

DTMF decoder to Servo kit with three Servo motor drive outputs

Our DTMF servo driver kit can drive up to three Servo Motors under DTMF tone control. Servo motor 1 can be set to six different positions

Servo motors 2 and 3 can be moved from one end position to the other, again under DTMF control

The servo motor positions are set by varying the width of the control pulses between 1mS and 2mS

Servo Motor 1

Sending DTMF '2' sets the pulses to 1.5mS, setting the motor position to the centre of its travel.

Sending DTMF '1' will move the motor one position in one direction, DTMF '3' one position in the other direction.

So, for example, sending '2' centres the servo (1.5mS), '1','1','1' goes to one extreme, then '3','3','3','3','3','3' goes to other extreme.

The six pulse widths are (mS):

- 1.0
- 1.25
- 1.4
- 1.5 (centre)
- 1.6
- 1.75
- 2.0

Servo Motor 2

DTMF '*' moves servo to one end (1mS)
DTMF '#' moves servo to the other end (2mS)

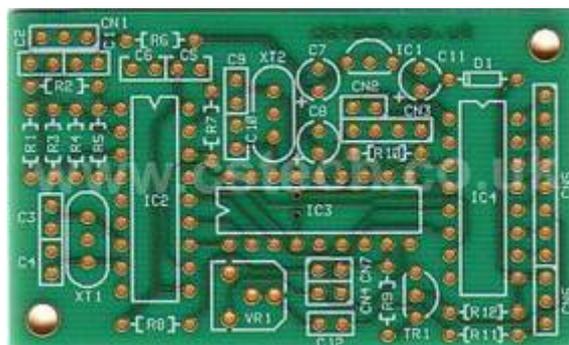
Servo Motor 3

DTMF '8' moves servo to one end (1mS)
DTMF '9' moves servo to the other end (2mS)



All parts shown in the assembled photo are included as well as some extras for alternative input configuration.

Note that 3 wire links must be fitted as shown in the picture above. These are from IC4 pin 3 to pin14; IC4 pin 4 to pin 13; IC4 pin 6 to pin 11.



PCB size (assembled) is 64mm x 38mm x 14mm approx.

A pdf data sheet for the HT9170B may be viewed at:

cstech.co.uk/pdfs/ht9170.pdf

The PCB has been designed to allow 3 input configurations - unbalanced audio, an Electret microphone or balance audio to be connected.

The PCB is a high quality double sided PTH (plated through hole) 1.6mm FR4 (Fibreglass) board 64 x 38mm in size.

A 4 pin programming header is also provided to allow in-circuit re-programming of the PIC.

There are many sources of DTMF, tone pads, two-way radio microphone keypads, telephone systems, and even your mobile phone's keypad tones

DTMF Servo Parts List

IC1	78L05
IC2	HT9170B
IC3	PIC16F627A
IC4	not fitted
TR1	not fitted
D1	1N4148
XT1	3.579MHz crystal
XT2	4MHz 3 pin ceramic resonator with internal caps
R1*	4K7
R2, 4, 9	not fitted
R5	wire link
R3*	270K
R6*	1K
R7	330K
R8	not fitted
R10, 12*	10K
VR1	not fitted
C1, 5, 6	100nF (marked 104)
C2	not fitted
C3, 4	22pf
C7, 8, 11	1uF (marked 105) observe polarity
C9, 10	not fitted
CN1, 6	3 pins
CN2	not fitted
CN3	4 Pins
CN5	8 pins

Supplied with:-

DTMF Decoder PCB Issue A
2 x 10K for alternative input configuration

*Note:-

Only fit R6 if using an Electret microphone as input.

Only fit R1 and R3 as 4K7 and 270K for use with a microphone, otherwise fit R1 and R3 as 10K or calculate a custom input configuration from HT9170 datasheet.

Note that 3 wire links must be fitted as shown in the picture above. These are from IC4 pin 3 to pin14; IC4 pin 4 to pin 13; IC4 pin 6 to pin 11.

Observe polarity of the 1uf tantalum capacitors and orientation of the IC's and diodes (see picture above).

DTMF Decoder application notes follow.

There are 3 input configurations for our DTMF decoder, Electret microphone, un-balance and balanced, the 3 options are shown below in the circuit extracts. The HT9170 DTMF decoder chip has a wide input signal range from approx. 27mV to 775mV, but as it contains an op-amp at its input and the op-amp gain can be altered using different resistor values, many combinations can be achieved.

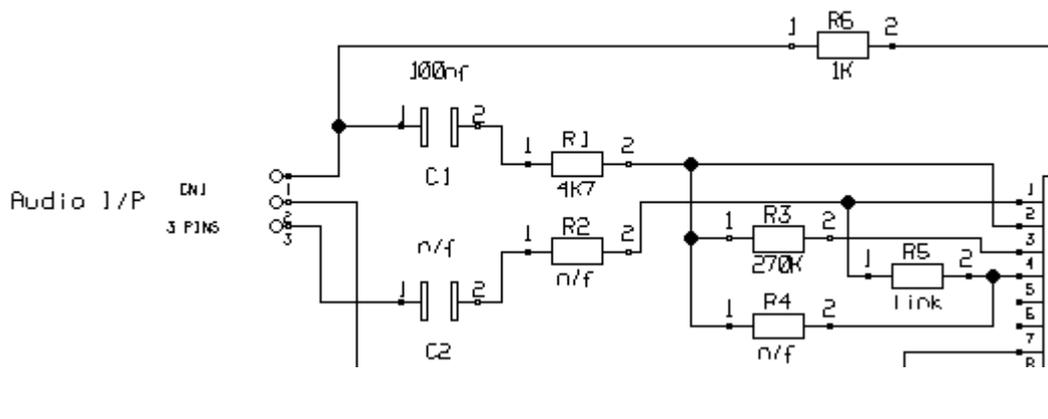
Please see notes below:

The Electret microphone input version provides power to a microphone insert via R6 (1K) and using R1 at 4K7 and R3 at 270K to set the decoder chip's input op-amp gain to x57 the sensitivity 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.

We do not recommend increasing the input gain any higher.

Connect the microphone between pins 1 and 2 (2 = Ground).

Resistors are provided in the kit for this option.

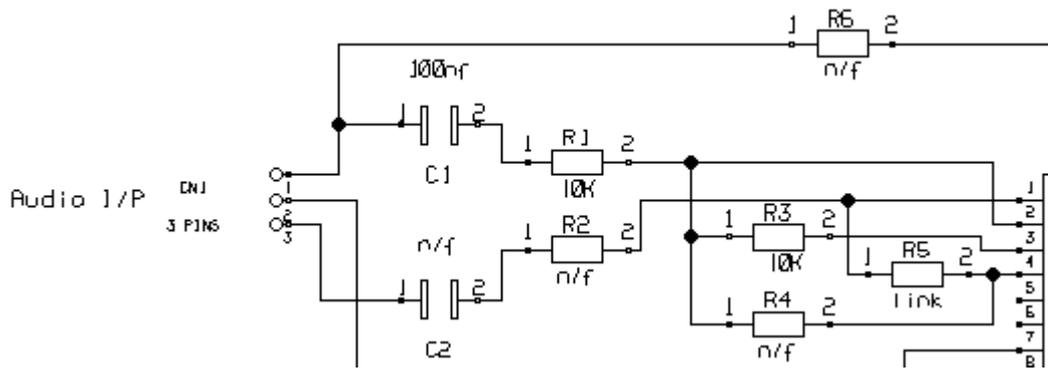


The following example offers an un-balanced audio input, using 10K resistors for R1 and R3 sets the decoder chip's input gain at x1 and gives an input impedance around 10K, R6 is omitted and this configuration can be fed directly from say the Packet modem RX audio output of a Ham radio, or from one of the earphone outputs of say a Nokia 1208 mobile phone.

If it is desired to change the input gain then increase R3 for higher gain and decrease R3 for lower gain.

Connect the signal source between pins 1 and 2 (2 = Ground).

Resistors are provided in the kit for this option.

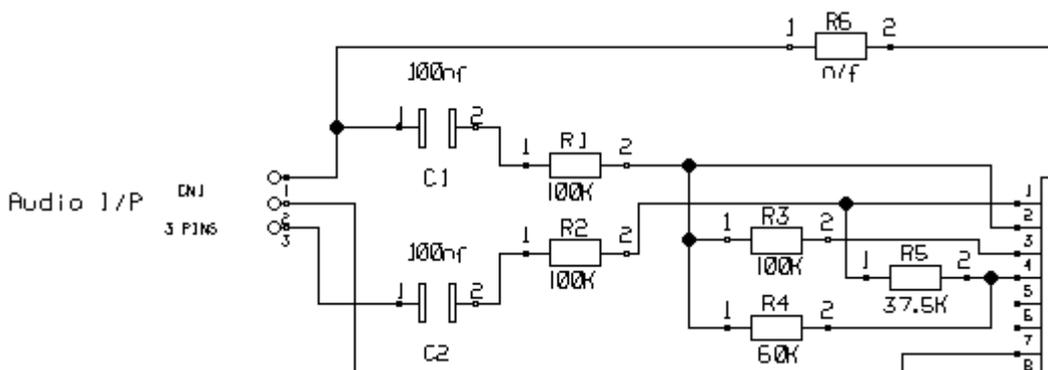


This example of a balanced audio input can be connected to say the earphone audio output of a GSM modem, with the values shown the decoder chip's input gain is also x1, however this can be changed as required, see the HT9170 data sheet for the calculations.

Connect the signal source between pins 1 and 3.

Resistors are NOT supplied in the kit for this option as there are many combinations that could be required.

62K and 36K can be used instead of 60K and 37.5K



Our decoder has 6 outputs that can be switched on/off using DTMF, they are all implemented as open collector NPNs in the ULN2003 Darlington driver chip, there are also 'back EMF' protection diodes on chip with their common connected to the +8 to 15V supply pin, when driving relays, the relays should be connected between the output pin and the + supply, we recommend using 12V relays with coils of at least 120 ohms and a 12V supply.

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.

Servo Motor Connections

The diagram below shows how to connect the Servo motors to the pcb and power supplies. The Servo Motors can draw a significant current from the power supply and should be powered from a separate 5V supply. The 0V connection of both supplies must be connected together as shown.

The angle of travel varies between different model Servo Motors but plus and minus 45 degrees is typical.

Take care not to exceed the maximum voltage of the Servo Motor you use or damage will occur.

