MODULATED FM CW CONTROLLER

I had the desire to be able to send morse code over my 2 meter radio to help some people in my amateur radio class improve their code skills. To that end I have developed the following circuit. In this day and age most people use programmable PlC controllers to perform this task. I am from the old school and prefer to use discrete components and chips to build my projects. I spend my days at work writing computer code so when I build a project I prefer to use solder and wire instead of bits and bytes. My goal was to build a unit that would produce a pure sine wave tone and to that end I decided to use a XR2206 function generator chip to produce the tone oscillator. Resistors R6, R7 and R8 set the output level to about 1 volt peak to peak. Capacitor C4 and resistors R9 and RiO set the tone. The fixed value of R9 sets the low end of the tone range to about 500 Hz and the variable resistor RiO varies the tone up to the 2000 Hz range. Ri 1 sets the XR2206 to produce a sine wave. Capacitor C5 sets the filter bias. No attempt was made to turn the XR2206 on or off to key the audio tone. To key the audio tone I use a CD405 1 CMOS 8 channel analog multiplexer. Any of the CD4O5X series of chips could have been used for this stage. Pin 6 or the 1NH line is held high by resistor Ri. When the code key is taken to ground the INH line taken to ground and the tone signal that is on pin 13, X0 is passed through to pin 3 the output of the CD405 1. The output of the CD4051 is used to develop two signals. The first output through capacitor C6 is a 1 volt peak to peak signal used to drive an external amplifier. The second output goes through resistor R12 and capacitor C7 and is used to drive the microphone input on the radio you are using. R12 is adjustable to set the level of the signal going to the radio so the radio will not be overdriven and cause distortion. The next part of the circuit starts out as a conventional one shot monostable multivibrator built around a LM555 timer chip. Capacitor Cl and resistors R4 and R5 set the length of time that the output stays high after the LM555 is triggered. R5 is adjustable to vary this time period. For this circuit to be useful to control the radio's Push To Talk (PPT) line it must stay active high as long as morse code is being sent and should only drop out when we stop sending code via the code key. Resistors R2 and R3 and transistors Qi and Q2 allow the *LM555* to remain triggered as long as the morse code key is being used before the timer expires. So as long as we are sending code the PPT line will stay closed and the radio transmitter will be keyed. We adjust R5 to our keying speed so the transmitter will not drop out between our code elements as we send them. The output of the *LM555* drives relay K! which grounds the PPT for use by the transmitter. I have added switch SW1 to allow the *LM555* to trigger the PPT line without letting the tone from the XR2206 to reach the radio. If we allow the PPT line and the audio tone to be triggered at the same time the transmitter will shorten the first morse code character because the transmitter does not become active instantaneously. By hitting this switch first the transmitter will be active before we send our first character. The last part of the circuit is a LM7812 voltage regulator. The wall wart power supply I was using put out about iS volts DC with a lot of ripple so I added the voltage regulator and capacitor C3 to supply a stable DC voltage to the project. If you attach this to a good power supply you can probably eliminate this part of the circuit. The next page of diagrams shows what I call personality modules. Each radio has its own way of connecting the microphone and the push to talk switch. Also, operating modulated FM

happens in the Voice portion of the bands so it is nice to have the microphone available with the click of a switch just in case you need to answer someone back when they ask what that strange beeping is. The first circuit is used with my HTX2O2. The PPT uses a 2.2K resistor to ground to key the transmitter on the same line as the microphone audio. The second circuit is used to connect to my Alinco DR15OT. Line i is the microphone line and is switched between the microphone and the code oscillator. Line 2 is the PPT line and is also switched between the microphone and the code oscillator PPT. All other lines just pass through from the input connector and the output connector. If you are going to only connect to one radio then this type of switching can be built into the main box. I had a small Radio Shack amplifier that I decided to use as my local monitor. I tried to use a LM386 audio amp chip but was not happy with the way it was working so I decided to go with the external amp. I have tried this unit on the air and it seems to work well. It also makes a nice code practice oscillator with a nice clean tone. Parts are readily available with a majority of them from Radio Shack and the XR2206 and CD405 1 from Arrow Electronics among others. To tell the truth most of the parts including the chips came from my junk box. Now to give credit where credit is due. The original idea came from the January 1998 issue of QST on page 78 entitled “A MORSE CODE ADAPTOR FOR FM TRANSCEIVERS”. The retriggerable LM555 idea came off of the internet from Terry Pinnel! published on May 17, 2001. The CD4O51 information came from National Semiconductor CMOS data book. The information on the XR2206 chip came from the EXAR Corporation web site data sheet area.

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