MORSE INTERFACE

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This Morse interface circuit can clean up noisy Morse signals copied from a HF receiver.

It provides a "clean" processed output signal at TTL level, or a constant tone for feeding to cassette or the cassette input of a personal computer.

Many amateurs and SWLs have software programs that enable them to copy Morse from a communications receiver and display it on their personal computer. There are many hardware interface circuits for RTTY available to constructors, but very few interfaces to copy Morse. The writer has found that the simplest interfaces are not satisfactory when trying to copy Morse on a computer from the HF bands. Any noise spikes present on the signal are usually interpreted by the computer as dots and the print-out contains mostly garbage.

When training, the human ear can copy Morse code which is partly masked by noise, interference from adjacent signals and fading. The computer however, has not this level of intelligence. One other area where the human ear is superior to the computer is in the spacing of the dots and dashes. If the correct spacing is not maintained by a hand keyer the computer will not be able to copy properly, irrespective of this interface.

In principle, the function of this circuit is to provide a sharp narrow band filter, followed by an audio tone decoder. Although the filter will provide good selectivity to interfering signals, it is not sufficient for pulse-type noise which has a relatively large bandwidth. Hence the signal is further processed by applying it to a tone decoder, integrator and comparator.

CIRCUIT DESCRIPTION

This interface consists of two parts:

1. A sharp audio filter centred on approximately 800 Hz.
2. A tone decoder and processor circuit.

The audio filter is composed of an input buffer stage IC1, followed by a four stage active filter, IC2, IC3. This filter gives very sharp rejection to any signals either side of its centre *frequency*. It is very useful when decoding a signal very close to unwanted signals.

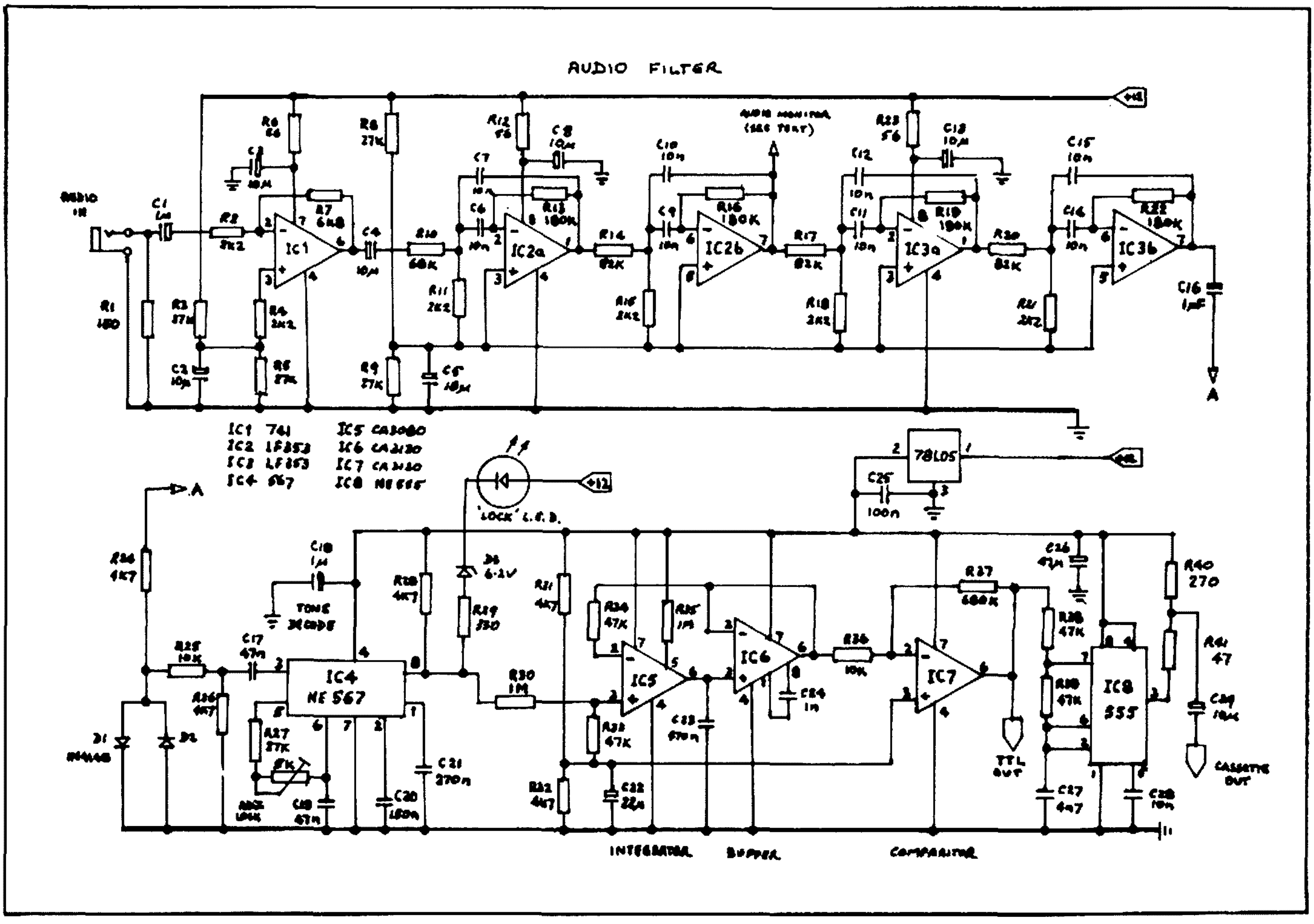
The output of the filter is then fed via a resistive attenuator network to the input of the Tone Decoder, IC4, on the second board. The back-to-back diodes ensure that the input signal level is limited to 600 mV peak-to-peak.

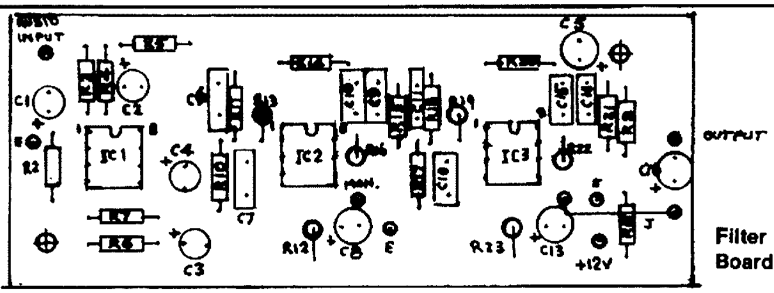
The frequency of the Tone Decoder IC4, is set precisely to the filter centre frequency by R27, C19 and preset potentiometer. The output of IC4 at pin 8, goes to logic 0 as soon as a 800 Hz signal is applied to its input, causing the lock LED to light. However, the Tone Decoder also responds to short interfering noise spikes that pass through the earlier filter. These pulses are eliminated by the following circuit consisting of IC5, IC6, IC7.

IC5 is configured as an integrator whose time constant is determined by the control current flowing via R35 into pin 7 and by capacitor C23. This has the effect of eliminating short pulses. IC6 is a voltage follower to prevent loading *on* Integrating capacitor C23. IC7 is configured as a comparator with a threshold voltage of 2.5 volts.

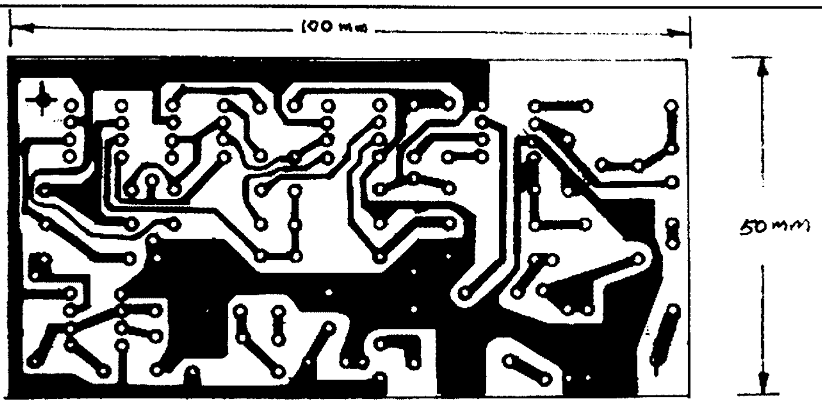
The output from pin 6 of IC7 will be at TTL level, going between 0 volts and +5 volts, depending on whether a tone (dot, dash) is present or not. This output can be used to interface with the input port of a computer that requires a TTL input.

The writer designed this interface for use with a software program for the VZ200/300 that requires an audio tone input to the cassette input of the computer. Therefore, IC8, an NE555 timer, is configured as a square-wave

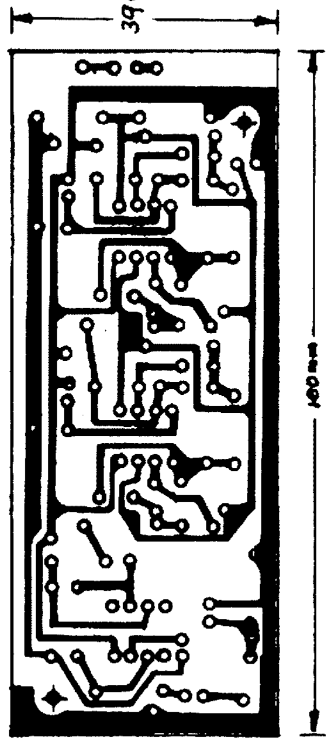




Filter Board.



Board Layout.



Copper Track Side.

tone oscillator. The preceding stage switches the tone on and off by switching the voltage on pin 7 of the IC. The output level at pin 3 is adjusted by R40, 41 to give the correct level into the cassette input of the computer.

If an audio monitor point is required, it could be taken from the output of IC8 but a better point would be from pin 7 of IC2 in the CW filter. The monitor signal could be buffered by a simple IC audio amplifier as per Figure 3 and brought out to a socket to drive a speaker or headphones. The circuit is supplied from an external 12 volt source that could be a DC plug-pack. The +5 volts rail is derived from the +12 volts rail very simply by using a 78L05 low power regulator transistor.

CONSTRUCTION

The circuit was laid out on two separate printed circuit boards to ensure as much flexibility as possible. The nature of the case housing the circuitry is left to the discretion of the constructor. The writer was able to mount the boards in the same case that contains a RTTY interface and thus obtain a single compact modem that can be used for CW as well as RTTY. Audio input and computer output connection are by way of miniature 3.5 mm jack sockets.

It is important to use close tolerance resistors and capacitors in the feedback circuits around IC2, IC3 of the CW filter. Preferably the capacitors could be checked using a capacitance bridge. Signal leads between the boards and the output sockets should be wired in shielded cable.

As some of the ICs are FET devices, the usual precautions against static damage should be observed. They were mounted directly on the printed board without sockets in the prototype, with the usual precaution of soldering the earth and supply pins first, using a properly earthed soldering iron.

ALIGNMENT AND USE

There is only one adjustment to be made after the unit has been constructed and the supply voltages checked to see that it is functioning correctly.

First check that the voltage on the input bias pins of the ICs is approximately half the rail voltage. Connect the audio input of the modem to the headphone output socket of a HF receiver and tune in a CW signal accurately so that the "Lock" LED lights in sympathy with the incoming CW signal. Reduce the receiver's audio volume control to a level where the LED just lights and adjust the preset "Lock" potentiometer for the minimum level of audio from the receiver that still keeps the circuit in lock. This will be the point where the tone decoder's frequency is adjusted to the centre point of the CW filter.

Check that a tone of approximately 1 kHz is being switched on and off at the output of IC8.

In use, it will be found that the circuit is quite sensitive and the audio input should be kept reasonably low so long as the decoder still stays in lock, indicated by the lock LED lighting at full intensity.

In operation, the circuit makes a surprising difference when listening to noisy signals. It could be used without a computer for monitoring off-air signals under difficult reception conditions.

MORSE SOFTWARE PROGRAM

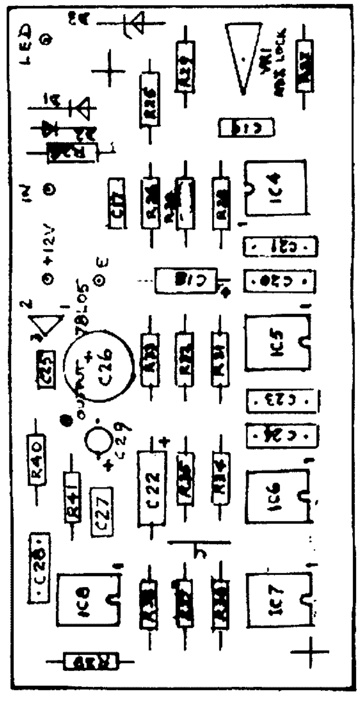
The writer is using a machine code Morse program written by Ross ZL1BNV, for the VZ200/300 computer.

This program has such features as sending and receiving with a speed rage of 1 to 99 WPM and split screen display. Input and output is via the computer's cassette I/O port.

PARTS LIST

RESISTORS: ½ watt 5 percent

R1	150 ohm
R2, 4, 11, 15, 18, 21	2k2 ohm
R3, 5, 8, 9, 27	27k ohm
R6, 12, 23	56 ohm
R7	6k8 ohm
R10	68k ohm
R13, 16, 19, 22	(2 percent) 180k ohm
R14, 17, 20	(2 percent) 82k ohm
R24, 26, 28, 31, 32, 33, 34, 38, 39	4k7 ohm
R29	330 ohm
R30, 35	1M ohm
R25, 36	10k ohm
R37	680k ohm
R40	270 ohm
R41	47 ohm
R42	(preset pot) 5k ohm



Processor Board.

CAPACITORS

C1, 16, 18	(electro) 1 μF
C2, 3, 4, 5, 8, 13, 29	(tantelum) 10 μF
C6, 7, 9, 10, 11, 12, 14, 15	(greencap 5 percent) 10 nF
C17, 19	(greencap 100V) 47 nF
C20	(greencap 100V) 150 nF
C21	(greencap 100V) 270 nF
C22	(electro) 22 μF
C23	(greencap 100V) 470 nF
C24	(greencap) 1 nF
C26	(electro) 47 μF
C27	(greencap) 4n7
C25	(disc ceramic) 100 nF
C28	(disc ceramic) 10 nF

INTEGRATED CIRCUITS

IC1	741
IC2, 3	LF353
IC4	NE567
IC5	CA3080
IC6,7	CA3130
IC8	NE555
IC9	78L05
D1, 2	IN4148
D3	6.2 volt zener

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QSP

ELECTRO-MAGNETIC PULSE PETITION

A petition has been presented to the FCC seeking a Notice of Inquiry on the subject of mandated EMP protective measures for telecommunications equipment under the Commission's jurisdiction. It is felt that the nation's economy is extremely vulnerable to severe disruption by high altitude nuclear explosions that might occur as a result of a variety of scenarios short of a general nuclear strike.

—From *The ARRL Letter* September 2, 1986

PICTURES BY AMATEUR RADIO

At the Kingston Amateur Radio Club meeting held on November 4, 1986, members of the Belleville TELIPAK Group, led by Syd Horne VE3EGO, demonstrated TELIPAK — a system which provides the capability for amateurs to exchange high-resolution, error-free, digital colour images, text speech and graphics.

The novel aspect of the lecture and demonstrations was that the pictures used for the talk were transmitted by packet radio from Belleville to Kingston using digipeaters, VE3TPK and VE3NFW. Barry VE3CJC, transmitted the pictures from Belleville and they were received by Syd VE3EGO, in the meeting hall at Kingston.

It is believed that this is the first time that digital colour pictures have been transmitted for a talk using packet radio techniques.

Does any Australian challenge the Kingston Club's claim?

—Written by Bob Boyd VE3SV, Program Chairman, Kingston Amateur Radio Club, Kingston, Ontario. Contributed courtesy The Editor, *The Canadian Radio Amateur*

THOUGHT FOR THE MONTH

He who throws mud loses ground!

DEFAUSSAT

Australia is committed to using its domestic satellites for military communications and will begin using a 12 watt AUSSAT transponder before 1990.

The Defence Department is planning to use 10 unmanned earth stations and two portable dishes to supplement an existing defence network of HF radio, microwave radio and cable systems.

The second generation of AUSSAT, now on the drawing board, could also include cross-band frequencies 7/8 GHz, which are reserved for defence-related satellite services.