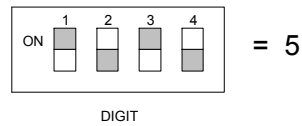
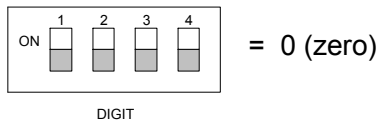


Figure 5

VBC-2A User Guide

Remote Commands (Continued)

The following illustrates the switch positions for the codes used:



Any other combination will cause an error. The error will be displayed on the front panel by the DTMF lamp blinking at a very fast rate. The DTMF lamp will continue blinking until the code is placed in the correct range, 0 thru 9, as shown above.

The STAR (*) and the POUND (#) codes are set in the firmware of the VBC-2A controller and are not changeable by the user. Likewise, the security code is programmed in the firmware and cannot be changed by the user.

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Remote Control Command Sequence Example

Turn the Double Beep On:

*AB20#

The (*) indicates the beginning of a command sequence.

The (AB) is the security code.

The (2) is the first digit of the Double Beep code and is user programmable.

The (0) is the second digit of the Double Beep code and is user programmable.

The (#) indicates the end of the command sequence.

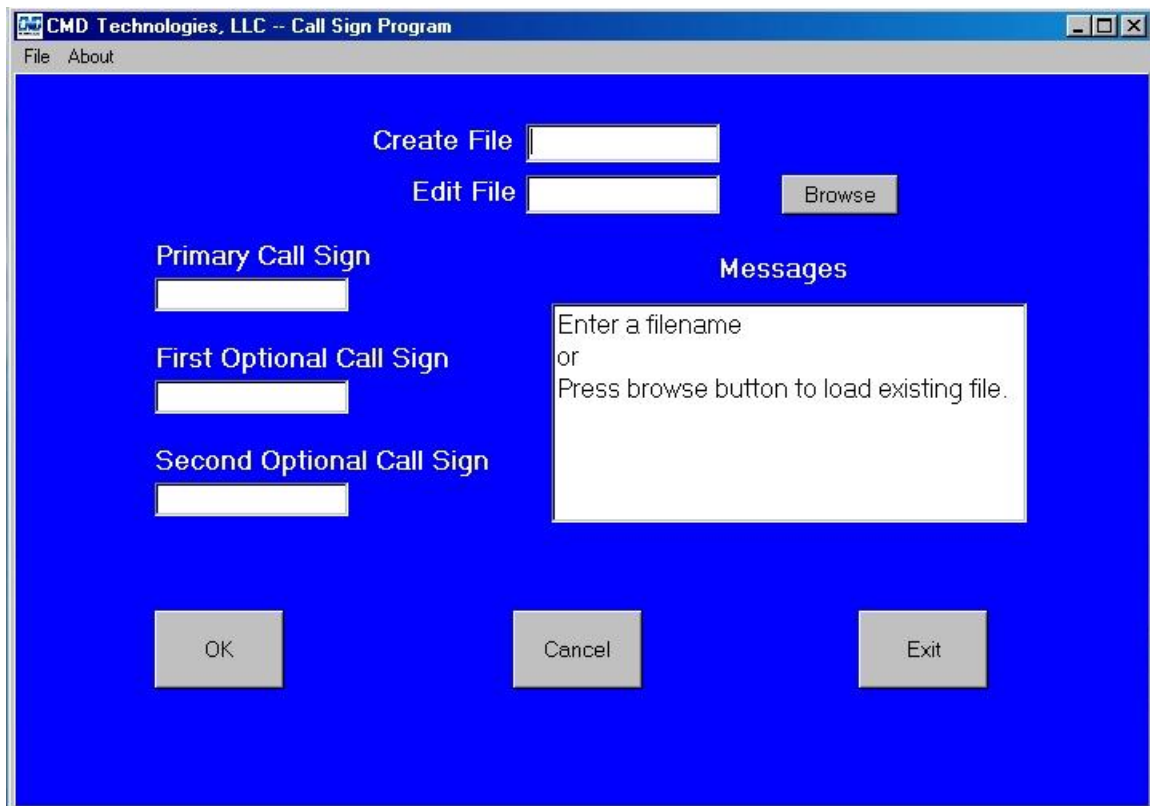
STAR (*), Function letter "A", Function letter "B", "2", "0", Pound (#). This will turn on the Double Beep. The Function letters are found on 4 x 4 type radio keypads.

Call Sign Generation Software

The VBC-2A repeater controller comes with a Windows program that will assist the user in generating the repeater call signs.

Insert the CD into your CD drive and it will auto start. If it does not auto start, click on “Start” on the task bar, then click “Run” or type d:/Setup.exe and click OK (where “d” is your CD drive letter)

The installation program will generate a desktop icon. Click the icon and the following screen will appear:



A file name that will contain the formatted call sign(s) will need to be entered in the ‘Create File’ box or an existing file name may be entered into the ‘Edit File’ box.

A Primary Call Sign **MUST** be entered before any others. Once the call sign(s) have been entered, click on the ‘OK’ button and the call sign(s) are generated and stored in the file designated.

To program the call signs into the EPROM the user must have an EPROM programmer that will accept an Intel HEX type file. If the user does not have access to an EPROM programmer, contact CMD Technologies, LLC and we will program it for you.

NOTE: The Call Sign Generation Software will automatically append ‘/R’ to all the call signs.