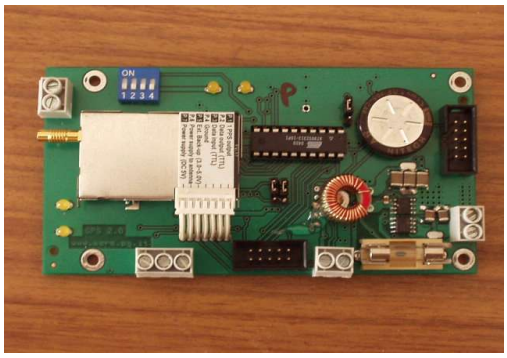
SEISMIC GPSDCF 02.10 board

Update of 10 April 2005 –
(preliminary)

Important notice

This device must be integrated in a computerized electronic system. Its engineering, setup and appliance of safety guideline of each country must be followed under the responsibility of who setup the board. European Community directives about Low Voltage equipment EMI and CE mark, or FCC regulation in other countries are under the responsibility of who setup the board in its final system. The manufacturer of this board produce it "as an electronic component". The manufacturer will be NO responsible of any damage or loss in money or life of the usage of this board conceived to be used and installed as a "electronic component" and to be engineered in electronic recording system.



Features

- 8 to 16V dc power supply
- 1W power consumption with active GPS module
- 300mW standby current
- PPS DCF77 encoded mode
- Simple PPS mode jumper selectable
- Power saving mode jumper selectable
- 5V 2A - Power supply with remote switch-off
- Internal or external GPS module
- Rising or Falling edge PPS signal jumper selectable
- Compact SMD design

Connections

- MMCX coaxial antenna connector
- 2 poles connector for power supply input
- 2 poles auxiliary power supply output
- 2 poles 5V 2A power supply output
- 2 poles connector for PPS pulse
- 5x2PII RS232 connector for GPS I/O with DB-9F connector

Overview

This is a circuit to convert the time signal of a GPS receiver in a coded pulses stream according with the DCF77 standard, the issued time can be UTC or Local Time according to the specifications requested at order. It and can be connected to a personal computer or to an external GPS receiver by a RS232 interface.
It is possible to use several operating modes. When the board is supplied as **standalone converter** it doesn't embeds a GPS module; in this case an external GPS source capable to generate NMEA sentences and a PPS signal over an RS232 interface must be provided. Jumper-switches allow to adjust the PPS polarity (rising edge or falling edge signals). When the board is supplied as a **receiver and converter** it doesn't accept the external data input but it generates by itself the NMEA strings and generates also a PPS signal. When an internal GPS module is used the generated PPS output has the highest accuracy (few nanoseconds of delay) if compared with the original GPS's PPS; the board is also equipped with an high efficiency step-down power supply capable to drive a 5V device with a load of up to 2A current.
A power saving mode is also available; it allow the reduction of the power consumption of the device down to few mA/h turning on and the GPS receiver only for 1/6 of the work time.
An auxiliary input is provided to shut-down the external 5V-2A dc output. When both the loads (GPS and external load) are off the step-down converter is switched off for a further reduction of the power consumption.
The unit can be also adjusted to provide a GPS syncronized square wave with 50% of duty cycle.

Installation of the board with an embedded GPS receiver

Connect the 9 poles cable to the connector J11 to a PC or the J1 connector (pulse signal) and its corresponding ground J2 to an SADCxx board to its DCF77 input (see the specification of the SADCxx board for details).

Connect the antenna cable adaptor to the MMCX coaxial connector and the GPS antenna to the corresponing BNC connector of the cable. Place the antenna under open sky or as near as possible to a window (even if in this condition the receiver could need a lot of time to track the enough satellites and have during signal lacks during the operation).

Even if the GPS could be equipped with a backup battery it may take several minutes before track the satellites. The GPS then will look for the first satellite available, download the almanac of satellites route and then will be able to track the other satellites and fix the position.

Warning! The receiver antenna is an active antenna, in the coaxial cable is present a 5V bias voltage; if the cable is damaged the receiver input stage could be permanently damaged too. Keep this in consideration if you need to apply a cable extension. Maximum 10 meters are allowed.

The circuit must be powered with a voltage of 9-16Vdc using the power connectors (J3 = +Vin and J4 = Ground). As soon is powered the circuit will show the operating by the monitoring led diodes. D5 will beging to flash with short pulses as soon the unit is powered.
As soon the enough satellite are tracked D6 will turn on and the D5 will show a DCF77 sequence. After the very next minute will begin also a DCF77 sequence will be emulated.

Installation of the board with an external GPS
In order to be able to drive correctly the GPSDCF board the external GPS must be programmed to issue both RMC and ZDA sentences one time per second. Furthermore the cable must bring the GPS generated PPS to the interface. A proper crossed cable is needed for this pourpose.
If present the internal GPS **must** be disconnected pulling out the strip white connector named J12 on the board layout.
The switches and jumpers must be proprely adjusted in order to receive the correct PPS polarity and signal from the external GPS. See the jumpers and switch description for details.

LED description

D5	Operating	Flashing when the controller receives the GGA string. It show that the GPS module is operative. It may flash at 5% of duty cycle, 10%, 20%, 50% depending on the condition of the receiver.
D6	Satellite fix ok	It is on during all time the GPS receive has enough satellite locked
D2	+5Vdc 2A	It is on when the +5Vdc 2A is enabled
D2	GPS Power	It is on when the internal GPS is powered

Switch and jumper summary

S1-1	OFF = normal operation	ON = GPS power saving
S1-2	OFF = PPS DCF77 modulated	ON = PPS 50% duty cycle.
S1-3	OFF = falling edge PPS polarity	ON = rising edge PPS polarity
S1-4	OFF = normal operation	ON = low input Vdc turn off 5V 2A output
SW1	1-2 = Normal PPS input	2-3 = Inverted PPS input
SW2	1-2 = Normal PPS output	2-3 = Inverted PPS output
SW3	1-2 = Internal GPS	2-3 = External GPS

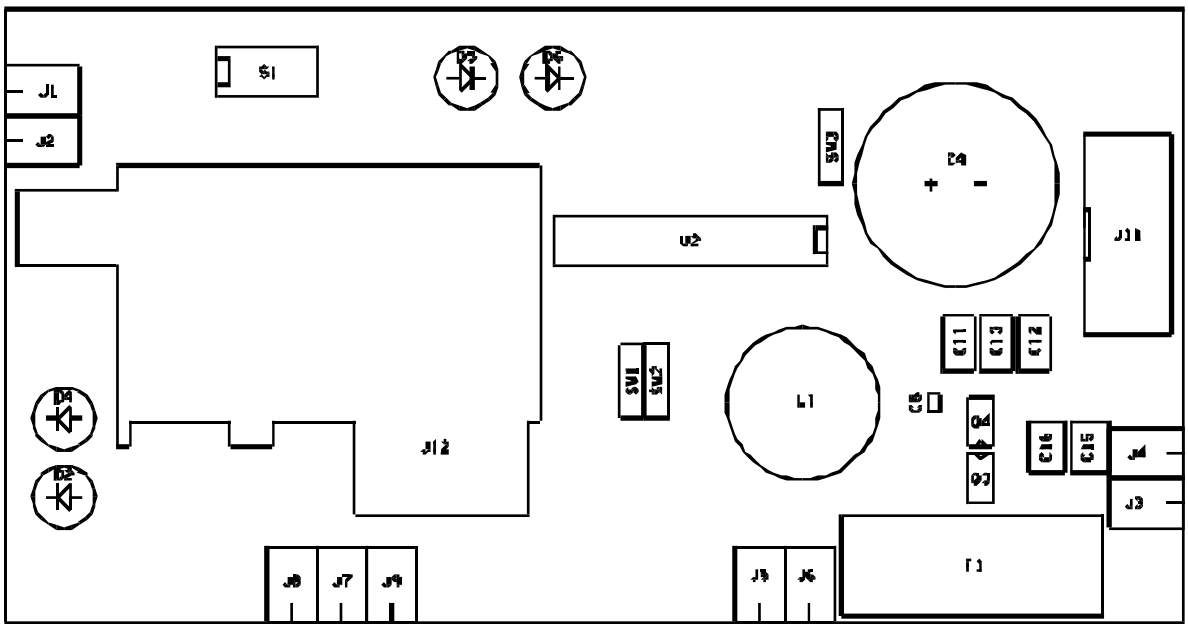
RS232 port description
The following pinout is referred to the DB9 connector interface provided with the unit.

1. Internal GPS PPS output
2. GPS TX signal either Internal or External
3. GPS RX signal either Internal or External
4. nc
5. GROUND
6. nc
7. nc
8. nc
9. External GPS PPS input

To connect this connector to a PC you can use a pin-to-pin 9 pins male/female straight cable. To connect the board to an external GPS unit you have to make-up the proper cable according to the RS232 specification of the GPS to be connected.

Components and connector layout

J1 PPS/DCF77 NPN - Open collector output, 5mA max load (external circuit must provide a 20K pull-up resistor)
J2 Ground
J3 +Vin (9-16Vdc)
J4 Ground
J8 Auxiliary 5V enable/disable open=5Vdc output enabled, closed to ground=5Vdc output disabled
J7 +5Vdc 2A max load switchable output
J9 Ground
J5 +Vout (voltage depending from the J3 input) this output is fuse protected by F1
J6 Ground
F1 Fuse 1A



Internal Standard GPS features