Suntrack Advanced Manual

Custom hardware

Version for software 4.00 and up.

Heliostaat.nl
Mark Ursum

Version	Date	remark
1.0	28-2-2012	Initial version
1.1	20-7-2013	Info on Huafang

Advanced Manual

Introduction.

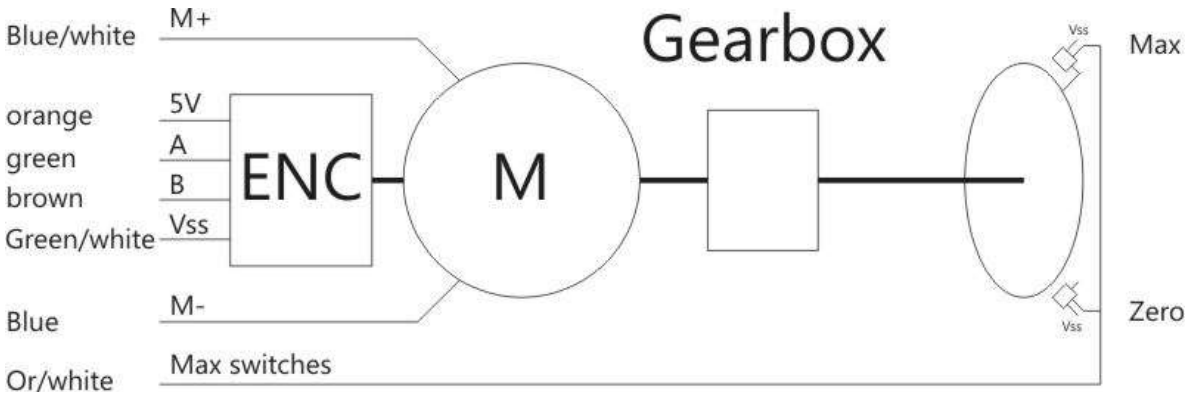
This document is for user using their own motors and encoders.

Description

This manual is for software version 4.00 and higher. What is new: The system time is always UTC so no more time zones. Also new is the command line interpreter.
The suntrack controller is standard configured for a SG2100A motor. The motor parameters can be changed for any type of motor 12 or 24 volt with incremental encoder. Users can change the step/decrees, offset and minimum pwm value.

Hardware connections

The CAT5 cable is connected to the motors, encoder and endswitches. *Mind the blue blue-white motor wires, they use 12volt or 24 volt and short circuit these to the other wires can destroy the microprocessor.*



Connection of Huafang Slewing drive motor SE3C-62-R-24E005

Terminal	Define	Wire
1	Motor-	Blue
2	Motor+	Blue/White
3	Ground	Green/White
4	Hall+	Orange
5	Hall A	Green
6	Hall B	Brown
E	Shield	Shield
-	Limit switch vs Ground	Orange/White
-	Not connected	Brown/White

Connector: AMPHENOL - C016 30F006 100 10 Farnell: 118-8960

The incremental encoder

The incremental encoder is a 5 volt type. It has 2 hall magnet sensors mounted at 90º relative to each other. These A and B signals are out of phase so the microprocessor can measure the movement and direction of the motor. The encoder is where it is all about in the suntrack system. The calculations are in a range of 0.01º so the resolution of the encoder has to be high, at least 30 pulses per decrees.

Steps per Decree

Calculate the number of steps per degree. Determine the final gearbox drive from the axle of encoder to the outgoing axle. For example a slewing drive motor with 1:62 and gearbox of 1:468 makes a final drive of 62 x 468 = 29016 so the AB encoder makes 29016 revolutions to turn the outgoing axle 360º. The steps per decree is 29016 / 360 = 80.6 The encoders gives 2 counts per revolution. 2 x 80.6 = 161.2 Since you cannot enter a dot enter the value in 10x So enter:

steps 1612

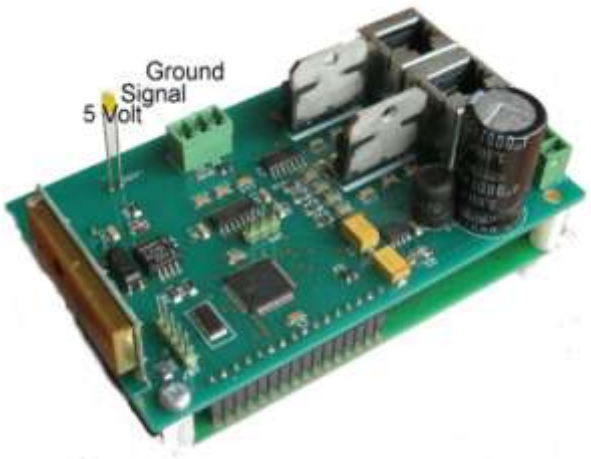
Endswitches

The end switches *Zero* and *Max* are normally open and connected parallel.In the original SG2100 it is only one switch and a tab triggers both the begin and end. The *Zero* is used for recalibration and the *Max* is used to learn the controller the maximum value. In normal use the software limits the values 1º from the endpoints so it never touches the real switch. Use a micro switch or a Inductive Proximity Sensor with NPN output.

Windsensor

The optional windsensor can be connected to the DCF connector.

- Simple pulse contact windmill is connected between *ground* and *signal*.
- Hal sensor windmill can be connected 1:1 to the 5V, signal and ground.



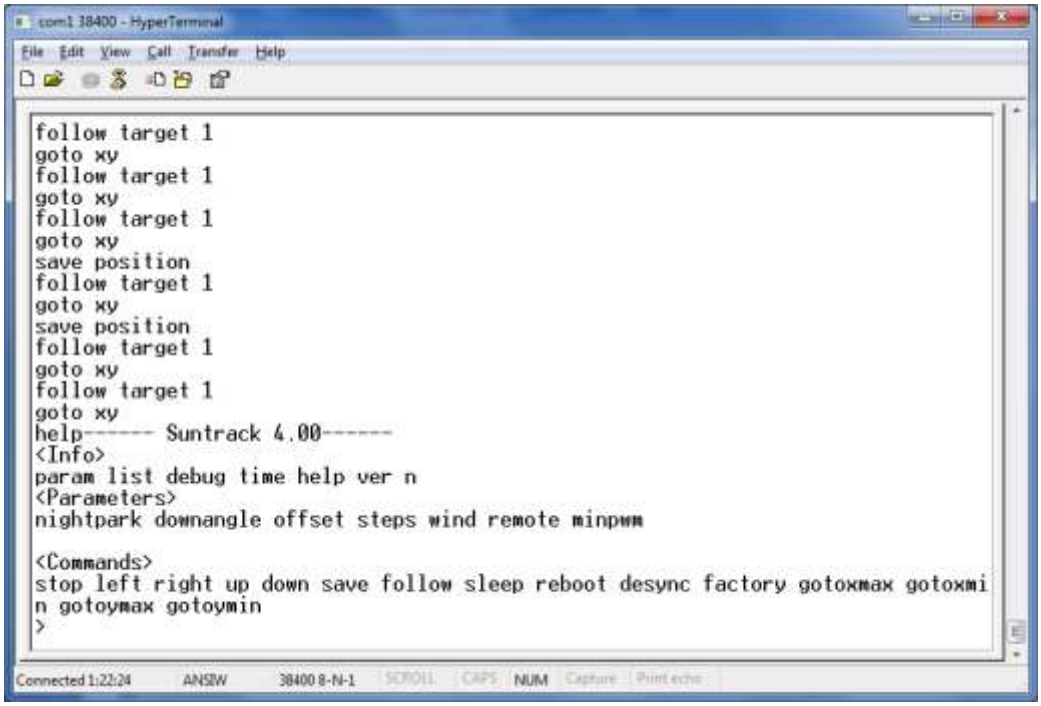
The wind pulses are counted for 1 minute and if the value is higher than parameter *wind* the system goes to mode off and brings the mirror to position park.

Connection to PC

When powering up the suntrack controller it shows: *Wait for GPS sync* Once the GPS signal is received remove the connector of the DCF/ GPS external receiver. Connect the 1:1 serial cable to your computers RS232 port or USB-RS232 port. Use the windows standard HyperTerminal and make a connection: 38400 baud, 8 bits, no parity, no flow control.

View configuration

When a connection is made the controller you can enter commands, like help and *param* This is a screen of the command *help* which shows the status of the system.



The following commands are available for information:

Command	Explanation
param	Show parameters
list	List targets
time	UTC time and date
debug	Debug information, used for development
ver	Shows the software version
help	List of all commands

The following commands are available parameters:

Command	Parameter	Explanation
nightpark	0 or 1	Night parking, if the mirror goes to park postion when sun<sundownangle
downangle	0..90	The angle of the sun when the mirror goes to parkposition
offset	1..100	Offset difference between real and calculated value
steps	1.10K	Encoder steps/decrees. Enter steps per 10º
wind	10..60K	Maximum wind, pulses per 60 seconds
remote	0..15	Change remote control 0..15 = A..P
minpwm	0..264	Minimum motor pwm from The dc motor will not work below a certain voltage. 0-264 = 0-100% pwm

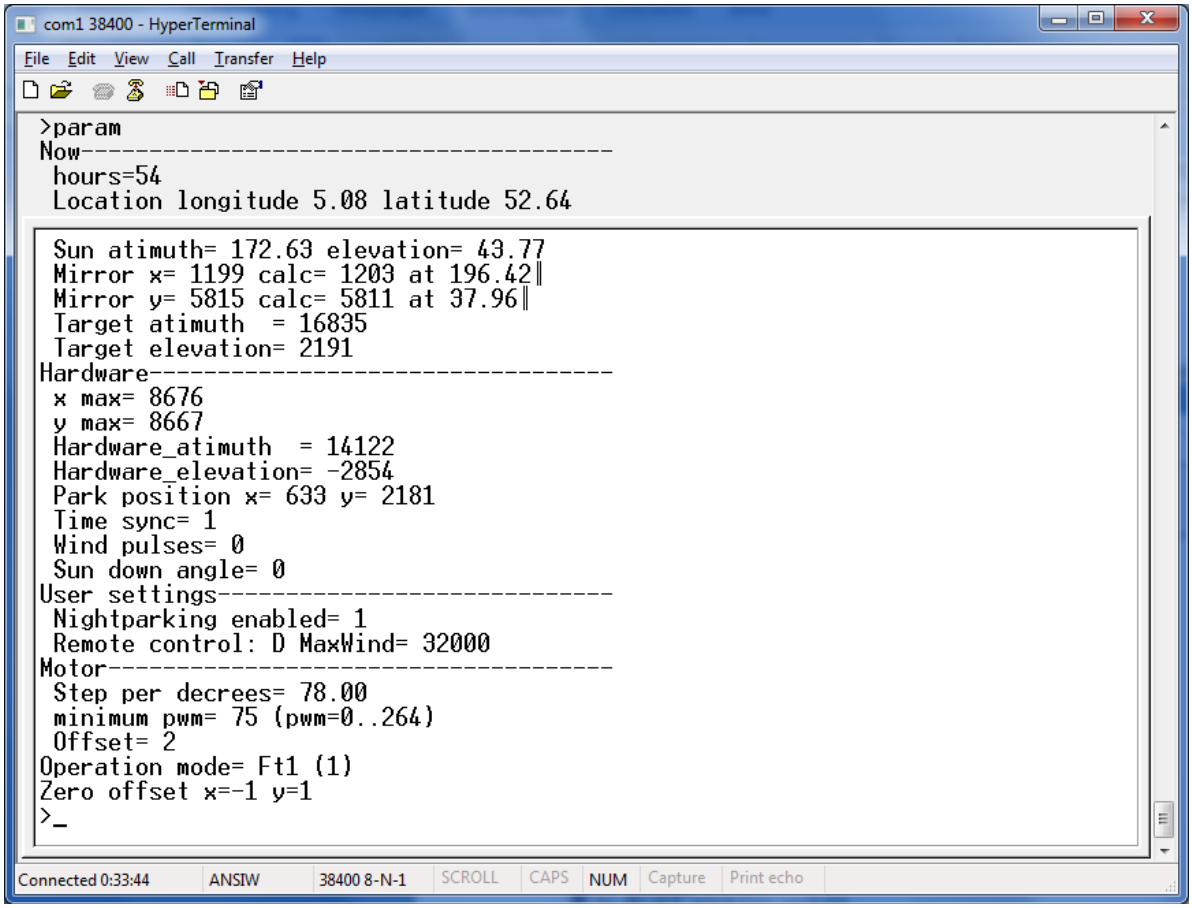
Note: all user changeable values are stored in nonvolatile memory.

The following commands are available for control:

Command	parameter	Explanation
stop		Stop motors
left	0-	Move mirror x steps left
right	0-	Move mirror x steps right
up	0-	Move mirror x steps up
down	0-	Move mirror x steps down
save	1..5	Save this postion as target 1..3. 4= parkingposition. 5= sunposition
follow	1..5	Follow target 1..3. 5= follow sun
sleep		Turn off system and goto park position
reboot		Reboot system
desync		De-sync time, force a synchronization
factory		Factory setting, load the settings of the standard SG2100 motor remote control=D
gotoxmin		Goto hardware zero, recalibration of the encoder value
gotoxmax		Learn the maximum value
gotoymin		Goto hardware zero, recalibration of the encoder value
gotoymax		Learn the maximum value

Parameters

The command *param* shows the actual parameters:



Explanation of the parameter screen:

Item	Explanation
hours	Operating hours in follow mode
Location Longitude latitude	Your GPS location
Sun atimuth elevation	Calculated sun position
Mirror X and Y	Current location of the mirror
Target	Target position in steps
X and y max	The maximum values where the mirror can move.
Hardware	The calibration values of the hardware, found by calibration the sun position.
Park position	Park pos. in pulses
Time sync	1 if new time came from GPS or DCF last 24h
Wind pulses	Total wind pulses during this running minute
Sun down angle	Under this angle the mirror will goto park postion
Nightparking	If 1 the system will park if sun < sundown angle
Further..	All user parameters.

Getting started

Power up the suntrack controller. Connect the GPS receiver and wait for a fix. Disconnect the GPS and connect to pc's HyperTerminal or Terraterm or Realterm. Check your parameters with *param* and customize them for you hardware.
Once the parameters are correct for your hardware some checks:

- Press x-zero, the mirror has to turn anti clockwise, if not change the motor wires.
- When the message HAL occurs the A and B signals of the encoder has to be changed.
- When the motors do not stop running the A and B signals might be wrong.
- Press y-zero, the mirror has to run toward the ground, if not change the motor wires.

Test if the pulses per decrees are correct. Look at the parameters *param* at the line:

Mirror x= 1019 calc= 1020 at 87.41º

So the controller thinks the mirror is in real world at 87.41º now move the horizontal motor 90º for real and measure the angle. Check if the software also moved 90º.
Ask the parameters again if it shows if 87.41+90 so

Mirror x= 2319 calc= 2320 at 177.41º

Now you can continue with the installation manual.