Technical Details & Schematic: PIC Based DTMF Repeater Controller

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Introduction:

This is a second run of DTMF repeater controller. The first run may be rated as a "mixed success" because few kits did not work well. The reasons found were associated with interfacing problem between 75T204 DTMF receivers and PIC. The 75T204 is now replaced by MT8870 and results are 100%.

Controller detailed here is based on design idea from Dave Robinson/WW2R who has provided necessary PIC firmware & related hardware information for a DTMF Remote Controller.

Picture of the Completed DTMF Repeater Controller:
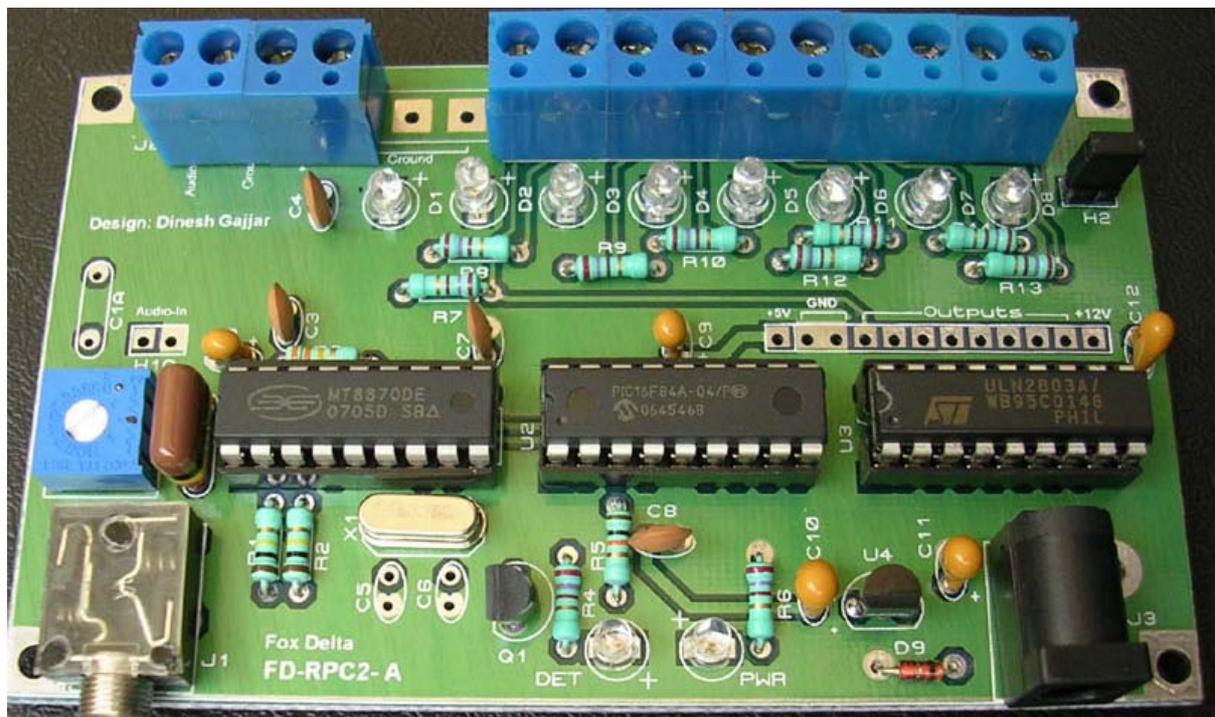
On popular demand, this second run of RPC2 PCB is provided with Screw Terminals for easy connections to external circuits at remote site.

Since I wanted a simple controller, cost effective & small in size, I decided to go for a Double Sided PTH board. Controller PCB is 10cm x 6cm.

The design is based on MT 8870 DTMF receiver, a Microchip 16F84A Micro-Controller and a relay driver ULN2803A.

PIC 16F84A is used. .ASM & Hex files are provided to get password protected operations. You will be required to re-program the PIC if you like to change PW. PW – 1234 is usually supplied with kits, however, you may request specific password while ordering kits if you do not have a PIC programmer.

ULA2803 is an OC Darlington relay driver. It may drive 8 LEDs and 8 relays. It may also drive your digital gates or driver transistors placed elsewhere.

A 12 PIN header H1 takes +12V, +5V, Ground & 8 OC outputs from this board to user's control equipment where relays or digital gates may be used. Male or female header may be used at this place as required.

In addition, all of the connections, Audio, +12V, +5V and 8 relay outputs are now available at Screw Terminals.

This controller may be used within other equipment where DTMF controls are required by way of connecting H1 and Audio.

You may install H1 Header at the bottom of the PCB for Plug-in installation of this DTMF controller on your own project board.
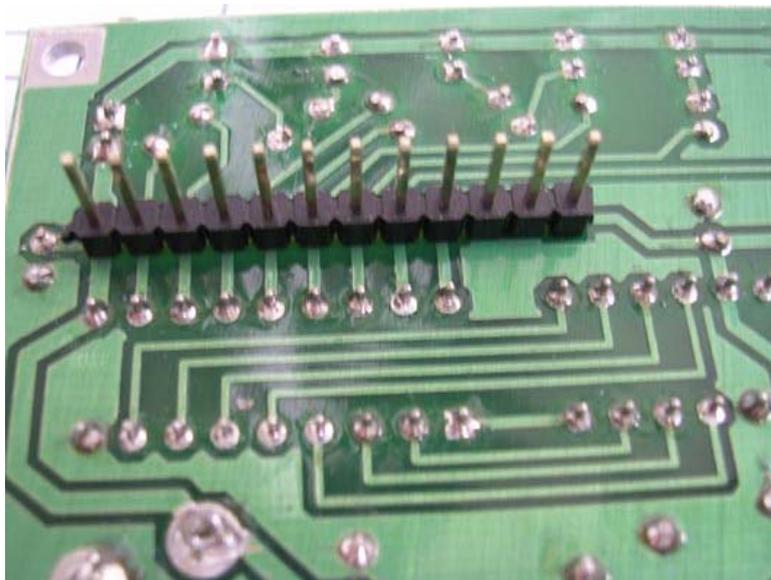
PIC Firmware:

Firmware for PIC is available here for download in .asm & Hex file with password set as 1234, which may be changed at the time of programming the PIC. If you do not have a PIC programmer, you may buy one available on this website in a kit. If you buy a kit, you may also request a suitable password.

New version of PIC firmware uses EEPROM area to store last relay position. This helps in restoration of a system after power failure. However, I haven't tested this version myself but you may experiment with the provided ee asm file.

Controller board has 10 LEDs of which 8 may be turned off by uninstalling the shorting bar on Header H2.
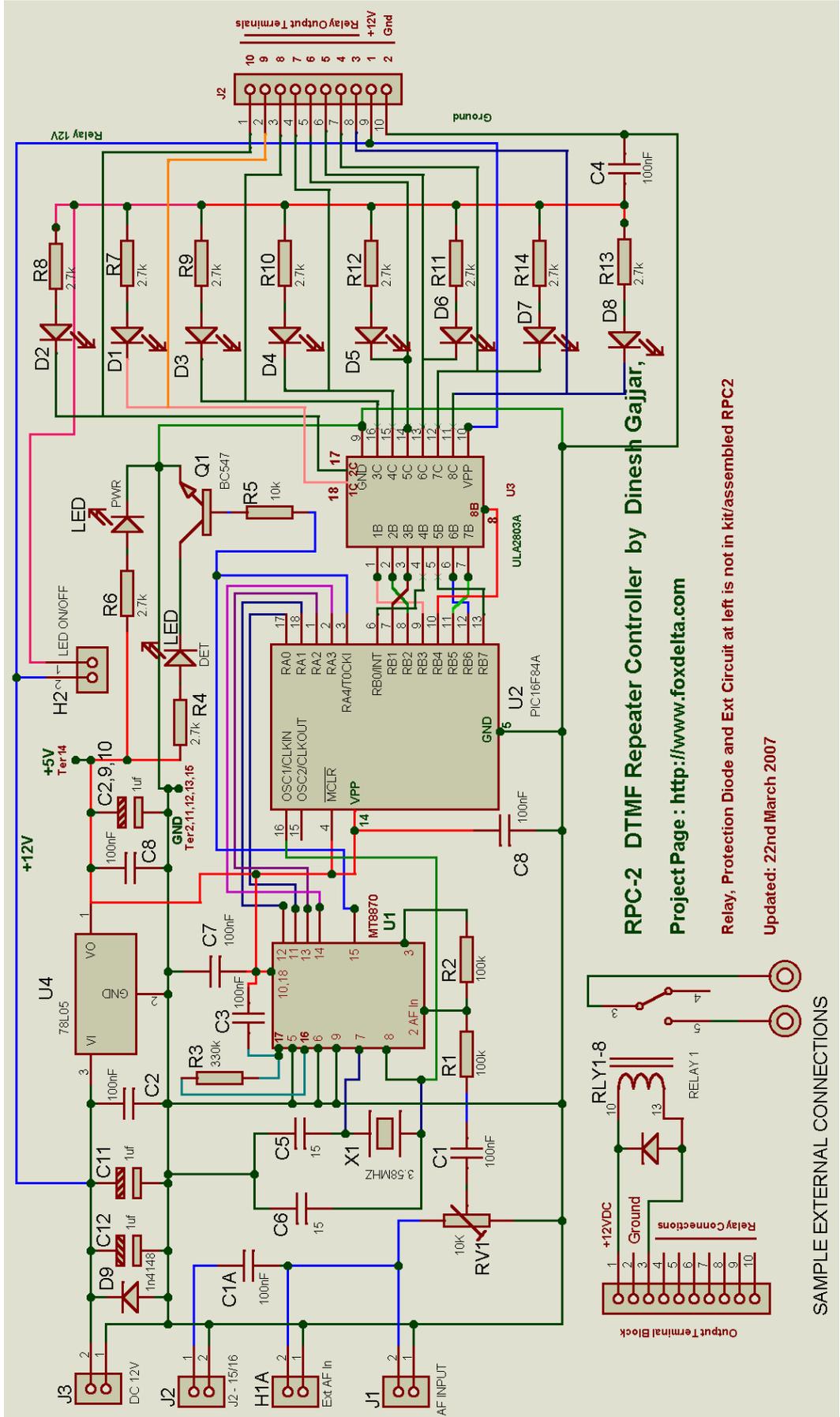
Basic Commands & Relay Outputs at Terminals:

Example below is for password= 1234

Command	Relay at Terminal Number:	Status:
*123411#	7	On
*123421#	7	Off
*123412#	8	On
*123422#	8	Off
*123413#	10	On
*123423#	10	Off
*123414#	9	On
*123424#	9	Off
*123415#	4	On
*123425#	4	Off
*123416#	3	On
*123426#	3	Off
*123417#	5	On
*123427#	5	Off
*123418#	6	On
*123428#	6	Off
*123420#	All Relay	Off

Note: Terminal 2 is Ground and terminal 1 is +12V DC

Schematic of the RPC2A DTMF Controller:

RPC-2 DTMF Repeater Controller by Dinesh Gajjar,

Project Page : http://www.foxdelta.com

Relay, Protection Diode and Ext Circuit at left is not in kit/assembled RPC2

Updated: 22nd March 2007
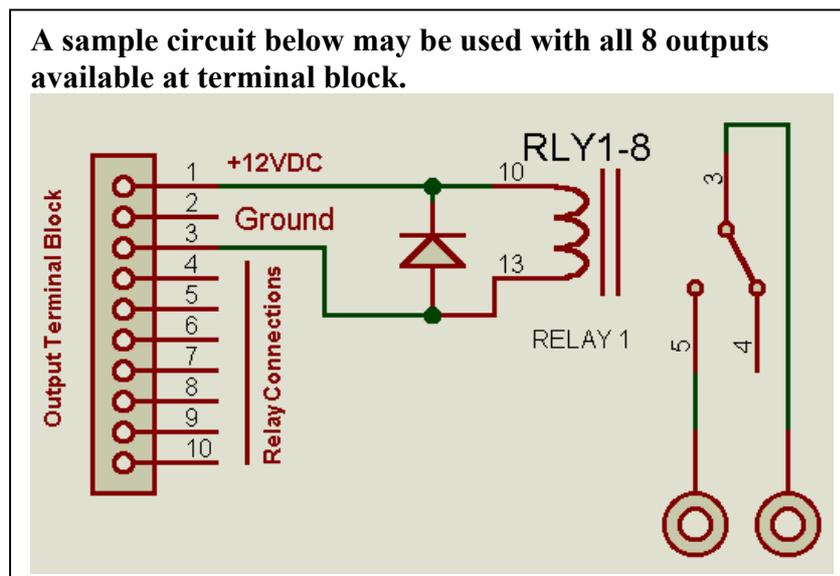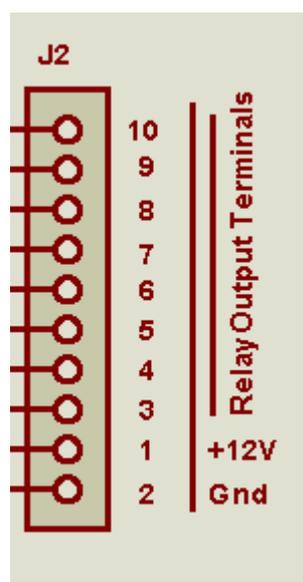
SAMPLE EXTERNAL CONNECTIONS

Extension of RPC2 to Repeater Board:

In view to use RPC2 with a Repeater Project, two 0.1INCH headers, "Audio" and "H1" may be installed under the RPC2 board. Following is a schematic of outputs/Inputs:

Relay Output Terminals:

A sample circuit below may be used with all 8 outputs available at terminal block.
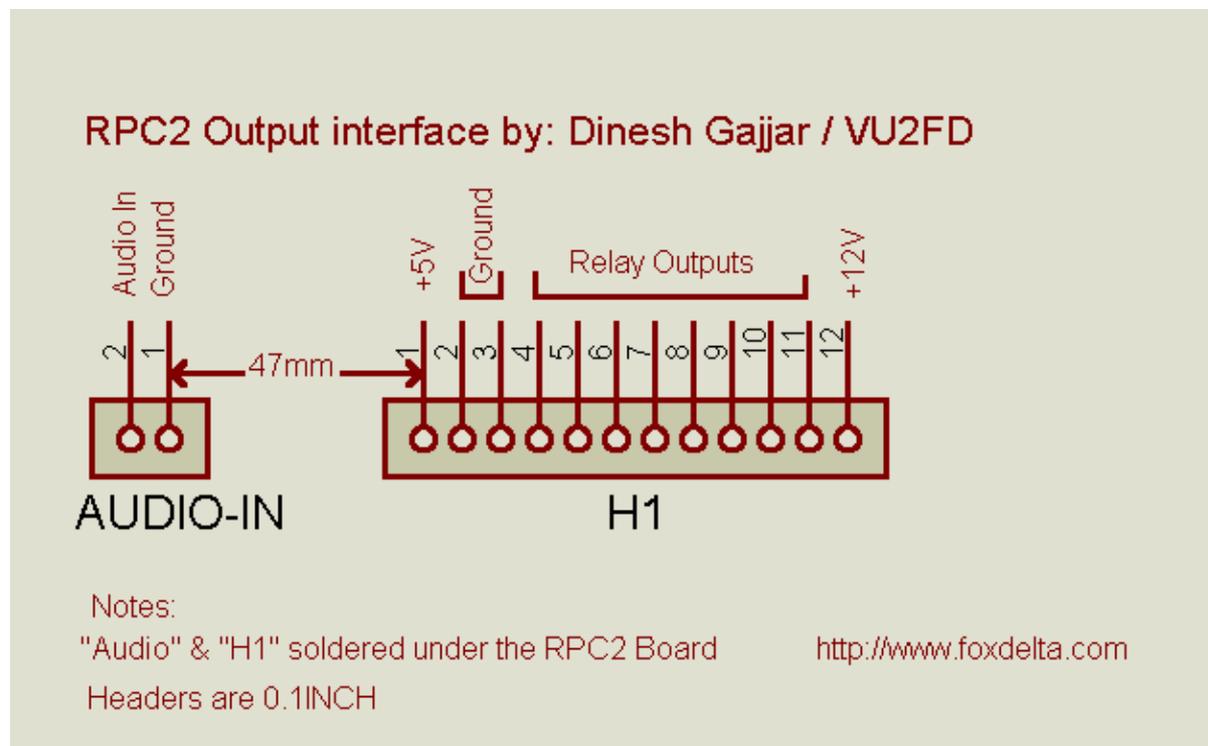
Note: Above components (Relay and protection diodes) not included with kit or assembled unit.

Assembly Note:

Kit is provided in a way that each component is packed in separate plastic bag with its part number.

It is assumed that kit builder is fully capable of reading schematic & having good soldering skills.

PCB is Double Sided PTH and care should be taken not to solder wrong part at wrong place. Doing so will damage the PTH and may damage upper & bottom tracks attached to that particular PTH.

Programming of PIC requires a simple PIC Programmer to transfer the HEX code generated by the provided foxrc.asm. Hex from this .asm file may be generated by programming software like MPLAB, freely available from Microchip.

I may help most kit buyers by way of supplying pre-programmed chip with their choice of password but, ultimately, one day, you will have to change pw again. Keeping this in view, it is recommended that you have a programmer and a MPLAB from microchip to generate hex.

If you do not have a PIC-Programmer, you may buy a kit for parallel or serial PIC programmer detailed elsewhere on this site.

Operation:

Operation of this kit requires simple setup. Apply DC 12V to (J3) the power connector (Center is +ve) and connect your Radio's audio output to audio input socket of this controller (J1).

The only control to adjust is RV1, which is an audio input preset. It may be set at mid point to start with, and adjusted as required for proper tone decoding operation.

Results:

Repeater controller is a good and simple project for any amateur station. I was able to control my house lighting thru my VHF radio.

This updated PCB design of second run of RPC2 was done keeping in mind the requirement of radio amateurs who wanted OC outputs for their associated equipment or wanted relays to be placed elsewhere on their project boards.

Project gives builder two important skills:

1. Controlling of remote system thru radio (or telephone line) and
2. Understanding and programming of PIC Micro Controllers.

Dinesh Gajjar / 20th April 2007

Visit project Page: http://www.foxdelta.com for more information & updates.