



Fox Delta

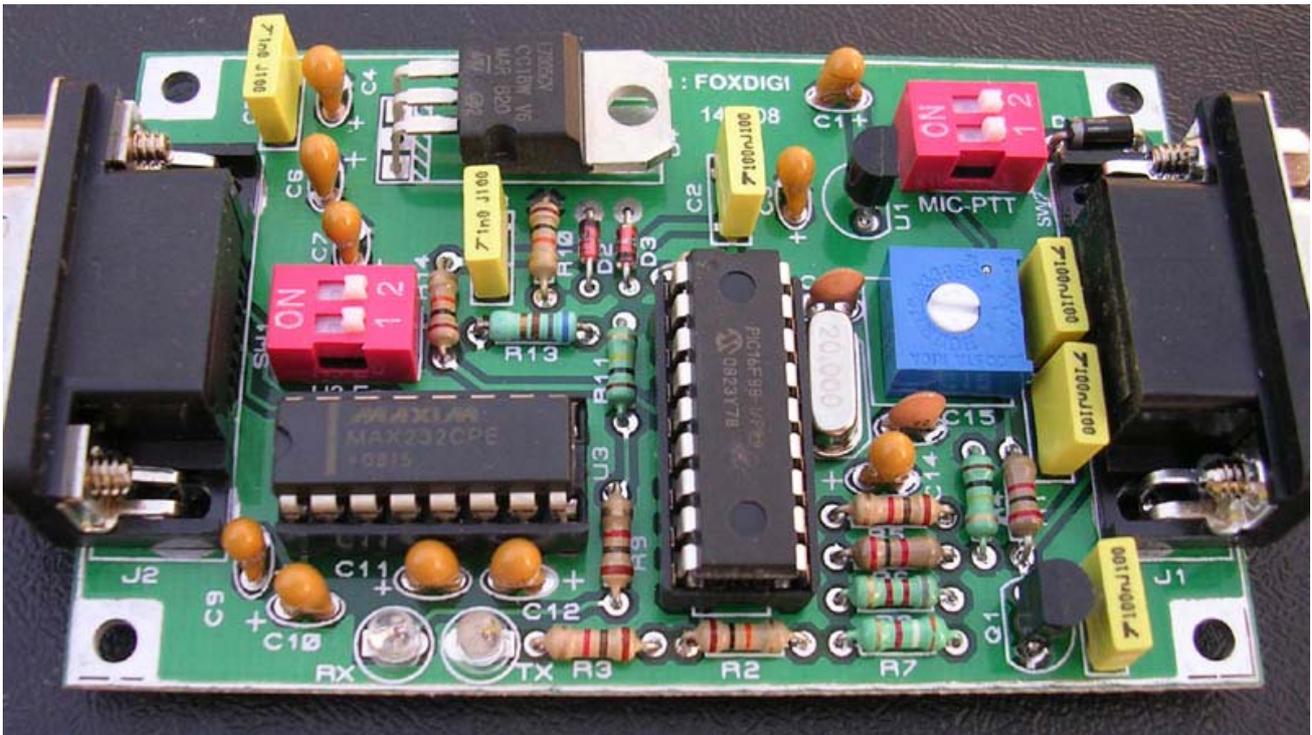
Amateur Radio Projects & Kits

FoxDigi

Technical Details and Schematic: A 1200-Baud APRS / Packet Digipeater

Rev: 141208

Completed FoxDigi:



Project Introduction:

FoxDigi is a PIC16F88 based 1200-Baud Mini-TNC, replacing traditional expensive chip MX614 from [Maxcom](http://www.maxim.com), making it ideal modem for VHF & Satellite digital work.

This project is based on articles written by many radio amateurs using this particular IC, Firmware and associated application notes of the chip manufacturer.

After successful utilization of FoxDigi by Radio Amateurs world wide, it was redesigned with following in mind:

1. Reduce standby current by putting off MAX232.
2. Use standard connectors & Pin outs as used for trackers
3. Uses 78L05 to power FoxDigi and has larger 7805 for GPS use, if needed.

A FoxDigi Demo at Japan Ham Fair Aug 2008:

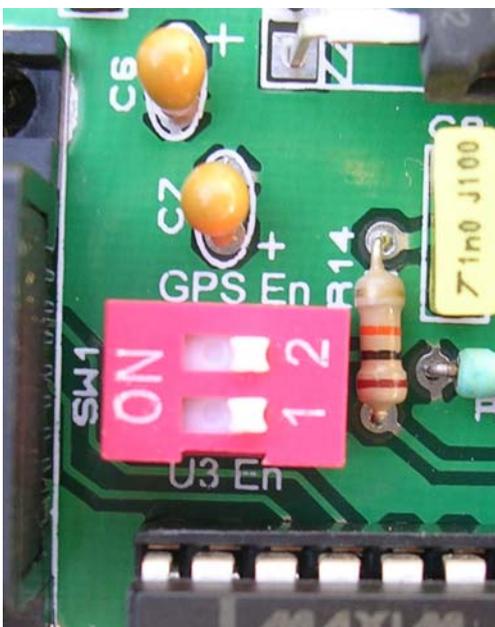


FoxDigi is expected to achieve some of the following:

1. A 1200 baud packet modem/tnc
2. **Stand-Alone Simple Digipeater.**
3. A Tracker with GPS

However, this particular project is targeted to make a simple, low power, stand-alone Digipeater. Other function, Tracker with GPS, is readily available. Some of the other options may need firmware update. I have avoided a boot loader concept and a TNC/DIGI firmware is supplied with this kits. If you wish to experiment with this modem/TNC, you may do so by simply reprogramming the PIC.

SW1:

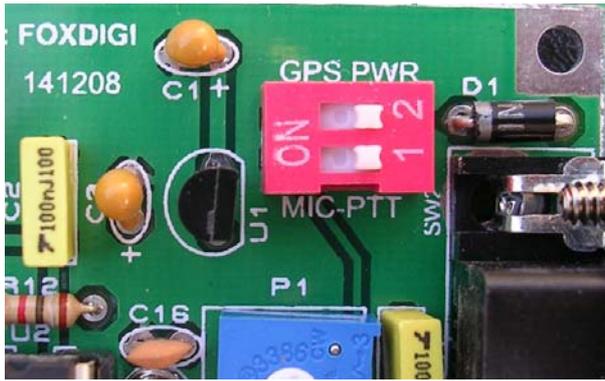


SW1 has two switches. GPS-En & U3-En.

A MAX232 is used to get true RS232 levels. However, since purpose of MAX232 is limited to configuration of PIC parameters, SW1 is provided to cut +5V to this chip to further reduce current consumption.

Switching on GPS-En activates PIC firmware to start receiving GPS sentences.

SW2:



FoxDigi is basically designed to be used without a GPS. However provision is made to power a GPS thru Pin4 of J2 connector.

In view to keep power low, SW2 has GPS PWR switch. +12V is sent to 7805 only when this switch is enabled.

Enabling MIC-PTT, insert a 2K resistor from MIC to PTT.

Some other useful notes:

FoxDigi has two panel LEDs for “RX” and “TX”.

FoxDigi takes very low current and its ideal for mountain top HT+FoxDigi+Solar Panel setup, to get aprs data digipeated.

Two D9 Connectors are provided on either side of the FoxDigi Board for following:

1. **J1:** D9-Female for Radio Connection and
2. **J2:** D9-Male for PC Connection. A null modem cable is required.

FoxDigi uses standard pin out for both J1 & J2. Standard means, pin outs used on FoxTrak, Open Tracker or TinyTracker.

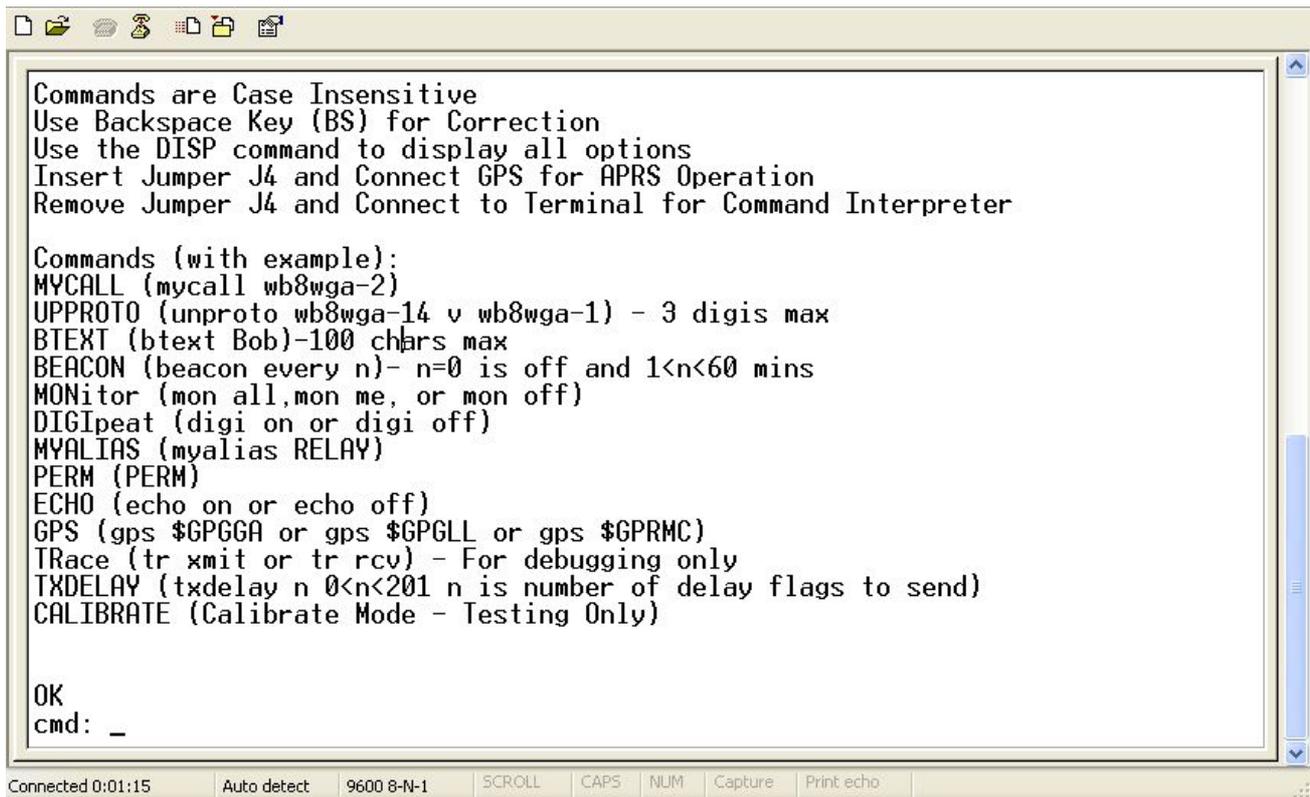
There is DIP Switch SW2 for “GPS EN” which is provided for those looking for “Tracker” functionality from FoxDigi!

Project is designed on a Double Sided PTH board measuring 8X6cm. With this modem, you may stop worrying about those hard to find, MX614s!!

Modem Configuration:

User data in Modem (PIC88) chip is stored by using a simple “HyperTerminal” of the windows. To enter config. Mode, connect a Null Modem Serial Cable to J2. Open HyperTerminal and set it up for 9600N1 or 4800N1. Apply power to Foxdigi & a message will appear. Type “help” to get list of commands.

Configuration screen looks something like this:



```
Commands are Case Insensitive
Use Backspace Key (BS) for Correction
Use the DISP command to display all options
Insert Jumper J4 and Connect GPS for APRS Operation
Remove Jumper J4 and Connect to Terminal for Command Interpreter

Commands (with example):
MYCALL (mycall wb8wga-2)
UPPROTO (unproto wb8wga-14 v wb8wga-1) - 3 digis max
BTEXT (btext Bob)-100 chars max
BEACON (beacon every n)- n=0 is off and 1<n<60 mins
MONITOR (mon all,mon me, or mon off)
DIGIPEAT (digi on or digi off)
MYALIAS (myalias RELAY)
PERM (PERM)
ECHO (echo on or echo off)
GPS (gps $GPGGA or gps $GPGLL or gps $GPRMC)
TRACE (tr xmit or tr rcv) - For debugging only
TXDELAY (txdelay n 0<n<201 n is number of delay flags to send)
CALIBRATE (Calibrate Mode - Testing Only)

OK
cmd: _
```

Do not forget to save your settings by entering “PERM”.

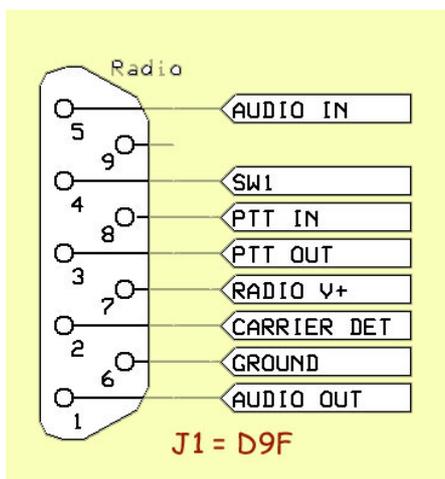
There is separate document with screen shots of configuration process.

Radio Connection:

User will be required to prepare a cable for Radio Connection.

J1 is a Female D9 connector. You will require a D9 Male connector, a shielded 4-core cable and suitable connectors for connection to your transceiver.

Standard Radio connections are:



J1 is a Female D9 R/A Connector. Connect your Radio here using a Male D9 Connector.

In FoxDigi, Following pins are not used:

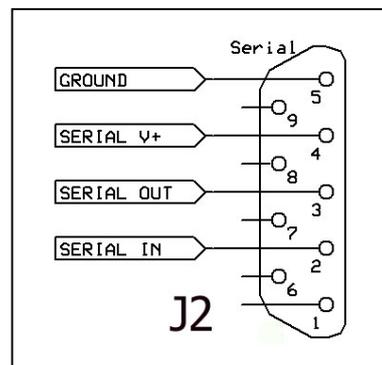
1. SW1
2. PTT-IN
3. Carrier-Detect

J1 Pin Connections: (Female D9 PCB Connector)

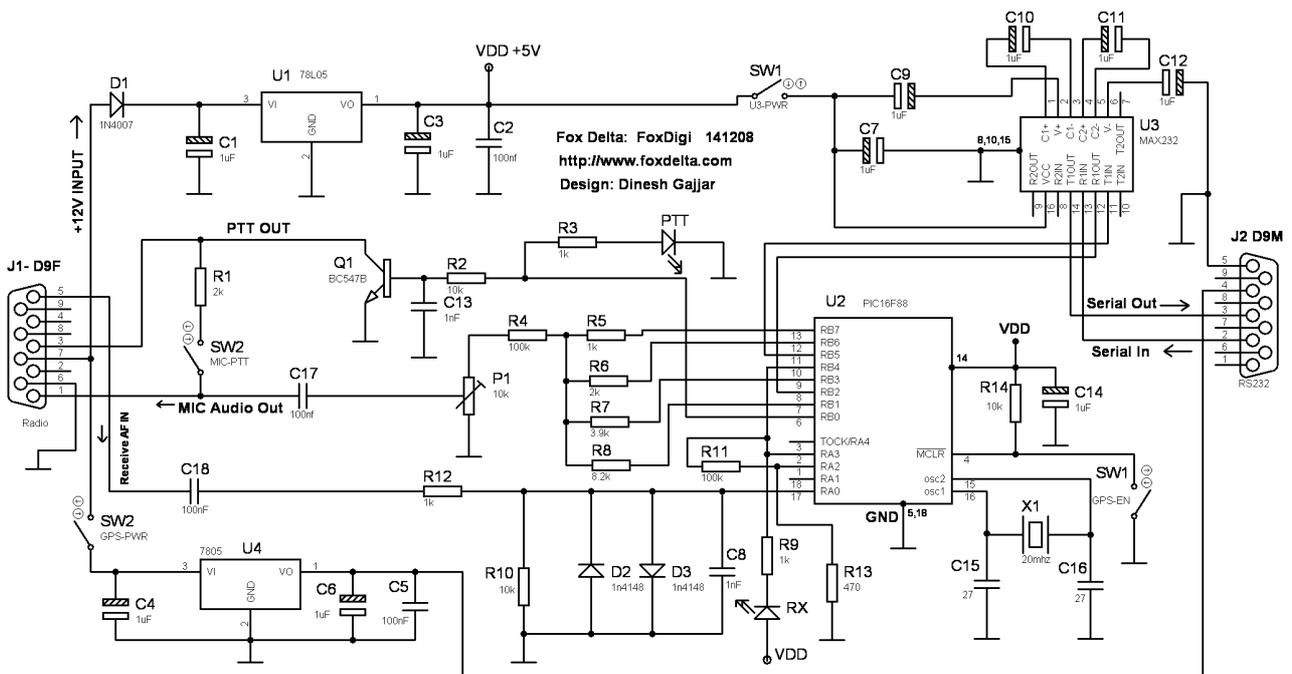
1. Mic Audio to Transceiver
2. NC
3. PTT to Transceiver
4. NC
5. Transceiver receiver audio to foxdigi
6. Power & Signal Ground
7. +12V for Foxdigi from Radio.
8. NC
9. NC

J2 Pin Connections: (J2 is D9 Male connector. Connects to your PC's COM port using a Null Modem Serial Cable)

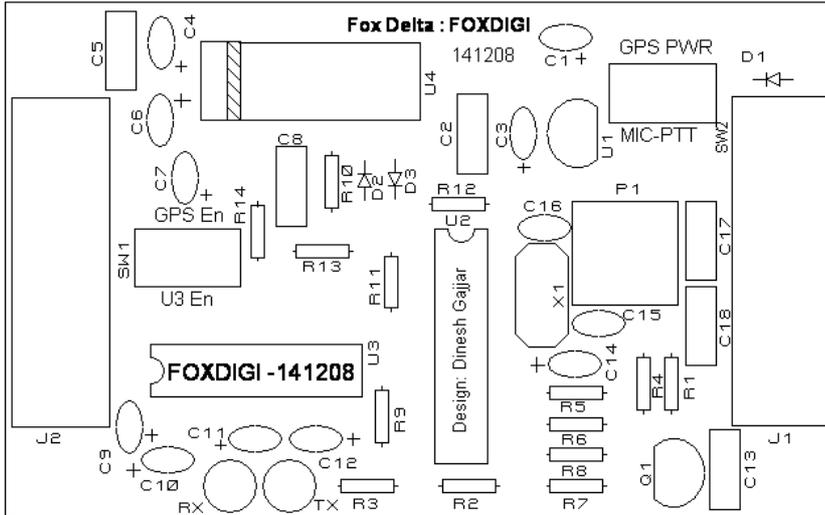
1. NC
2. Serial In
3. Serial Out
4. +5V when SW2/GPS PWR En
5. Ground
6. NC
7. NC
8. NC
9. NC



The Schematic:



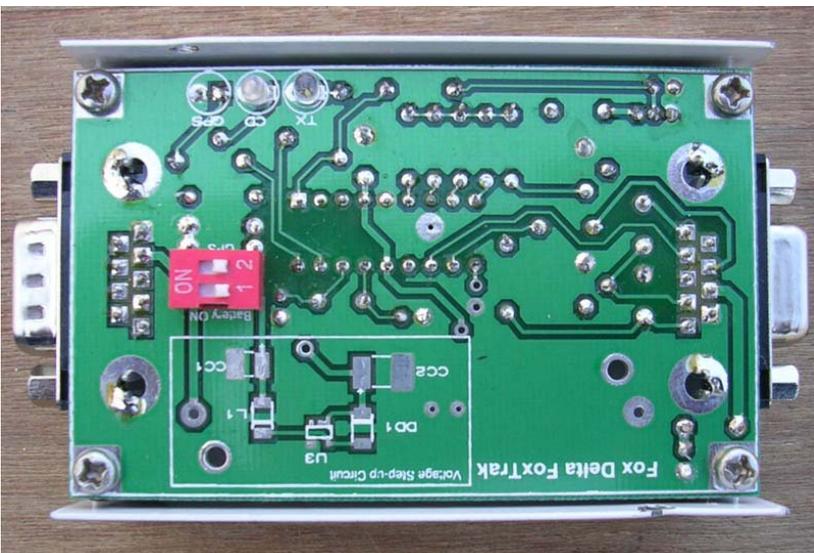
Silk Snap of the FoxDigi Board:



Completed FoxDigi in a supplied Metal Case:



Top Cover Removed:



Parts List:

Qty	ID	Details
1	U2	PIC16F88, Pre-Programmed With Firmware 4800/9600
1	U3	MAX232 or Equiv. RS232 Driver
1	PCB	FoxDigi 141208 Double Sided PTH Board
1	U1	78L05
1	U4	7805
1	Q1	BC547B, PTT Switch
2	SW1, 2	2 Position DIP Switches
1	J1	D9 Female Right Angle Connector PCB
1	J2	D9 Male Right Angle Connector PCB
2	LED	3mm: RX, TX
1	X1	Crystal 20MHZ HC49US
1	P1	Preset Bourns 10K
1	D1	1N4007
2	D2, 3	1N4148
1	DIP18	IC Socket for U2
1	DIP16	IC Socket for U3
1	D9F	D9 Male Connector for Transceiver Connection
1	Case	Powder Coated Metal case
Qty	ID	Details
10	C1, 3, 4, 6, 14, 7, 9, 10, 11, 12	1uf 35V Tantalum
4	C2, 17, 18, 5,	100nf Poly
2	C8, 13	1nf Poly
2	C15, 16	22 or 27pf Ceramic
2	R6, 1	2K
4	R3, 5, 9, 12	1K
2	R4, 11	100K
1	R7	3.9K
1	R8	8.2K
3	R2, 14, 10	10K
1	R13	470

Note: Metal case is designed in a way that FoxDigi is to be installed with Components facing inside of the case.

In this situation, SW1 (U3 Power & GPS) should be installed on the solder side of the PCB so that switches are accessible from Metal Case Window.

Dinesh Gajjar / 16th Feb 09

Please visit <http://www.foxdelta.com> for more information on this project.