Motor: SunTracer
Model: CBL (charger)
Firmware version: H3.7
Date: 26. Aug. 2009

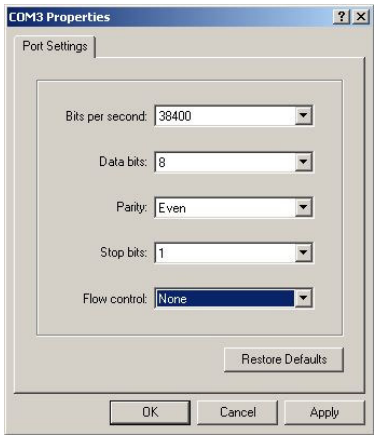
History in changes

- Important update: When motor moves a heavy load (panel), some negative impuses appear due to elastic property of gears. It looks like some shift at the end of a day. This update correct it.

Menu commands

- **Communication setting**
- Use a computer that has an asynchronous serial transfer port with a 9-pin male connector, type »DB9-M«. With some newer computers that do not have this port you can use the USB port in combination with an appropriate USB ⇒ RS232 converter, which serves as a virtual serial port.
- Connect the enclosed serial cable to the serial port on your PC.
- Operating systems usually already contain the software for terminal work. As an example we are stating the operating system Windows XP and its terminal program »Hyper Terminal«, which we recommend. One of the ways to access this program is through the command shell (START ⇒ RUN ⇒ »hypertrm« ⇒ OK).

- In the program window choose File ⇒ Properties and then choose the port you are using (COM1, COM2, etc.). Click on the settings and set the communication parameters according to the following figure:



- Port settings: Bits per second: **38400**, Data bits: **8**, Parity: **Even**, Stop bits: **1**, Flow control: **None**
- On the screen a menu appears which is sent by the motor with all the current values, as shown in the following figure.

- By using the keyboard you can also change these settings. For a more detailed description of individual settings read the explanations in the continuation.

- ATTENTION!! Changing the values will influence the motor operation. Incorrect operation can destroy the motor, the solar cell, the battery or even the load. Therefore, do not change the values if you do not know what you are changing!

- **Voltages and currents**

  The first and the second row are meant for monitoring panel and battery voltage and all necessary currents: "Isol" is current from solar panel, "Ibat" is charging current to the battery and "Iload" is current to the load. As values are read-only, user can not change them

- **Voltage drop on the cables**

  Each connection cable has a resistance, which means energy loss. Usually, such a cable diameter and length are chosen that the losses are negligible. The motor operation does not depend on losses on cables (if you do not overdo it, of course); the only exception is the accuracy of measuring the state of the battery. Therefore, the resistance of the connecting cable between the motor and the battery can be measured and set.
  Resistance is set in the menu:

  - **rwire=xxxx** (+ the Enter key) , where xxxx is resistance in miliohms

  (example: rwire=200 + the Enter key**,** means 200mΩ or 0,2Ω **)**

  Thus, the measurement error on the cable will be taken into account with the upper limit of charging. In this way the motor will virtually measure the value on the battery clips themselves. Thus, the measuring is accurate.

- **Charging hysteresis**

  The motor contains an electronically controlled charging circuit, which ensures that the battery stays in the charged state. However, it must not overcharge or discharge it too much, so that it does not break down. To achieve this two limits of the battery itself are important, which form the charging hysteresis: the upper and the lower charging limits.
  When the battery reaches the upper voltage limit, it means that it is charged. Therefore, the circuit stops the charging and in this way protects the battery from overcharging - breakdown.
  If the voltage of the battery falls under the lower limit, the circuit turns on the charging. The circuit stays turned on even if the battery is still discharging (a too big load or insufficient solar energy).
  The value of both limits is set in the menu:

  - **upch=xx,x** (+ the Enter key) for upper hystersis value, where xx,x means voltage.
  - **dnch=xx,x** (+ the Enter key) for lower hystersis value, where xx,x means voltage.

  (example: upch=13,5 **or** upch=24,6 **or** dnch=11,4 + the Enter key**)**

  The charging circuit is dimensioned up to the current of 10A.

- **Load hysteresis**

  This part of the circuit turns the load on or off according to the state of energy in the battery. There is no reason for the load not to be turned on if there is enough energy. However, if there is not enough solar energy for the needs of the load, the load will use the energy from the battery and empty it in this way. In order for the battery not to get too discharged, the described part of the circuit disconnects the load and prevents the harmful discharge.
  The limit is set in the menu:

  - **dnld=xx,x** (+ the Enter key), where xx,x means voltage.

  Reconnection of the load makes sense at a somewhat higher voltage, when the battery is at least a little charged.
  The limit is set in the menu:

  - **upld=xx,x** (+ the Enter key), where xx,x means voltage.

  (example: dnld=10,5 **or** dnld=20,6 **or** upld=12,4 + the Enter key**)**

  The load circuit is dimensioned up to the current of 10A.

- **Clock setting**

  Unless you have set the clock as described in section K (Synchronization to the solar time), you can set it by directly entering a time from 00:00 to 23:59. After typing the time in (confirmed with the Enter key), the currenct time is changed immediately. Use the following command:

  • **time=xx:xx** (+ the Enter key) to set solar mean time for your longitude (not for your time zone!!)

  (example: **time=11:55** or **time=08:05** or **time=16:25** + the Enter key)

  How to get mean solar time exact for your longitude? MeanTime = GMT + (YourLongitude * 4)

  (**example**: if you are living in New York, your longitude is -72, so 4*(-72)= -288 minutes (4h and 48minutes after Greenwich time. If Greenwich is at noon 12:00, your solar mean time is 12:00+(-288 minutes) = 7:12)

- **Turning internal clock on/off**

  • **auto** (+ the Enter key) turns on/off the control of tracking according to the internal clock.

  en – control according to the internal clock is enabled
  dis – control according to the internal clock is disabled

  When the internal clock is disabled, the motor will not turn automatically. In this mode, the motor can be turned using the "ha" command (see the following section).

- **Date setting**

  Date is used for correction due to Sun's variable velocity. Thise correction is explainted in "equation of time" and is shift between real and mean solar time. Use the following command:

  • **day=xx** (+ the Enter key) to set a day and
  • **month=xx** (+ the Enter key) to set a month.

  (examples: **day=05**, **day=25, month=01** + the Enter key)

- **Motor turning according to the hour angle**

  To turn the motor according to the hour angle, enter the following string in the menu window:

  • **ha=xx,xe** or **ha=xx,xw** (+ the Enter key). Hour angle is expressed in angular degrees.

  Enter the angle in degrees, zero degrees for the solar noon. The range is from 00.0 to 50.0 degrees for each direction. The motor will not respond to an incorrect entry. This command does not operate if the internal clock is enabled. The current direction is shown in the menu.

- **Motor operation for the southern hemisphere**

  The motor is factory-set for operation in the northern hemisphere. In the southern hemisphere the motor is facing the North and the movement directions east-west are exactly opposite. Therefore, it has a setting where the direction of turning for the southern (or northern) hemisphere is set.
  To change the hemisphere, type in:

  • **hemi** (+ the Enter key); this command changes the setting of the hemipshere, depending on where the motor is installed.

  The current setting is shown on the menu. Upon each command entry, the setting toggles between northern - southern - northern – etc.).

- **Selecting the turning interval**

  The command:

  • **int** (+ the Enter key) is used to change the automatic turning time interval.

  It denotes how frequently the internal clock will change the motor position. The following options are available: 1, 2, 3, 4, 5, 10 and 15 minutes. Upon each entry the cycle is changed. The factory setting is 5 minutes.

- **Other values**

  There are also some internal helpful values, meant **only** for monitoring. Value DY means "day of year", EOT means time shift (in minutes) between mean and sidereal solar time (see "equation of time"). P and D are current position and destination both in pulses. OV warns you if you are using too high voltage to supply the motor (42VDC is maximum).

- **Motor upgrade**

  The control electronics (firmware) in the motor can be upgraded through communication via PC. Make sure you always have the latest version.
  Further instructions and program can be found at www.solar-motors.com.

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