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DTMF decoder module with 6 outputs & Morse transpond.

Our DTMF decoder module has 6 NPN open collector Darlington outputs that can be switched on/off remotely with or without a 4 digit security code (ID). The decoder also has a TX keying output to key a transmitter for transponding a Morse confirmation. An audio output is included for the Morse audio tones.

By default the input has unity input gain which is ideal for connecting to many audio sources. There are links on the PCB to re-configure the audio input for the alternative Electret microphone option.

To turn on/off an output send the decoder it's ID followed by the output number and * for ON or # for OFF e.g. 12341* turns on output 1 and 12342# turns off output 2 etc.

To toggle an output send e.g. 12341**A** and the state of the output will be changed to the opposite of its previous state - the Morse transpond will be confirmation of the new state. To pulse an output send e.g. 12341**B** and the output will turn on for 0.5 seconds - the Morse transpond will be e.g. 1P.

* You can use 9 or A and 8 or B if you only have a 12 button keypad.

For confirmation of the desired switching of an output the decoder will key a Transmitter and respond in Morse code, e.g. turning on output 1 will respond as 1 ON in Morse, and turning off output 2 will respond as 2 OFF. As there are only 6 digits and 3 letters to learn, Morse shouldn't put you off. There is a 2 second transpond delay followed by a 400ms link establishment delay to allow for CTCSS (if used).

The module is supplied with pin headers for the main connection pads, see list below.

Specification:

+7 to 16V DC supply

Input level 27mV to 775mV RMS

Six Outputs at up to 100mA each

38 x 44mm in size

Sending the turn off code for the dummy output zero e.g. 12340# will transpond _._._ OFF but won't affect any outputs. This is useful for checking if in radio range.

The 4 digit security ID by default is set as 1234 but this can be changed by fitting a jumper as shown in the drawing below, powering up the decoder and sending it a new 4 digit ID, then remove power, remove jumper and power-up and the new ID is set. If no ID is required then simply program the ID as 0000 and on next power-up no ID will be needed and for example 1* will turn on output 1.

The ability to turn off the Morse transpond also exists. When setting the 4 digit ID, add a fifth digit as 9 and the Morse transpond will be turned off. Any other character in the fifth position turns the Morse transpond on. When supplied the identity is supplied as 1234 and the fifth digit is set as 0. You do not need to program the fifth digit if transpond is desired; the fifth digit is not used as part of the ID.

A 5 pin programming header is provided to allow in-circuit re-programming of the PIC should you wish to write your own application specific code, this connector also acts as the change ID mode select input when a jumper is fitted.

Also included

The module is supplied with, but not fitted to the board:-

1 x 5 pin header
1 x 7 pin header
1 x 8 pin header
1 x 16 position, 15 way socket
1 x Jumper
1 x 10K variable resistor
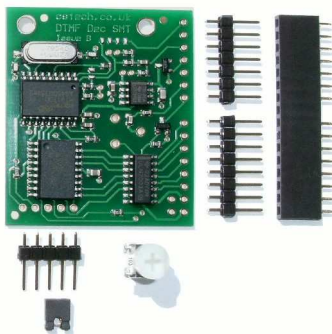
You can fit the 7 pins and 8 pins to the top or bottom of the module, if fitted to the bottom the module can be plugged into a motherboard using the socket. If fitted to the top you can solder wires to the socket, sleeve the joints and use it as a cable connector.

The 5 pins should be fitted to the top.

Audio Input

As mentioned above, our DTMF decoder module comes configured by default with an un-balanced input configuration with unity gain. It has approx. 10K input impedance and will accept an input signal range from approx. 27mV to 775mV RMS.

There are 3 links on the module which allow the input to be configured for an Electret microphone as an alternative input option. In this case the input gain is increased to x57 and allows pick-up from a DTMF tone pad at a couple of inches. A speaker phone, two-way radio speaker or the keypad tones from a mobile phone can be picked up 6 to 12 inches away.

To reconfigure the module for Microphone input fit a wire link to CN6, CN7 and cut the tiny track between the pads of CN8.
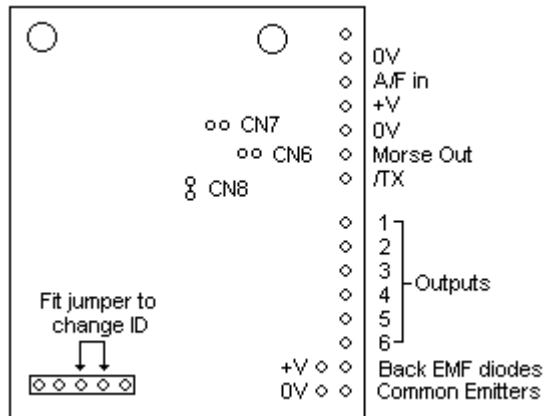
Connecting the module

The 6 outputs are all implemented as open collector NPN Darlington Drivers in the ULN2003 IC, there are also 'back EMF' protection diodes on chip with their common connected to a pad on the module, the common of the emitters is also connected to a pad on the module to allow the load current path to be separated from the audio ground if desired. When driving relays, the relays should be connected between the output pin and the +V supply, we recommend using 12V relays with coils >120 ohms and a 12V supply.

Additional +V and 0V pads are provided next to the 'Back EMF' diodes and Common Emitter pads to enable easy connection when isolation is not required.

If using the outputs to interface to logic or to say the channel change select inputs of a Radio transceiver, the Back EMF diodes can be left un-connected.

The open collector TX keying output is implemented with a BCW32 NPN transistor; this output is intended to ground a radio transceiver's electronic PTT input and is therefore not protected from 'back EMF'.

When a relay is switched off, the collapsing magnetic field causes a voltage to be induced back into the coil, this is known as 'back EMF' and can damage transistor drivers, therefore protection diodes are included in the ULN2003.

The Morse audio output can be connected to a radio transceiver's Microphone input or packet modem TX audio input, so that the Morse code response can be heard at the remote controlling radio. If using with a GSM phone this audio can be fed into the phone's Microphone input.

A variable resistor on the decoder allows for adjustment of the audio level, however if the adjustment is too close to the minimum end of the control, add a resistor in series with the audio output.
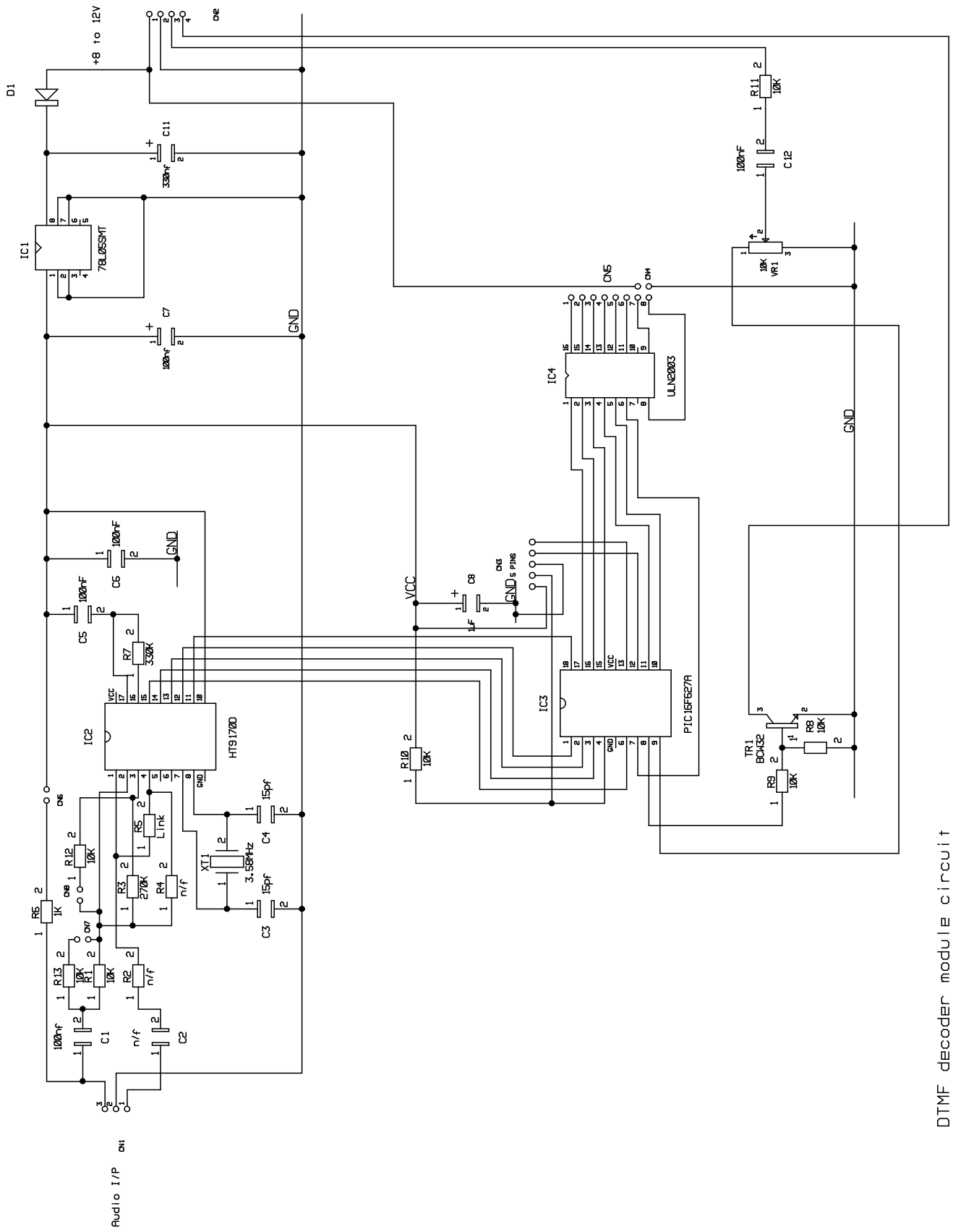
Examples
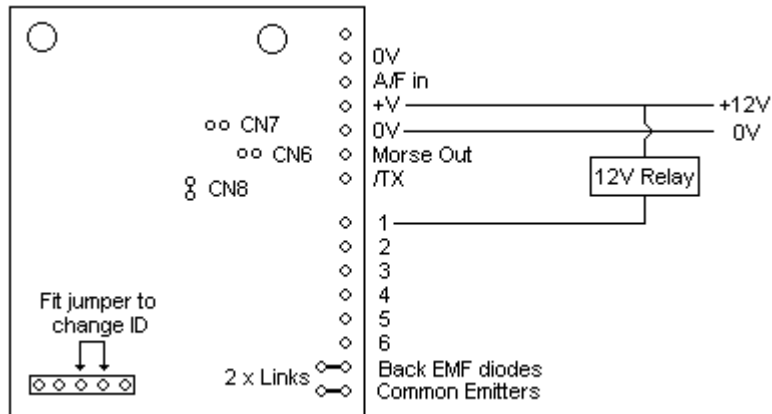
The above is an example of the connection of a relay and linking of the 'back EMF' diode and Common Emitter pads. Add more relays as required.
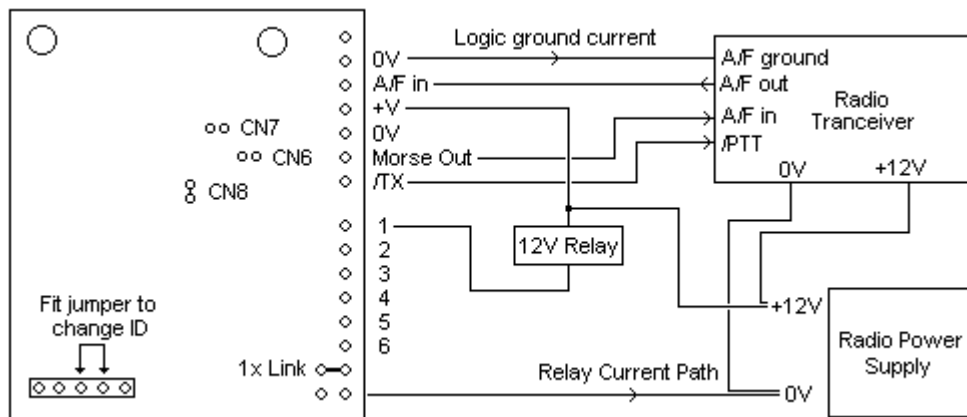
The above is an example of connecting the module to a Radio Transceiver and separating the relay current path so the relay current does not flow through the radio transceiver audio interface ground connection.   Add more relays as required.

DTMF decoder module circuit