SHACKNEWS

HIGHVELD AMATEUR RADIO CLUB

JUNE 2009

COMMUNICATION IS THE NAME OF THE GAME

Meeting At this months meeting Frank, ZS6TMV, gave a talk and demonstration on PSK31. It is one of the many digital modes available to amateur radio. His own designed and built USB PC to Radio interface was shown and discussed in detail. The circuit and description on pages 2 & 3. Where to find PSK31 operations further down on this page. At the next meeting there will be a talk given on batteries in general.

SSC Meeting The meeting held at the home of Berridge and Sandra was well attended. Lots of discussion and plenty to eat and drink. The next meeting will be held at the home of Rex and Ingrid on 2008-08-08.

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PSK31 HF Frequencies

Band	Frequency
160 meters	1.838 MHz
80 meters	3.580 MHz
40 meters	7.035 MHz
30 meters	10.140 MHz
20 meters	14.070 MHz
17 meters	18.100 Mhz
15 meters	21.080 MHz
10 meters	28.120 Mhz

PSK31 VHF Frequencies

Band	Frequency
6 meters	50.290 Mhz
2 meters	144.144 Mhz
1.25 meters	222.07 Mhz
70 centi-meters	432.2 Mhz
33 centi-meters	909 Mhz

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New 40M Band Plan	
7000 - 7025	CW contest preferred
7025 - 7040	CW, QRP CoA 7030 MHz
7040 - 7047	Narrow band modes - digimodes
7047 - 7050	Narrow band modes - digimodes, automatically controlled data stations (unattended)
7050 - 7053	All modes - digimodes, automatically controlled data stations (unattended)
7053 - 7060	All modes - digimodes
7060 - 7100	All modes, Digital voice, CoA 7070 MHz, SSB QRP CoA 7090 MHz, SSB contest preferred
7100 - 7130	All modes, Region 1 Emergency CoA 7110 MHz
7130 - 7200	All modes, SSB contest preferred, Image CoA 7165 MHz
7175 - 7200	All modes, priority for intercontinental operation
	CoA = Centre of Activity

Universal PC / Radio interface for digital modes **by Frank ZS6TMV / PA3GMP**

This interface will let you connect most ham radio transceivers to just about any PC soundcard. It is suited for any digital mode that uses standard audio with a constant amplitude. Meaning: it won't support 9k6 bps packet and other high speed modes that require direct interfacing to the MF stage of the transceiver, and it cannot be used for speech or music, because the radio would stop transmitting during each pause. It will work just with 300 or 1200 bps soundcard packet, though, as well as with PSK31, RTTY, AMTOR and a host of other digital modes that use the PC soundcard.
Most digital mode software uses one of the pins on the PC's serial or parallel port to operate the transceiver's PTT line. This requires extra cabling and opto-coupler circuitry, and also makes it difficult or impossible to use a modern laptop computer. Serial and parallel ports are becoming rare on modern laptops, and ham radio software often won't work with USB-to-RS232 converters. The circuit presented here solves both these problems by means of a simple VOX circuit.

A note on galvanic separation

If you only work on VHF and UHF, you could probably get away with not having any galvanic separation. After all, the popular "Baycom-style" packet modems don't have galvanic separation either, and they work just fine. On HF, though, RF power levels are usually higher, and larger antenna's pick up a lot more grief when there is a lightning strike (or even sheet lightning) somewhere in the neighourhood. Also, the PC's soundcard is designed for microphones and headphones or speakers, and is not nearly as rugged as the RS-232 port traditionally used for packet radio. For these reasons, galvanic separation is strongly recommended.

Circuit description

The interface consists of three main sections: the RX audio section, the TX audio section, and the VOX section.

RX audio section

The RX audio section is little more than an audio transformer and an attenuator. The transformer can be any old small audio transformer. Most radio hams have a few of those small plastic audio transformers (salvaged from an old Japanese transistor radio) that have been sitting in an old pickle jar somewhere for ages, waiting to be used. These will work just fine. Unless you happen to have a 1:1 type (which is rare), connect the low impedance side of the transformer to the soundcard side of the circuit, and the high impedance side to the radio's loudspeaker or headphone output. Any tranformation ratio (within reason) should do.
Jumper J4 can be closed if a "Line In" jack on the soundcard is used and the volume of the audio signal fed into the Line In input is too low. Of course this also depends on the type of transformer that is used. When the soundcard's microphone input is used, this jumper should be left open (or may be omitted altogether). The signal strength going into the soundcard can be set with trim potmeter P2, which forms an attennuator circuit together with R4. Jumper J3 is used to select the left or right channel on the soundcard input. Depending on the soundcard make and model, the microphone input may (but usually won't) be a stereo type. Line inputs will usually be stereo.

TX audio section

This section is essentially a mirror version of the RX audio section. Jumper J1 is used to select the left or right channel. Depending on the software used, the TX audio signal can be on either one, or on both. Again, the transformer is a small audio type from the junk box. However, in this case it should have at least a 1:5 tranformation ratio or higher (again, within reason - something like 100:1 or 1000:1 would be too much of a good thing). As in the RX audio section, the low impedance side of the tranformer is connected to the soundcard side of the circuit, the high impedance side goes to the attenuator formed by R1 and P1. If the radio's microphone input is used, jumper J2 should always be left open (or may be omitted), but if another input (say, the 1200bps AFSK packet radio input) is used, it may be necessary to close this jumper if the signal is too weak. (This will also depend on the type of the transformer used.)

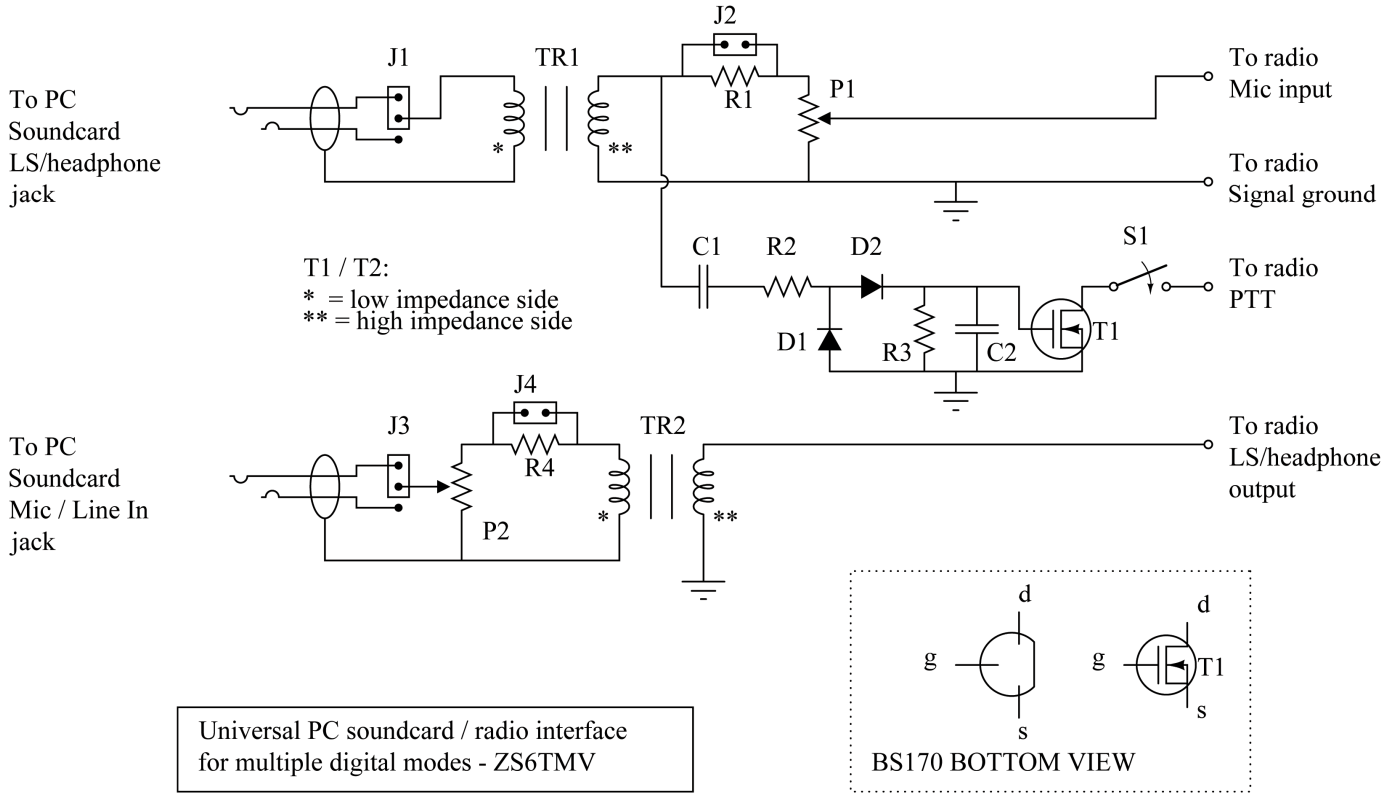
VOX section

The VOX section takes its audio input from the high impedance side of transformer TR1. This signal will already have an increased amplitude as a result of the up-transformation by TR1. It is then fed into a voltage doubler formed by C1/2 and D1/2, until the resultant DC voltage across R3 is high enough to drive transistor T1, which then triggers the PTT line. Switch S1 is used to deactivate the VOX circuit and prevent your PC from keying the radio inadvertently.

General hints

T1 should be the specified type MOSFET. Normal transistors will NOT work, and most other MOSFETs won't, either, unless their specifications are sufficiently close to those of the BS170.
Signal levels depend largely on the equipment used, and on which transformers you can find in the junkbox. Audio levels produced and required by both transceivers and soundcards vary greatly.
Some experimentation and, in some cases, modifications of the attenuator circuits around P1 and P2 may be necessary.

Note that the circuits connecting the low impedance sides of the transformers to the soundcard should not be grounded. There should be no galvanic connection to the PC ground (i.e. the shields of the audio cables going to the soundcard) and the radio ground.
Remember that overdriving your audio inputs is the leading cause of problems when using digital modes, so make sure you don't. When adjusting P1 and P2, start at their lowest setting (i.e. zero) and slowly work your way up to the minimum level required for digital operation. It is best to set the PC's master volume (the fader in the system tray) to maximum before adjusting P1 and P2. Also note that the microphone input is often muted by default in MS Windows. Make sure that it works properly before you connect the interface to the soundcard.
IMPORTANT: disable all Windows sounds! If you don't, your PC will broadcast every error sound or incoming e-mail notification on whatever frequency you happen to be on at the time!



R1, R4 - 22k
R2 - 2k2
R3 - 470k
P1, P2 - 22k trim potmeter
C1 - 100nF
C2 - 22nF
D1, D2 - 1N4148
T1 - BS170
J1, J3 - 3-pin jumper (select two out of three) - see text
J2, J4 - 2-pin jumper (open or closed) - see text
TR1, TR2 - Small audio transformer - see text
S1 - On/Off switch

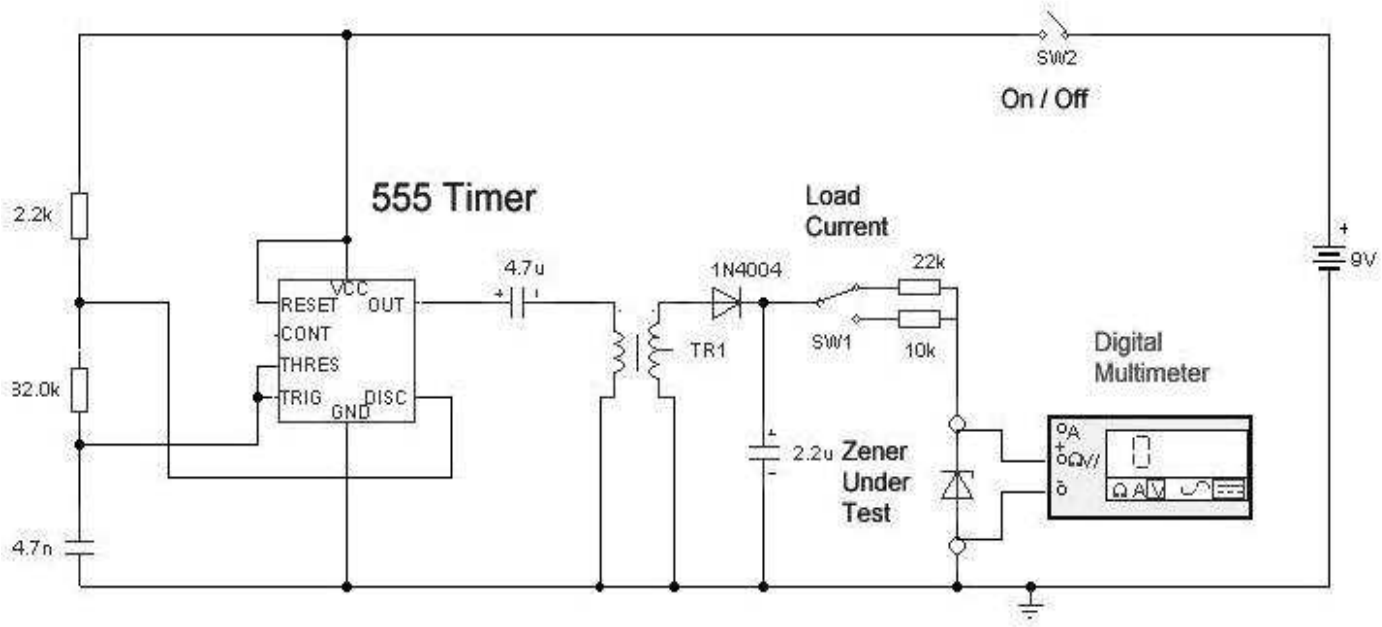
Zener Diode Tester

To be able to test the voltage rating of a zener diode up to 50 VDC, a small transformer and a single **555 timer** IC would be required to produce a high voltage. In this event, the **555 timer** functions in the astable mode in which it operates as an oscillator or in a free running mode, thereby producing square waves. The small audio transformer is being driven by the output in pin 3. This transformer is a LT700 or similar . The impedance of 8 ohms is rated on the secondary coil while an impedance of 1K ohm is centre tapped on the primary winding. The unloaded voltage is about 120 VDC as the transformer operates in reverse.

The 1N4004 diode rectifies the unloaded voltage while the 2.2 uF capacitor flattens it to reach the rate of 150 VDC. 1N4004 provides high forward surge current capability, guaranteed high temperature soldering and low forward voltage drop or reverse leakage.

A multimeter set to DC voltage is used during the test of zener diode. The zener diode can be tested at 1 mA or 2 mA DC with the aid of the load current switch. These values are the rectified DC load. A properly working zener diode will show a good reading on the multimeter.

This circuit will have a straight forward use in the testing of zener diodes. Zener diodes are normally used to regulate the voltage across an electric circuit. When the **555 timer** is operating in astable mode, it may be utilized in pulse position modulation, security alarms, tone generation, logic clocks, pulse generation, lamp flashers, and light emitting diode.



CLUB INFORMATION

Postal address PO Box 19937 Sunward Park 1470

Website http://www.qsl.net/zs6hvb/
e-mail zs6hvb@gmail.com
Repeater 145.1875 MHz input - 145.7875 MHZ output
Linked to 70 cm - 438.850 MHz

Bulletins Sunday morning - 145.7875 MHz & 7062 KHz @ 08h45.
Relay - 80M - 3662KHz

Monthly meeting venue

Witwatersrand Rifles HQ
Cnr Barlow and Cavaleros Str
Industries West
Germiston

First Saturday of the month at 14:30

Committee

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