Fox Delta

Amateur Radio Projects & Kits

Schematic & Parts List: PIC16F88 Micro Controller LCD VHF/UHF SWR Meter

FD-SWM-VHF: VHF/UHF SWR Meter Kit: Max. VHF/UHF Power = 100W

Measuring SWR at VHF/UHF frequency was never a fun. Most radio amateurs just assume that their 50 ohms cable is matching a beam or GP.

SWR Meters of niddle variety are flooding market, although, not very economical. LCD meters are bit expensive, crossing a range of over $140. However, they may include "Antenna analyzer" or something like that, which few of us, use or understand, but pay price for!!

LCD SWR Meter presented here meet many simple task using a micro controller, especially, dear to all of us, a PIC!!. The very basic purpose to make this project is to encourage radio amateurs to build their own SWR Meter at very low price instead of buying ready made at high prices.

PIC projects are very dear to radio amateurs and other enthusiasts because of their easy programming needs and ample of source codes already available to experiment with.

Project Bases:

Project is developed on two double-sided PTH boards. The first one is CPU board where LCD, Regulator and Op.Amp are located. This board receives pure DC level from sensor board for calculation & display.

The second board is RF Sensor Bridge where power from your transceiver comes in and goes out to antenna. Its strip line type pickup and uses SMT parts, including BAT85 diodes.

Although, N types of connectors are used, there is no reason why you cannot use SO239 type connectors. Both types fit nicely on four mounting holes available. (Option of SO239 connector may be available with kits)

Micro Controller:
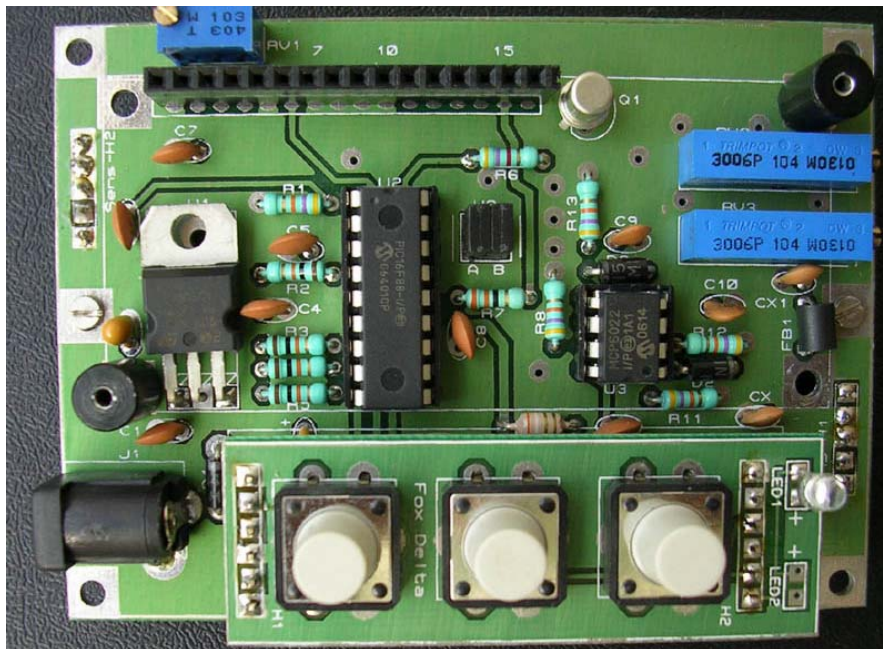
This SWR Meter uses a PIC16F88, which includes built-in RC Osc. Running at 8MHZ. Micro controller calculates forward & reflected power and in addition to FWD & REF readings on 2x16 LCD, controls LCD back light.

Backlight turns off when there is no power available for measurement, i.e. you are not transmitting. I am sure you are not trying to measure SWR with this meter, when you are not transmitting!!! (We will come-up with such project shortly!!!)

Firmware defaults to 20W power level, which may be changed by using menu buttons.

Buffer Op.Amp:
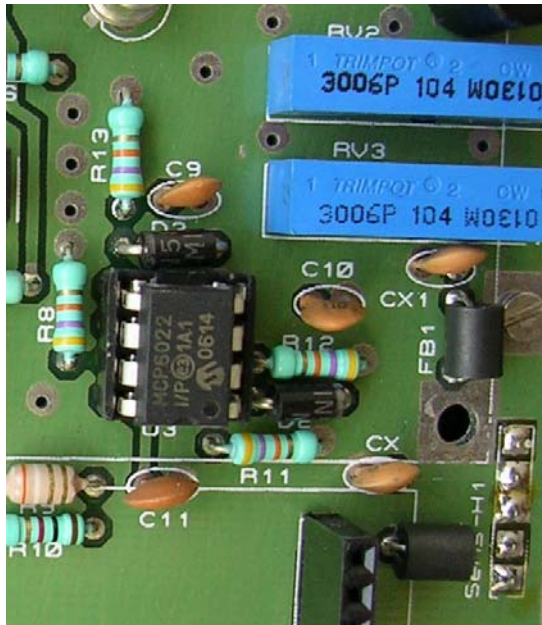
Preferably, MCP6022 would work fine in this project but you may use any other Op.Amp, which are used as a buffer/voltage amplifier.

10 Turn Pre-sets are provided for calibration purpose.

5-pin header connects sensor board to this CPU board. If necessary, a Ferrite Bead may be used to suppress Presence of RF on measured DC voltages.

Purpose of capacitors marked CX is similar to Ferrite beads.

Menu Control:

Three push buttons are provided for menu control. One for Function and other two for the direction control.
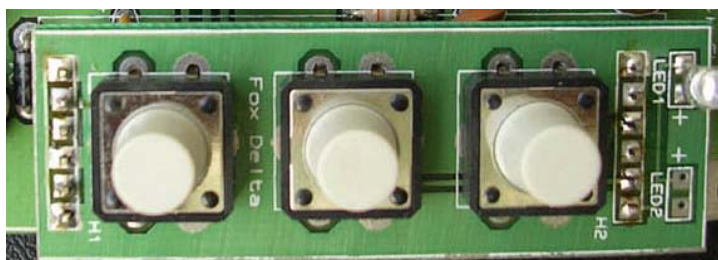
This small board installed over the main CPU board by using 0.1inch header male at both ends. Two female 0.1inch headers are used on CPU board for this purpose.

Power:

SWR meter requires DC8-14V for operation. It may work well on a 9 V battery too provided you disconnect Back Light of the LCD which would otherwise

drain your battery quickly. Internal supply for entire SWR Meter is 5V DC, which is accomplished using a three terminal regulator.

Sensor/Bridge Board:

Although named a "VHF" swr meter, you may make this meter an HF SWR Meter if you can construct suitable RF Sensor Bridge for HF Frequencies.

Because I already made an HF SWR Meter with different PIC & Sensor board, I decided to build this one exclusively for VHF/UHF Purpose.

Bridge with SO239 Sockets fitted on SMT parts side:
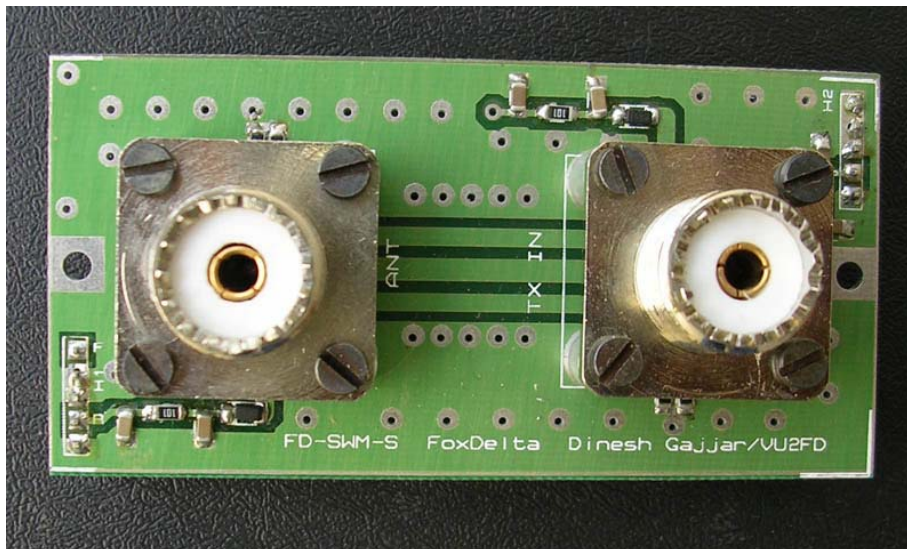
As visible in above picture, all capacitors, resistors and diodes are surface mount. Most pain related to soldering SMT parts is removed by providing all kits with pre-soldered SMT parts.

Bridge with "N" Connectors, supplied as standard:
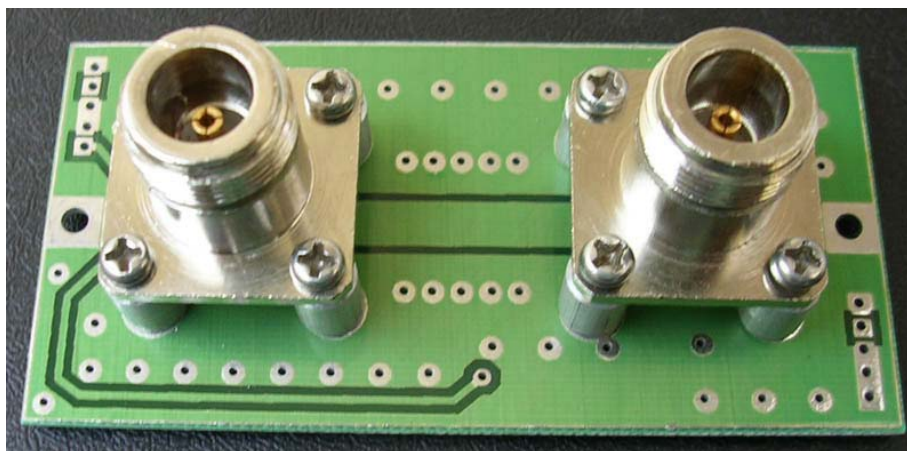
8 alum spacers & 16 SS Bolts (3mm threads) are supplied with this kit. Although all SMT parts are pre-soldered, you will have to install connectors and solder center "Hot" connection.
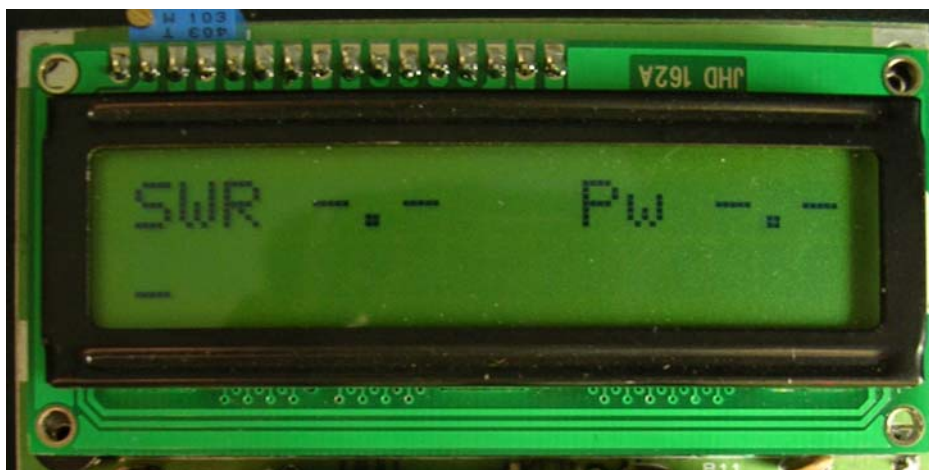
Picture of the Backside of the bridge:
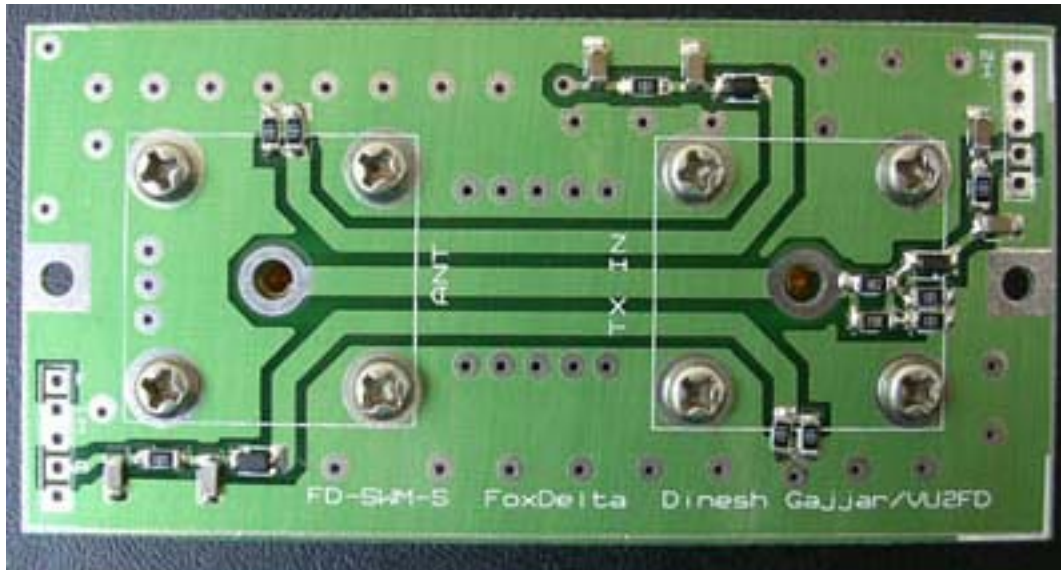
Best way to use this SWR meter would be to locate this Bridge board closer to the rig (Transmitter or Transceiver) and use two multi core shielded cables from bridge to display unit.

LCD Display:

A 2x16 character LCD with backlight is used for this project. 16pin Male/Female headers are used for easy replacement of LCD module.

SWR Meter will display measured SWR and Forward Power. A Bar Graph will be displayed on 2nd line of the LCD

Kit Building:

Like all kits, this will be a simple kit to build. If you get RF Sensor board pre-soldered, most work is over. PIC will be delivered pre-programmed with firmware.

Like all other kits, this kit & project is for radio amateurs. You can build this kit without any problems if you can read schematic well. Purpose of this doc is not to teach Step-by-Step assembly but to highlight capability of the kit.

Please go though the Schematic and Kit Packing List & Silk snap doc for more details.

What is not supplied in KIT?

1. You will require two multi-core shielded Cable to connect bridge & display boards.

2. Metal cases for bridge (essential) and display unit (not essential)

I hope this project will be useful to many radio amateurs and fun to build.

Dinesh Gajjar
15th Jan. 2008

For more details, please visit Project Page: http://www.foxdelta.com