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Overview

The ZL1CVD TSIP is a small LCD display used to report the status of a GPS devices compatible with the **T**rimble **S**tandard **I**nterface **P**rotocol (TSIP) and used in a wide variety of Trimble GPS receivers & compatible products. The display allows you to easily see the current status of devices like the Trimble Thunderbolt.

This ZL1CVD TSIP display is based on tbolt2lcd by Götz Romahn (http://www.g-romahn.de/tbolt2lcd/index.htm) & TSIP2LCD (http://lea.hamradio.si/~s56wix/gps/). It has been tested and works with:

- Trimble Thunderbolt

- Nortel NGTS50AA

- Nortel GPSTM

How It Works

When powered up, the display shows version information then attempts to read and interpret any TSIP data packets received on its serial port. It will display 'No comms...' until a valid data connection is made.

> *Note: This product only reads & interprets data on the serial port at 9600,8,N,1. By default many Trimble TSIP devices must be configured to send out TSIP packets with programs like TSIPMON.EXE, Lady Heather, Etc.*

Once a valid TSIP packet has been received, the 1st line of the 16 character display always shows the current time and how many satellites are connected. Line two then cycles through mode, status, activity & alarms as per the table.

Disciplining Mode	GPS Decoding Status	Disciplining Activity	Minor Alarms
DIS - Normal	GPS - Doing fix	Phase locking	! DAC near max !
DIS - Power up	GPS - No time..	OCXO warm up	! Ant - open !
DIS - A Holdover	GPS - ??Status??	Frquency locking	! Ant - short !
DIS - M Holdover	GPS - PDOP 2high	Placing PPS	! No sats !
DIS - Recovery	GPS - No sats!	Init Loop Filter	! Not disc Osc !
DIS - N/A	GPS – only 1 sat	Compensatg. OCXO	! Surveying...!
DIS - Disabled	GPS – only 2 sat	Discipl Inactive	! No Position !
	GPS – only 3 sat	??	! Leap sec pend!
	GPS - Sat error	Recovery loop	! In test mode !
	GPS - TRAIM rjct	Calibr > Voltage	! Position ?? !
			! EEPROM error !
			! Almanach err !
			! No PPS !

> *Note: A detailed description of these reports can be found in the Thunderbolt Book and other Trimble TSIP documentation available on the Trimble website.*
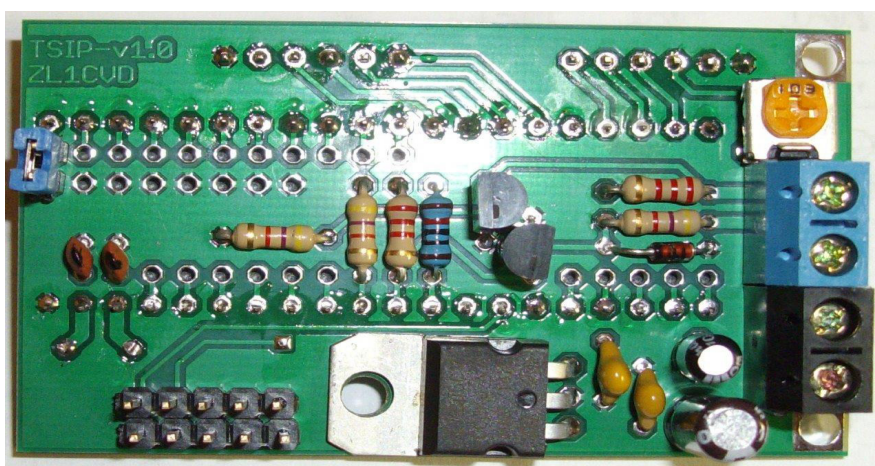
Time Format

Two time formats are supported in the firmware – UTC (Coordinated Universal Time) and DST (Central European Summer Time).

- A jumper fitted to PC0 selects DST & a 'S' is displayed at the end of the time.
- If no jumper is fitted to PC0, UTC is selected and 'U' is displayed at the end of the time.

Note: *If the line "#define TOW" is commented out in the source code then compiled and uploaded, the time format saved in Thunderbolt firmware will be used instead of UTC or DST. Please read the notes at the top of main.c for more details.*
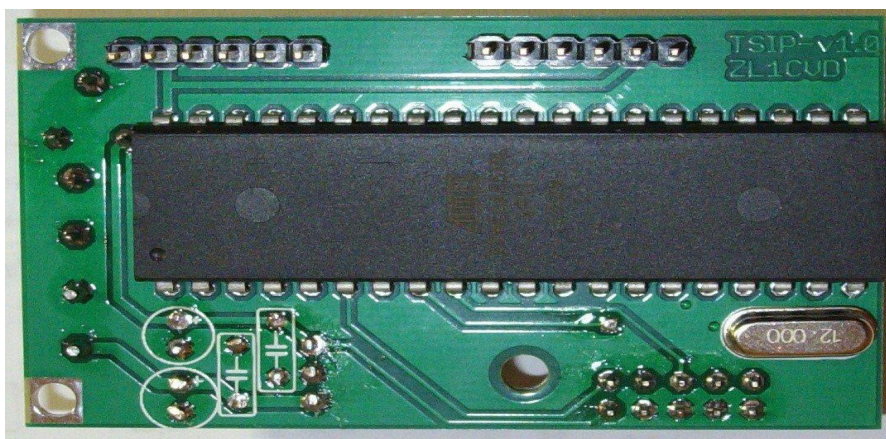
Kit Assembly

Assembly is strait forward. Take note of which parts are soldered on which side of the board and part orientation. Start by mounting and soldering all parts on the bottom first. Trim all leads close as practical. Then proceed to solder all top mounted parts. When soldering has been completed, clean the board with a suitable solvent like "CRC Lectra-clean". Please review the following pictures.

Bottom mounted parts

Note: *Cleaning removes flux and other residue which will improve board lifetime by ensuring good surface resistance and by preventing current leakage that could otherwise lead to failure at a later date. These boards have yet to be cleaned..*
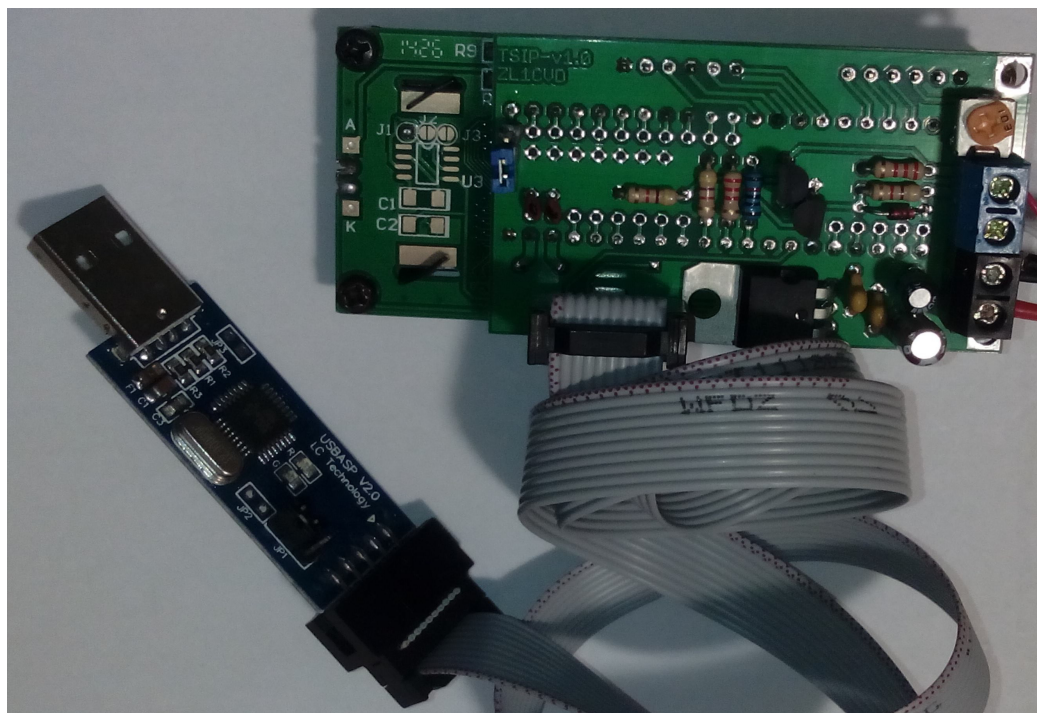

Top mounted parts

Note 1: *Power supply capacitors are are mounted on the bottom despite the silk-screen indicating otherwise. Make sure the polarity of the 2x electrolytic capacitors are correct.*
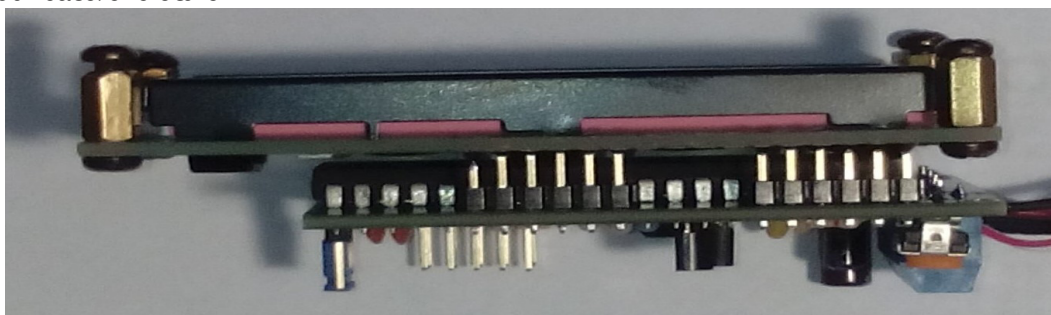
Programming & ICSP

The design supports In Circuit Serial Programming (ICSP). This enables you to easily program the microcontroller and reprogram it time and again should you wish to play with the included source code. It supports the standard USBASP AVR Programmer available on eBay and hobbyist outlets.

Mounting Hardware

The TSIP controller is mounted on the back of the LCD display. 4 x M3 8mm brass stand-offs are used to mount the display inside your case/enclosure.
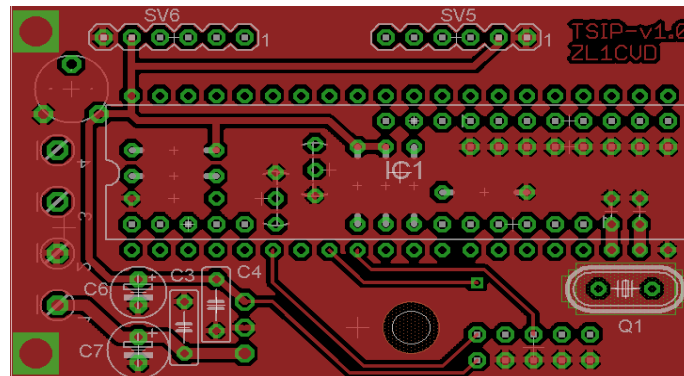
LCD Back-light & Contrast

The 16x2 LCD used has a back light rated for 5V. Some LCD's may need a voltage drop resistor inserted in series with LCD pin 15. Refer to the data sheet for the LCD you are using. The design could also be used with older displays that do not have a back light. In this instance, LCD pins 15 & 16 would not need to be connected. If you find the back-light is too bright, add a resistor in series with the backlight Anode (LCD pin 15). Experiment with values between 10 and 200 ohms. Contrast is set by the 10K pot and may need to be adjusted to see anything.
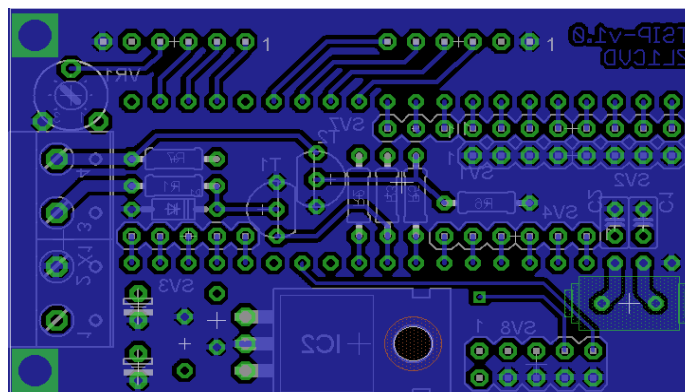
Technical Details

Specifications

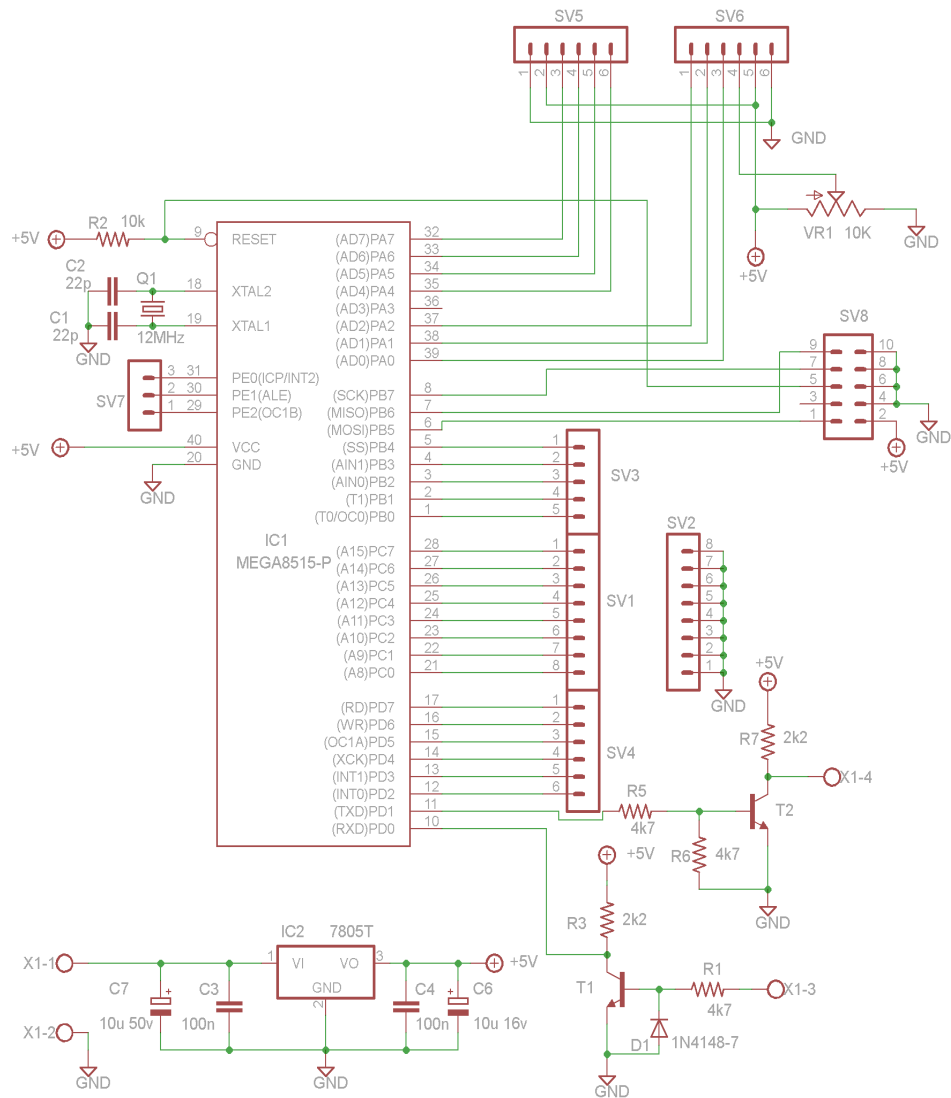|	
Operating Voltage:	7 to 24V
Operating Current:	About 125mA
Serial Port:	9600, 8, N, 1
TSIP Packets Decoded:	0x8f-ab, 0x8f-ac
Source code provided:	Yes (GNU License)
Development IDE:	WinAVR2010
In Circuit Serial Programming (ICSP):	Yes (firmware can be upgraded without removing chip)
Commercial Grade FR4 PCB:	Yes with plated through holes and silk-screen
Customisable Configuration:	Yes (all setting saved in EEPROM)
Dimensions (W x H):	Controller board only 62mm x 36mm Controller mounted on display 80mm x 36mm

Layout – Top Layer

Layout – Bottom Layer

Parts List

C1	22p	D1	1N4148
C2	22p	IC1	MEGA8515-P
C3	100n	IC2	7805T
C4	100n	Q1	12MHz
C6	10u 16v	T1	BC547A
C7	10u 50v	T2	BC547A
R1	4k7		
R2	10k		
R3	2k2		
R5	4k7		
R6	4k7		
R7	2k2		
VR1	10K		

Schematic

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