

## **911 Systems LLC TAC34 & SA500 Series Two-Tone Sequential, Single, and DTMF Tone Decoder and with 4 Relays v1.09 and higher 6/01/2023**

The TAC34/SA500 Series is a tone decoder capable of controlling 4 relays with Single Tones, Two-Tone sequential or DTMF signaling. The Single and Two-Tone sequential Tones are completely user-settable from 260-3500hz. Minimum tone lengths can be 0.1 to 9.9 seconds per tone. This offers complete versatility to allow the use of any tone, tone pair or tone length regardless of whether it is standard or not-standard. In Two-Tone Sequential mode each relay can be assigned 3 different tone pairs for activation and a 4<sup>th</sup> for cancel. In DTMF mode there are 4 activation and 1 cancel code of up to 11 digits in length.

Each relay can be programmed for several different timing parameters. Delayed activation, delayed transpond, relay on-time (or Latching), wait-time and repeat time. All timers are settable from 1-255 seconds.

### **Hook Up**

There are five 3-position plugs used for hook-up, all clearly marked on the circuit board. The first header on the left has connections for +12, Ground, and Audio input. As an alternative and for ease of testing there is a 3.5mm audio jack that parallel's the audio input. This can be plugged into a PC's sound card output for testing. It can also be used to plug into the external speaker jack of a receiver for capturing tones. There is also a 2.1x5.5mm center pin positive DC power jack for 12V for ease of testing and is connected together with the 12V input on the terminal block. The board can also be powered by the 5V signal on the USB connection.

The other four 3-position plugs are used for the four relays with Normally Closed, Common and Normally Open contacts brought out.

There are 6 LED's on the front panel. The red is a PTT indicator that will light when the radio is keyed when a transpond tone is sent. The green power LED is also used as a programming and tone receiving indicator. In program mode it will flash on and off slowly. When receiving a programmed tone in Two-Tone Sequential or single Tone Mode it will blink fast. When in DTMF mode it will turn off when a valid DTMF tone is decoded.

## Programming

Connect the USB cable to a PC with a terminal program set to 9600,8,N,1, with echo turned on. Drivers for the USB chip used are available at: <https://www.ftdichip.com/Drivers/VCP.htm>. Click on the “setup executable” under comments at the right of the page. If you do not have a terminal program contact us and we can share a simple one we made for in-house use. Be sure to set the flow control to None. You can enter program mode by either pressing the program button on the board or by sending a “P” from the terminal. It will then display:

```
911 SYSTEMS LLC PGM MENU
1 – DTMF & 2-Tone Codes
2 - Mode
3 - Tone Settings
4 – Timer Settings
ENTER 1-4:
```

*Enter a 1 and sub menu will appear:*

**Enter 1 to program DTMF, 2 for Two-Tone**

*To program DTMF codes enter a 1 and a list of all the existing codes will appear as follows:*

**Current DTMF Strings:**

```
K1:
1-1234
2-
3-
4-
5-5678
K2:
1-2345
2-
3-
4-
5-5678
K3:
1-3456
2-
3-
4-
5-5678
K4:
1-4567
2-
```

- 3-
- 4-
- 5-5678

**To set DTMF code strings select a relay 1-4:**

*Now enter a 1,2,3 or 4 to select the code strings for the relay you want to program. For example, if you entered a "1" it will allow you to program the 5 codes associated with relay 1.*

**Enter 1-5 followed by DTMF string. 5=Cancel Command, Enter to End.**

Each DTMF relay can be programmed with 4 activation codes and one cancel code. Code 5 is reserved for cancel or to turn the relay off. Each code string can be up to 11 digits long and is limited to the 16 digit DTMF code-set: 0-9,\*,#,ABCD. The # in the programmed code string can be used as a special character called a "Don't Care" when the "Don't Care" option is turned on in "Tone Settings". When "Don't Care" is turned on, then the # can be used to accept any character in an incoming code string for that specific place in the code. For example, let's say you wanted to set up a system that had multiple activation locations with a 6-digit code and you wanted to identify the activation point by the first character of the code string with the remaining 5 characters being the code used to activate the relay. The first digit of activation site one uses a "1", two a "2", three a "3" etc., and the activation code is 67890. Then if you programmed all of the TAC34's in the system with #67890 they would all activate even though activation site one sent 167890, 2 sent 267890, etc. When "Don't Care" is turned on it also affects the handling of the received DTMF "#", but more on that later in the "Tone Settings" section. Use the Escape key to return to the previous menu section. If you make a mistake when entering the code escape out and re-enter.

From the "DTMF & 2-Tone Codes" option select 2 for "2-Tone Codes" The current list of tones associated with each relay will be shown.

**Current Two-Tone Settings:**

- K1:**
  - 1-0378.6/0510.5
  - 2-0000.0/0000.0
  - 3-0000.0/0000.0
  - 4-2043.8/0368.5
- K2:**
  - 1-0688.3/0928.1
  - 2-0000.0/0000.0
  - 3-0000.0/0000.0
  - 4-2043.8/0368.5
- K3:**
  - 1-1251.4/1687.2
  - 2-0000.0/0000.0
  - 3-0000.0/0000.0
  - 4-2043.8/0368.5
- K4:**

**1-2271.7/2468.2**

**2-0000.0/0000.0**

**3-0000.0/0000.0**

**4-2043.8/0368.5**

**To set Two-Tone code strings select a relay 1-4:**

**Enter 1-4 followed by tones nnnn.n / nnnn.n**

**The . and / will be automatically entered.**

**Leading 0 must be used (Code 4 = Cancel Command)**

Be sure to enter the leading 0 if your tone is below 1000 hz. For example, to enter a tone of 378.6 you must enter 0378 (. will be automatically placed) 6. Then a "/" will be placed after the first tone as the program awaits your second code entry. Be sure to stay within valid tone parameters of 260-3500hz. The fourth tone pair is used for cancel or to turn off that relay. If you want to use the same code for all relays you must enter the same tone pair in slot 4 for each relay. If you make a mistake you will need to escape out and re-enter the value. Follow the same procedure for each relay. If you are in 1-Tone mode the first tone of the pair above will be used for matching the incoming tone. The second tone will be ignored.

From the Main Menu option "2" is for selecting the "Mode". It will tell you the current setting: 1-Tone, 2-Tone, DTMF or Mixed and allow you to make a change.

**Enter 1 for 1-Tone, 2 for 2-Tone, 3 For DTMF, 4 For Mixed**

### **Mixed Mode**

The Mixed Mode is new with version 1.08. It sets the first 3 relays to be used with Two-Tone, and Relay 4 to as a single tone. This allows for the TAC34 to be used in situations that require two-tone for some functions and a single tone for an "All-Call". When 4 is selected from the Mode menu it will also ask for a minimum tone length for the single tone used with relay 4. The default is 5.0 seconds. It can be changed to a value up to 9.9 seconds that is longer than the minimum set for the first tone of a two tone pair. So if the first tone of a two-tone pair is, for example, 0.6 seconds, the value for the single tone in Mixed mode must be 0.7 seconds or higher. Like in Two-Tone, this is the minimum amount of tone decoded for an activation. Be sure this value is lower than the length of tone being sent otherwise you will not get an activation. In Mixed Mode you can not use a tone that is being used as the first tone in one of the two-tone pairs being used. So, for example, if K1 is set to decode a two-tone pair of 669.9 and 569.1 then the long single tone can not be set to 669.9. It can, however, be set to the second tone of 569.1 or any other tone that is not a first tone.

*Selecting a "3" from the Main Menu is "Tone Settings". Selecting this option brings up:*

**1 – Min Tone Lengths, 2 – BW, 3 - # Don't-Care Y/N**

*Enter a 1 to set minimum Tone Lengths:*

**Enter Tone Length N.N 0.1 to 9.9 seconds (don't enter the dot)**

**Currently Programmed:**

**T1-0.8 T2-2.6**

**T1-**

If you are using, for example, 103 two-tone sequential tone decoding, you must enter minimum tone lengths for the first and second tones that will allow enough time for the tone decoder to decode the tone and have a little room for error. In the above example, the lengths are set to 0.8 and 2.6 seconds for 103 decoding. 103 means the tones transmitted will be 1 second for the first tone, 0 wait and then 3 seconds for the second tone. If you are using single tone decoding, only T1 will be applicable.

*A 2" from the Tone Settings menu option selects the Bandwidth setting.*

**Enter BW Value: A-O, A=0.1, B=0.3, C=0.5, D=0.7, E=0.9, F=1.1, G=1.3**

**H=1.5, I=1.7, J=1.9, K=2.1, L=2.3, M=2.5, N=2.7, O=2.9,**

**Currently Programmed:**

**Bandwidth**

**1.5 Percent**

**>**

The Letters A through O (“Oh” not zero) select bandwidths of 0.1 to 2.9 percent plus and minus. The default value is set to 1.5%. This means that the received tone can be plus or minus 1.5 percent from the value selected. For example, if it is set to decode a 1000 hz tone and the bandwidth is set to 1.5% then a received tone from 985 to 1015 will be accepted. If you have tones set for different functions that are close in frequency you can turn down the band width setting to help keep them from interfering with each other. Most modern tone encoders will send pretty precise tones so this can normally be set quite low. Some older tone transmitting equipment may be more sloppy.

Since the use of two-tone schemes that have a wait between the tones are rarely used, we do not currently support them. However, it is still possible to decode them by setting the decoder for single-tone decoding and using two relays in series.

*Option 3 is used to turn the “Don’t Care” feature on or off.*

**Currently Programmed:**

**-N**

**Don’t Care # Character in Activation Code**

As described more fully above in the DTMF code string section, when “Don’t Care” is turned on and a # is entered as a part of the stored code used to match incoming DTMF strings, a # is used to accept any digits in the location where it is placed. Be careful in its use. For example, if you were to enter a code of ##### then any 4 digit DTMF code would activate your

relay! This feature can be useful when certain digits of a code may change based on the source that is sending the activation code. It may be used at any location in the stored code.

### **Don't Care # Character in Incoming DTMF**

When the "Don't Care" function is turned on, the decoded DTMF "#" is also used as a "Don't Care" in the incoming code. So if your code to turn on relay 1 at one location is 456781, at another is 456782, and a third 456783 then when 45678# is received it will activate all three TAC34 units. This can be used for group or all call functions. The "Don't Care" DTMF # is only valid for positions 4567 in the incoming DTMF code. If the stored activation code is 0520041345 you can send the # for the 0041 but not for 052 or 345. This way site locations can be imbedded in your code in positions 4567 for specific site activation or, with the use of the "Don't Care" DTMF #, group and all-call functions can be used. The limitation to just 4 digits of the activation code prohibits an unauthorized person from sending a string of "#" characters and causing an activation. The "Don't Care" feature must be turned off if you need to use the "#" as part of a specific code that will only activate a relay when it is received. For example, if you want a relay to activate only when 123# is decoded then turn off the "Don't Care" function. Then a 123# must be received to activate the relay.

### **Timer Settings**

Option 4 from the main menu is for setting timers for each relay. There are four timers and one counter function associated with each relay: Activation Delay, Transpond Delay, Relay On-Time, Pause-Time, and Repeat Count. Each can be set with a value of 000-255 seconds or counts in the case of the Repeat-Count. Each of the 4 relays can be set with different values. Select a relay 1-4 and follow the on-screen menu to enter each of the 5 values. After entering each 3 digit 000-255 a "/" will automatically be inserted. The values will be saved once you enter the last value. If you make a mistake escape and start over.

**Activation Delay** is the value 000-255 seconds before a relay will turn on once a valid code is received to activate it. For example, if you want K1 to wait 5 seconds before turning on then enter a value of "005". 000 will cause the relay to turn on immediately when the activation code is received.

**Transpond Delay** is the value 001-255 seconds once an activation code is received before the TAC34 will key the PTT and send a 500 hz tone to acknowledge the action. If this is set to 000 then there will be no transpond tone sent. This setting will also be used when the cancel command is decoded. So, for example, if it is set to 005 then the TAC34 will send a tone both 5 seconds after activation and 5 seconds after a clear command is received. It will not send a tone if it times-out, only when a cancel command is received.

**Relay On-Time** is the value 001-255 seconds that the relay will stay on before timing out and turning off. For example, if you want a relay to stay on for 3 minutes set this value to 180 (3x60=180). **A value of 000 in this field will cause the relay to latch** on and stay on until a cancel command is received (code 5) or the board is reset or power is cycled.

**Pause Time** is the value 000-255 seconds after the relay timer has expired and turned off the relay until it will again be activated if the repeat count is non-zero. This works together with the Repeat count also settable 000-255. For example, if you want a relay to turn on for 5 seconds, then turn off for 2 seconds and repeat this cycle 10 times, set these values to 005/002/010. You must exit program mode before the TAC34 can be used to decode tones. Use the Escape key to exit out or press the PGM button. There is also a 3-minute timer that will force an exit if you forget. Once it has exited program mode the green LED will stop flashing.

**PLEASE NOTE THAT THE TAC34 & SA500 SERIES CONTROLLERS DO NOT USE THE TRANSPOND FEATURE.**

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