4S6GGS APRS TRACKER V0.9 PROJECT

4S6GGS

4S6GGS APRS Tracker is a small, inexpensive radio controller designed to broadcast position reports from a GPS receiver.

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Overview

4S6GGS APRS Tracker is a small, inexpensive radio controller designed to broadcast position reports from a GPS receiver.

It removes the need for a full TNC (terminal node controller) in an APRS tracker. When combined with an NMEA-0183 possible. GPS data must be sent at 4800/9600 baud,

Compatible GPS receiver her I aim use Garmin GPS128, and a radio transmitter my home brew TX And Kenwood TM231A, This unit will key the radio at user-defined intervals, and transmit the GPS's current position.

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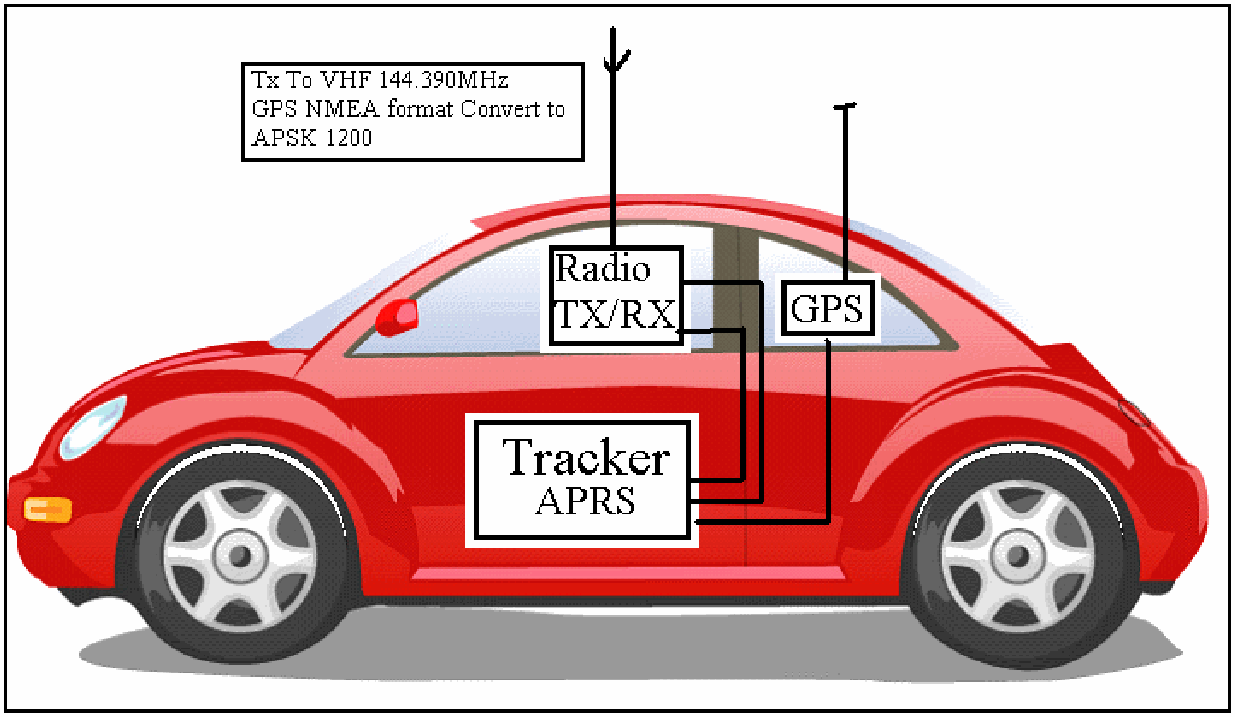
WHAT'S APRS?

In its simplest form, APRS allows the tracking of mobile amateur radio stations. Developed, it is a packet radio system, which permits any number of stations to exchange position data just like voice users would in a net.

APRS versatility is most evident during emergency or a special event situation where the tracking of key sets in real-time is possible. Where is the Event Leader? Where are the emergency vehicles? What's the Weather at various points in the county? Where are the power lines down? Where is the head of the parade?
APRS has been described as the answer to a problem that doesn't exist - but do we always have to do things for a reason? With such a narrow approach to life we would all be surfing the net and talking on cell-phones. The same goes for most of the activities in ham radio - why do we work rare DX on cw, collect prefixes,

What's a Tracker?

A tracker is the means by which a mobile station can be tracked. It may consist of a radio, antenna, TNC and GPS but since most of the time the mobile just transmits unconnected UI frames, the receiver part of the TNC is redundant. Therefore more and more stations are using small-dedicated tracker units instead of full-featured TNCs. These trackers can have various operating abilities. The simplest will just transmit a UI packet indicating their position every few minutes, others have more functions.



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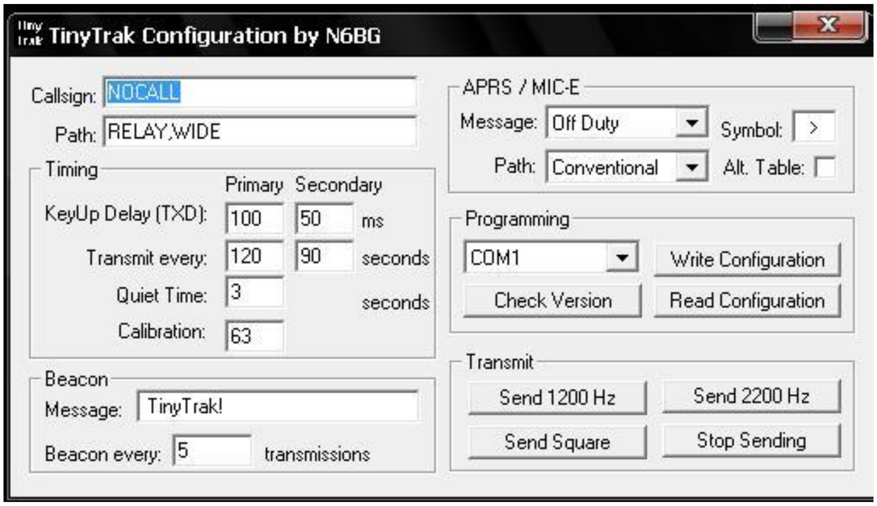
Here generates an APRS signal

Her is functions are controlled by PIC16F84A The position data in NMEA format ($GPRMC) delivered from a GPS is decoded and a 1200 bps packet radio signal is generated from it. This can be fed directly into a Radio Transmitter .This unit speed dependable beacon rates and beacon transmissions at major course changes. Firmware is developed by DK7IN And N6BG who has also made a nice configuration utility to rite user parameters in PIC. However I modify the Program little I can For use 4s Land it **only for ham radio**, Her the I am use software TinyTrak Config utilities can Change the Basic operation.



TinyTrak Configuration by N6BG

Callsign: NOCALL
Path: RELAY,WIDE

Timing

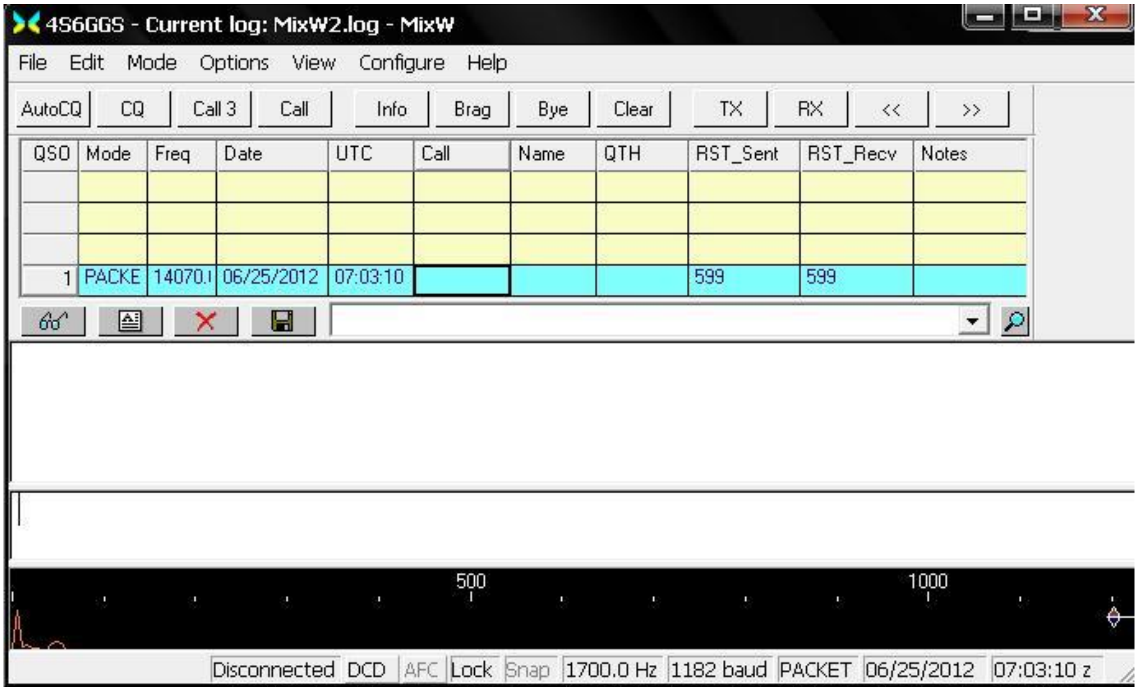
	Primary	Secondary	
KeyUp Delay (TXD):	100	50	ms
Transmit every:	120	90	seconds
Quiet Time:	3		seconds
Calibration:	63		

Beacon
Message: TinyTrak!
Beacon every: 5 transmissions

APRS / MIC-E
Message: Off Duty
Symbol: >
Path: Conventional
Alt. Table: □

Programming
COM1

This Format can be decode by PC her I am use SW **MixW2** you can download this software in internet.



4S6GGS - Current log: MixW2.log - MixW

QSO	Mode	Freq	Date	UTC	Call	Name	QTH	RST_Sent	RST_Recv	Notes
1	PACKE	14070.(	06/25/2012	07:03:10				599	599	

Disconnected | DCD | AFC | Lock | Snap | 1700.0 Hz | 1182 baud | PACKET | 06/25/2012 | 07:03:10 z

4S6GGS Gayan   E-mail-www. 4s5gs.gayan@gmail.com

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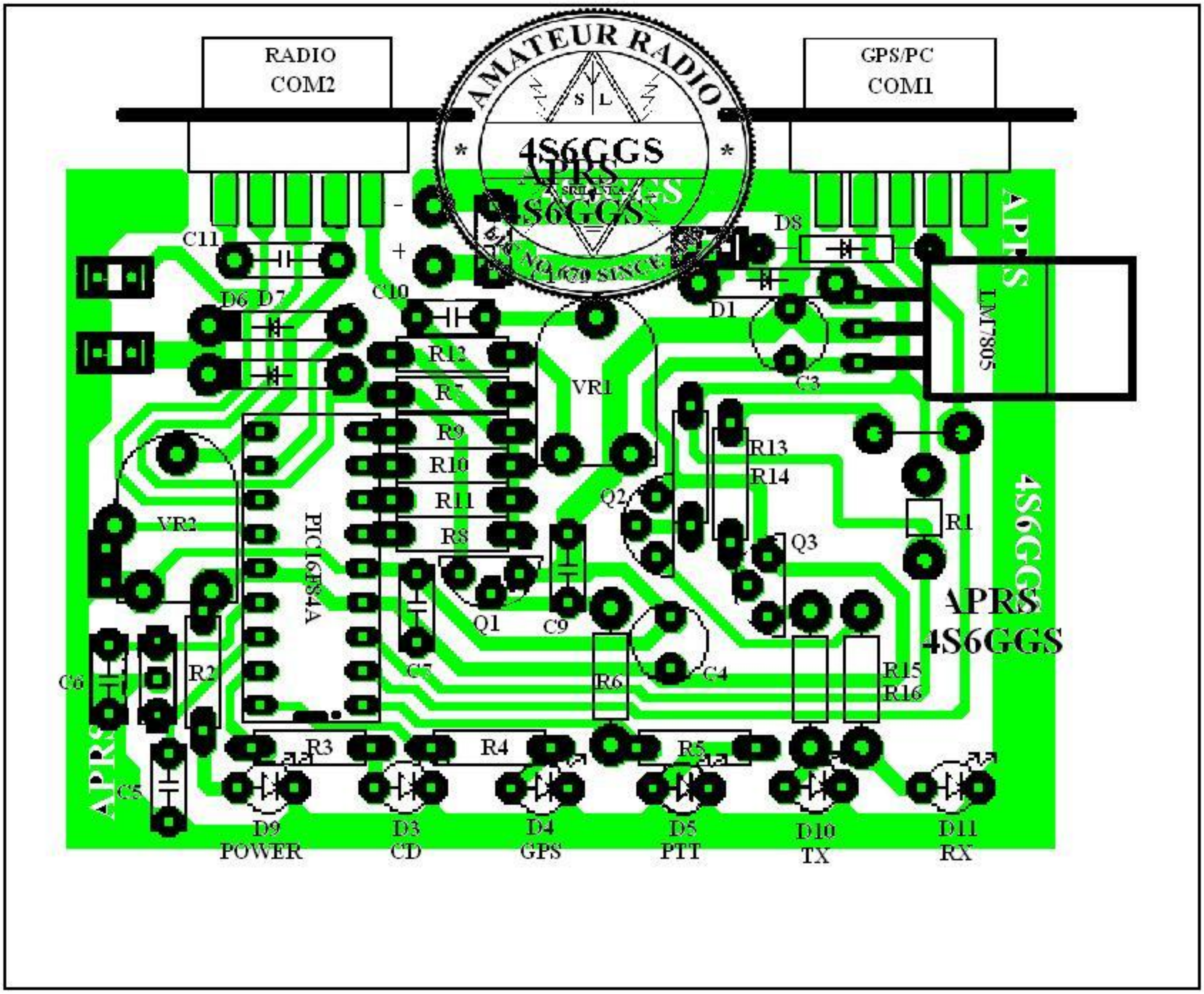
Construction



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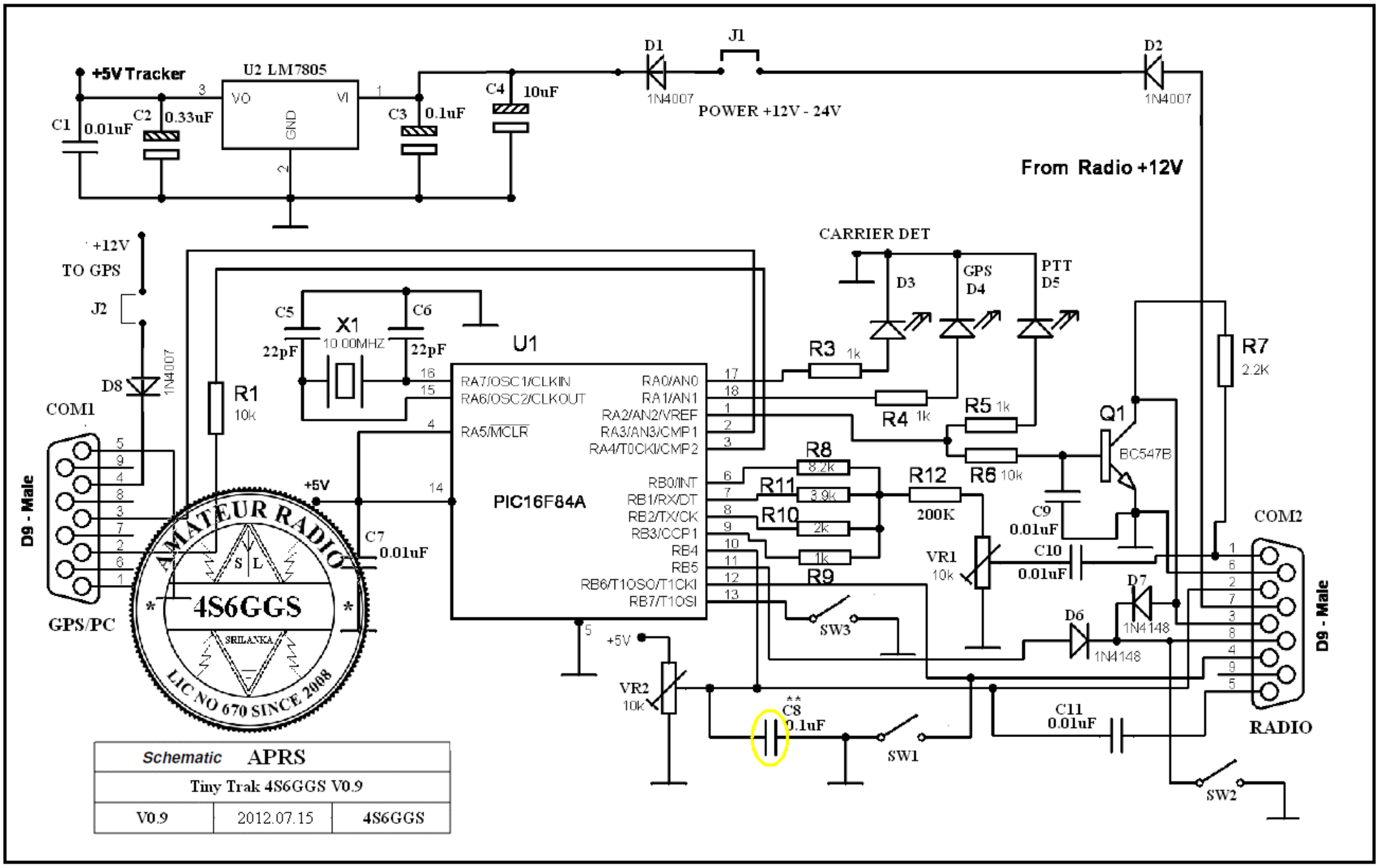
Schematic



Parts List

Part	Description	R1-6	10K
C1-7-9-10-11	0.01uF	R2-2-3-4-5-9-15-16	1K
C2	0.33uF	R7	2.2K
C3-8	0.1uF	R8	8.2K
C4	10uF	R10	2K
C5-6	22pF	R11	3.9K
U1	PIC16F84A	R12	200K
U2	LM7805	R13-14	33K
X-Tal	10.0000MHz	VR1-2	10K
D1-2-8	1N4007	Com1-2	RS232 Male
D6-7	1N4148	Q1-2-3	BC548A
D3-4-5-9-10-11	LED		

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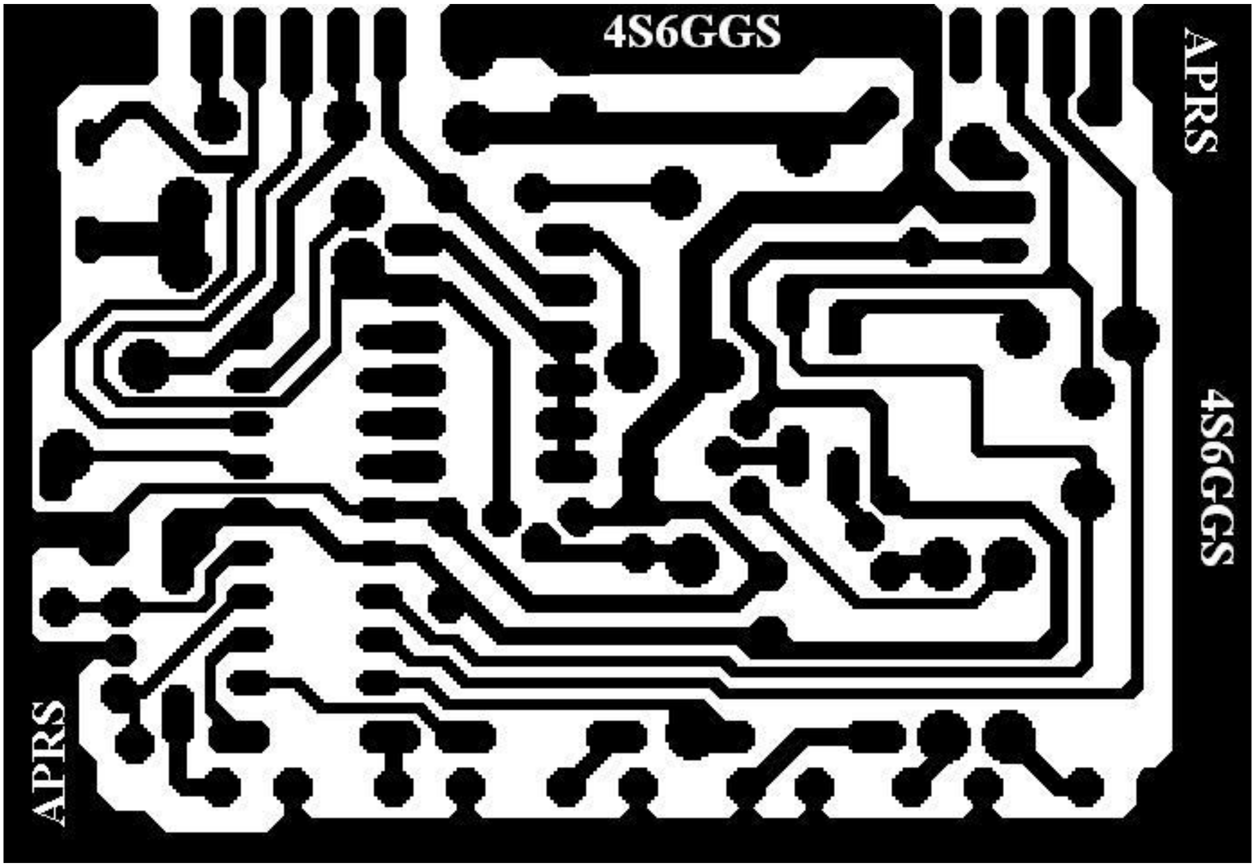
Circuits **PCB Lay Out**



H=49.35mm x W 75.71mm

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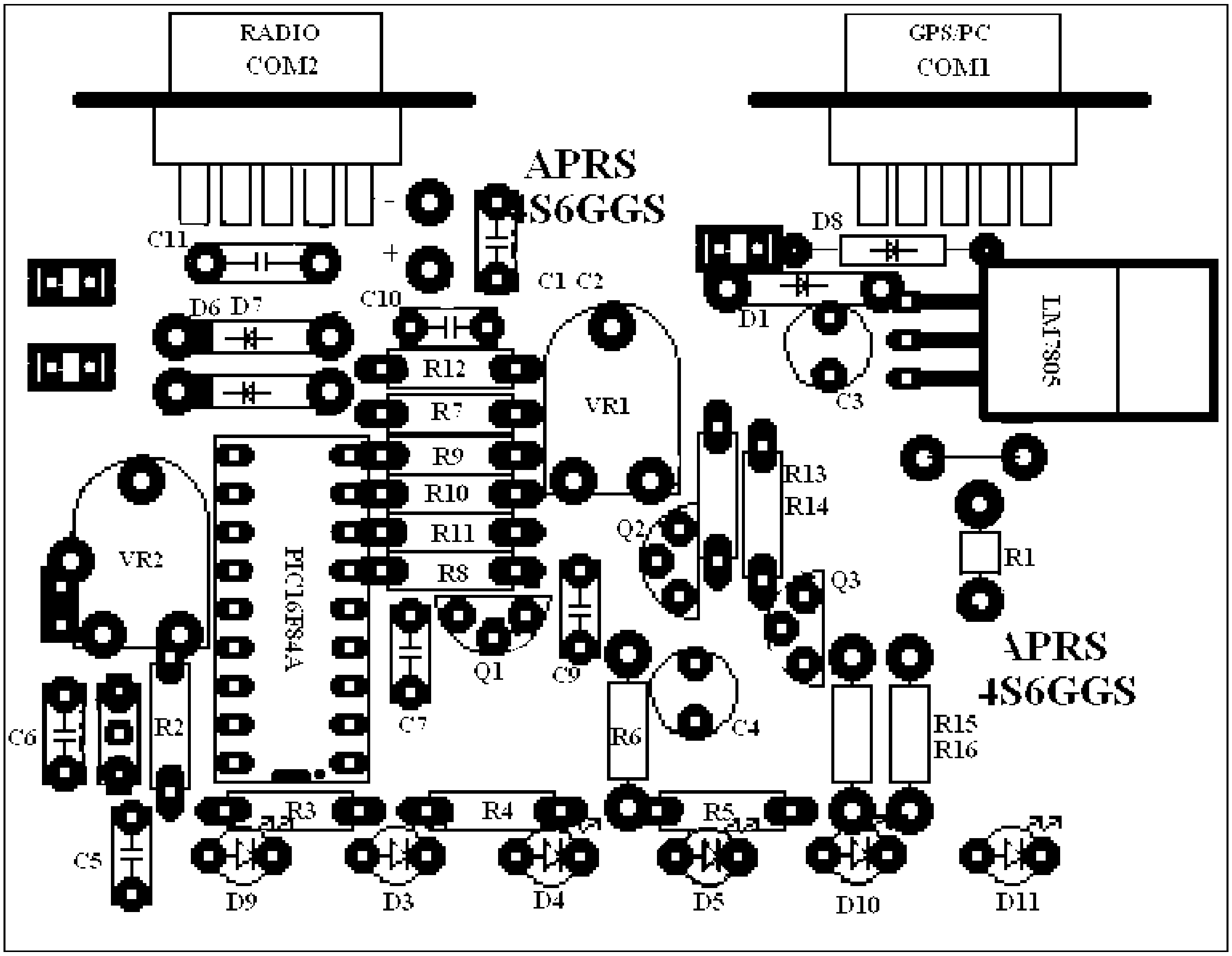
Component Placement



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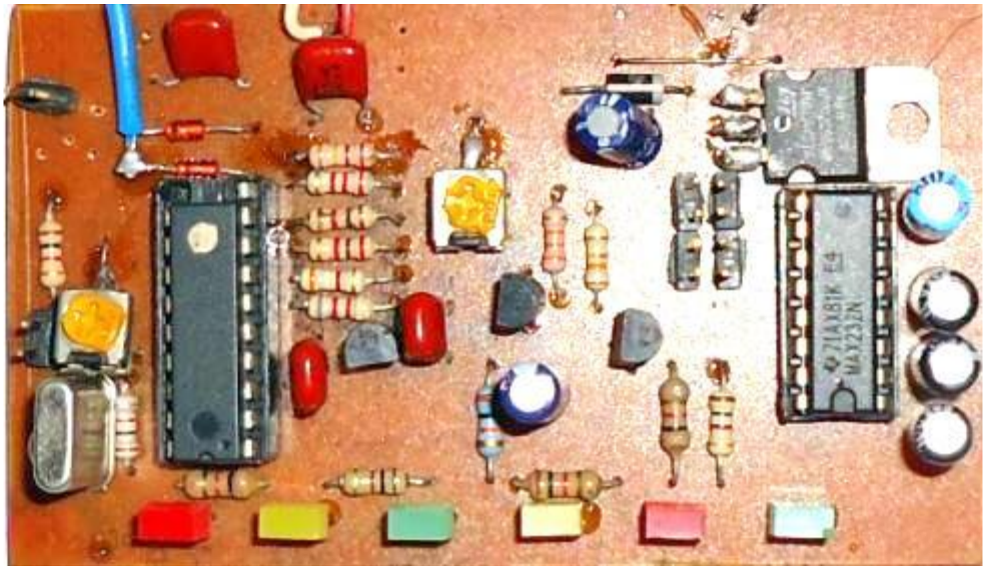

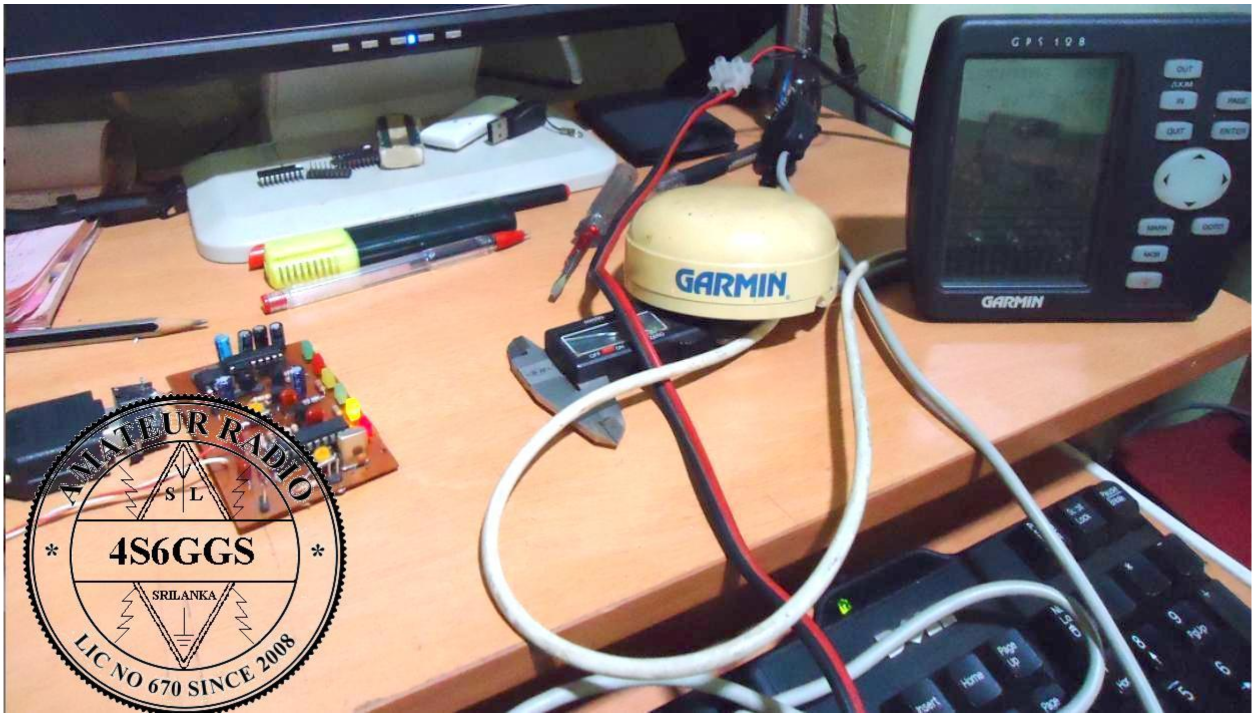

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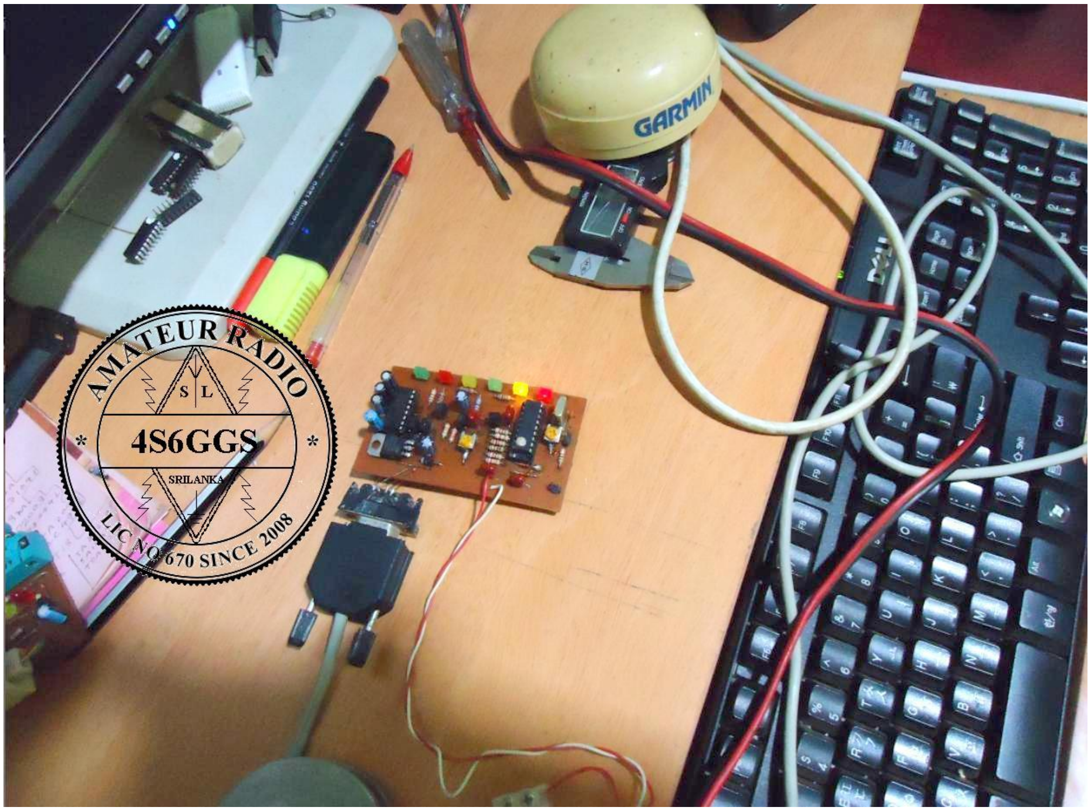

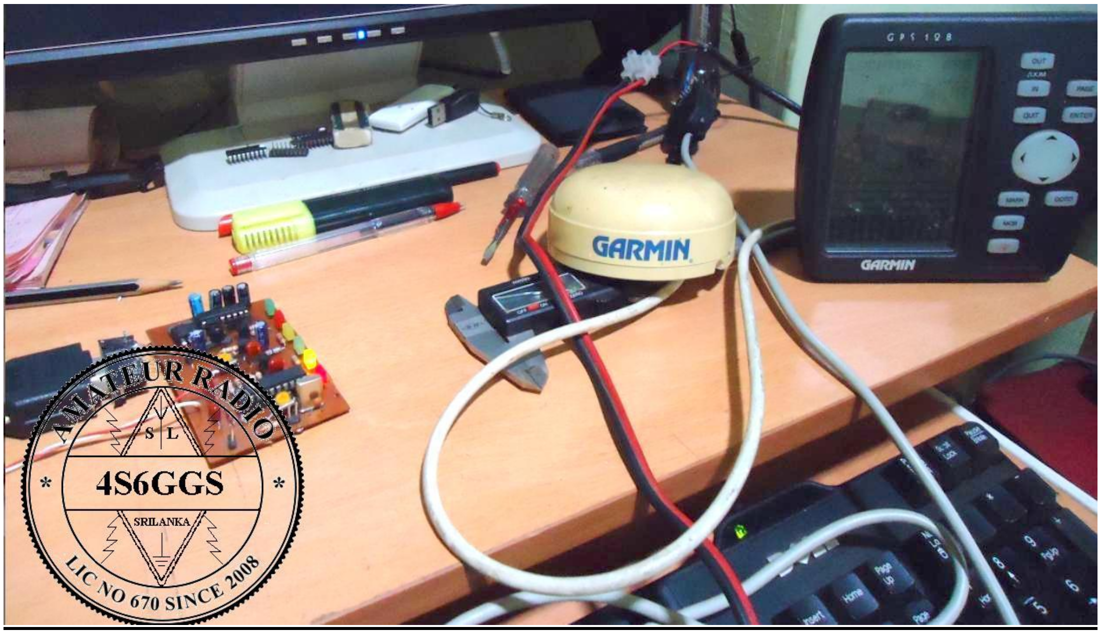

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Circuit

Heart of the circuit is a Microchip PIC16F84A that also generates the necessary frequencies for the packet radio signal. The 10 MHz version has to be used because the 4 MHz version is too slow for generating the audio frequencies.

The circuit is equivalent to the TinyTrak design with a few hardware additions. The knowledge of the TinyTrak documentation is helpful and silently assumed.

I could not get a ceramic resonator, therefore I used a 10 MHz crystal, which needs two additional 22pF condensers.

An additional 100nF condenser from the common point of the four D/A converter resistors to ground slightly improves the shape of the audio signals.

A Jumper allows connecting a 2k2 resistors for PTT control over the MIC line as needed for most handiest. An installed jumper gave no problems with my mobile transceivers TM-231A, but who knows. A 100nF condenser from the base of the PTT transistor to ground avoids problems with HF interference.

At pin 11 of the microcontroller a key to ground could be connected, which allows to transmit a beacon immediately.

Besides the fixed beacon rates my extended firmware supports a smart beacon control. With that the beacon rate changes depending on your speed, according to two selectable tables.

Maximum speed	< 4 km/h	> 4 km/h	> 11 km/h	> 24 km/h	> 50 km/h	> 100 km/h	> 150 km/h
S2 on: beacon every	25 min	4 min	120 sec	60 sec	30 sec	20 sec	10 sec
S2 off: beacon every	30 min	5 min	160 sec	80 sec	40 sec	30 sec	20 sec

Relevant is the maximum value of the speed since the last beacon transmitted.

For a better track accuracy at street edges a beacon will be transmitted if there is a major change in the driving direction, while the speed is more than 15 km/h. That is, sometimes I'm asked if the altitude could be transmitted too. Now only 21 bytes are left in program memory. May be I get a solution someday... but I don't know.

In the meantime Byonics added the transmission of height to the original TinyTrak, and I think their memory then was full too. Now I was a beta tester for a new Trak unit with a microcontroller with more memory. Besides the altitude the new now also has smart beaconing and corner beacons like I did it before.

Microcontroller Programming

A new microcontroller first has to be programmed with suitable firmware that means a program has to be loaded that analyses the GPS data and generates the APRS signals. You can find information for building programmers on the web. Here is my current firmware Tiny Track 4S6GGS V0.9. Some electronic parts companies not only sell micron rollers but also can do the programming for you. If you encounter problems reading the HEX file with some homebrew flashers with Windows software, try opening and saving the HEX file with a text editor first.

Adjustments

The audio level has to be adjusted for correct modulation of the connected transceiver and the PTT jumper should be set for handiest (PTT via MIC input).

For checking the modulation or the frequency shift the circuit can produce some constant frequencies. This can be controlled with my configuration program or by entering special commands with a terminal program (4800 baud or 9600baud, 8N1). Using the last another arbitrary character ends the tone and reinitializes the circuit.

With the simple circuit the VR2 -10k potentiometer will be adjusted, so that the carrier LED is just not illuminated. You have to set squelch and volume on your transceiver.

The carrier detect LED 🟢 at pin 17 is illuminated if another station is transmitting. The GPS LED 🟡 at pin 18 is on with valid data from the GPS receiver and blinks while receiving GPS data without a valid position. The PTT LED 🔴 is on while the transmitter is keyed. During initialization at **power up the yellow and green LEDs are blinking three times followed by a beacon**. **But automatic beacons will only be transmitted if valid NMEA data from the GPS receiver is received**.

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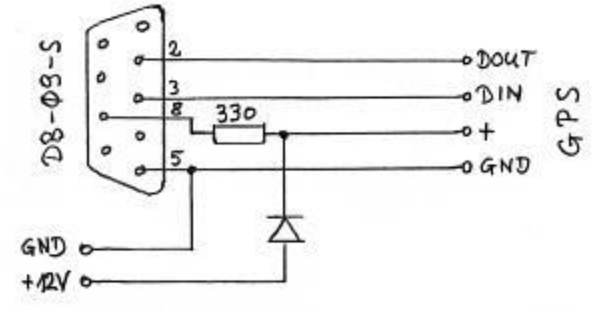
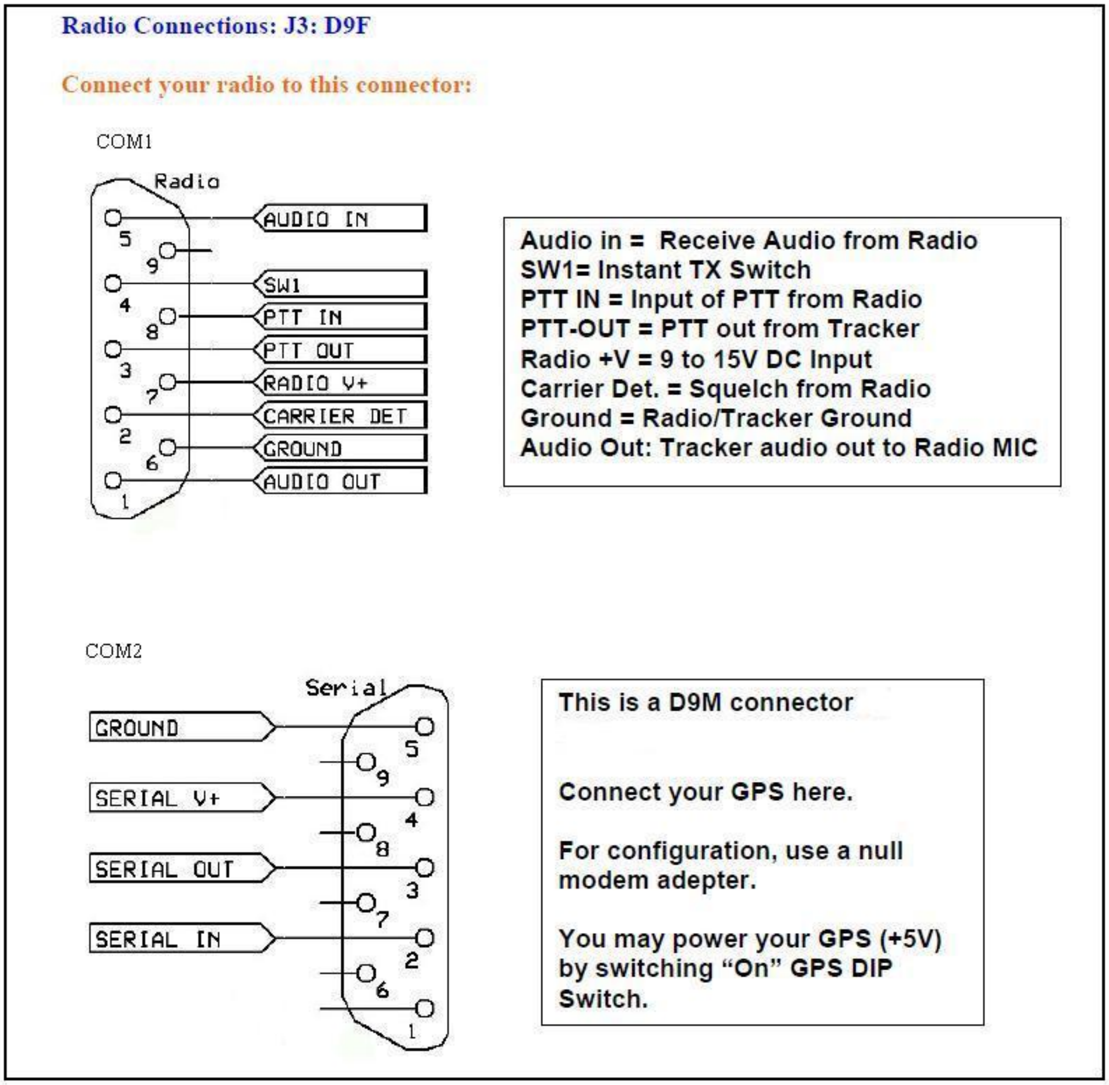
Connection

My cable for the GPS receiver has a female DB-09 connector, so it matches directly with the computer. The power supply of the GPS is done over this interface cable and also the APRS interface is supplied through a 220R to 330R resistor.



<u>In my case I decided to also use a female connector for the APRS interface for direct computer interfacing, so an adapter cable (null modem) is needed for connecting to the GPS receiver</u>.



Radio Connections: J3: D9F

Connect your radio to this connector:

Audio in = Receive Audio from Radio
SW1= Instant TX Switch
PTT IN = Input of PTT from Radio
PTT-OUT = PTT out from Tracker
Radio +V = 9 to 15V DC Input
Carrier Det. = Squelch from Radio
Ground = Radio/Tracker Ground
Audio Out: Tracker audio out to Radio MIC

This is a D9M connector

Connect your GPS here.

For configuration, use a null modem adepter.

You may power your GPS (+5V) by switching "On" GPS DIP Switch.

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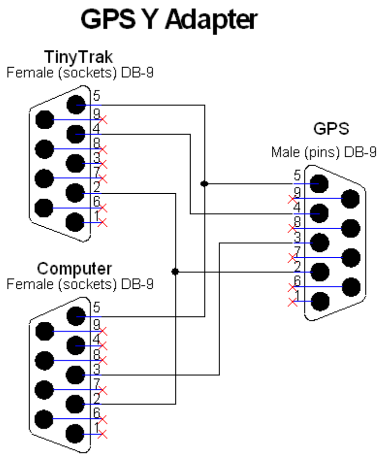
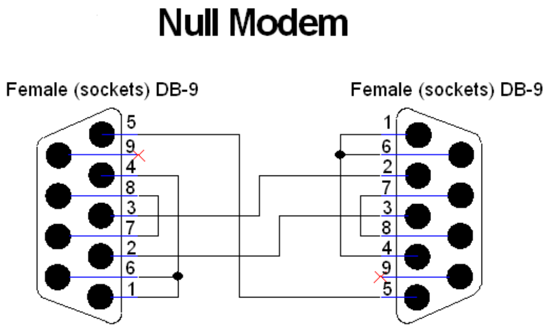
GPS /PC Connect to use Com RS232 null modem cable ……





- Resistors R8-11-10-9 which create the 4–bit digital to analog resistor ladder. For each resistor, bend one of the
- Potentiometer VR1, 10k which adjusts audio output level.
- Capacitor C11, 0.01uFwhich smoothed and de-biases the audio output. Polarity does not matter.
- Transistor Q1, BD548A which provides Push-To-Talk (PTT) for the radio transmitter. Be sure to orient flat side to match

. Transmitter

To transmit the positional packet beacon, a transmitter must be connected to via the AUD OUT and ptionally
PTT OUT points. If the transmitter transmits (PTT) when the Microphone input is grounded (most handheld (HT) radios,
Except the Kenwood brand), resistor R8 must be installed, but PTT OUT will not need to be connected to the transmitter.
For all other transmitters, PTT OUT will be needed. Connect AUD OUT, Ground, and PTT OUT if needed to the
Transmitter microphone / PTT input. Refer to the transmitter's manual for more information, and look for a section on
Installing a terminal-node controller (TNC) for packet operation.

Receiver

carrier detect components were installed on the board to prevent transmissions over other stations,
Must be interfaced to a radio receiver. Connect the receiver's audio out (earphone) jack to the AUD IN and Ground points
.

Mic Input

When sending position beacons after un keying on a voice channel is desired, the radio microphone input should be Interfaced to this point. The line should be grounded when PTT is active, and floating at other times.

Switch 2

Manual Transmitting

Acknowledgments For I Take Data

TinyTrak was developed with the help of many individuals who deserve recognition. Randy Holland (KO6KC), Dave Lee (W6ZL), Ken Mirabella (KM6YH), Marty Mitchell (N6ZAV), Luc Bodson (ON9AAV), Walter Crauwels (ON4BCB), Vesa Kauppinen (OH4EA), Barbaros Asuroglu (TA2CBA), Klaus Hirschelmann (DJ7OO), Mårten Persson (SM7SYX), Sylvain Mercier (VE2SIL), James Gutshall (N7VHF), Anders Richardsson (SM7WGG), Allan Gibbs (G7GFU), James Gorr (N3TOY), David Inkster (ZL2BLI), Ron Graham (VK4BRG), Robert Stessel (K1WXY), Jacob Tennant (KB8QIR), Hans Meijer (PA1PG), Mike Palmer (K8LG), Alfons Wittoeck (ON4AWT), Wes Johnston (KD4RDB), Peter Mulder (PE1IEE), David Andersen (K0RX), Ernie Howard (W8EH), Bert van Dalen (PA0DAL), Ed Newman (VK4JEN), Curt Mills (WE7U), Brian DeYoung (KE4HOR), Harry Bloomfield (M1BYT), Ulrich Stolz (DJ9XB), Johan Hansson (SM0TSC), Fred Reimers (KF9GX) of FAR Circuits, and Lara Garrabrant (KD6AYO). Thanks go to all these people for helping make TinyTrak all that it is

foxdalta….

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