

# **AHP® GT1-GT2 Motor Controllers Manual and Usage Guide**

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## **GT1-GT2 specifications**

The GT1 and the GT2 are stepper motor controllers with goto functionality compatible on all types of telescope mounts, being able to set the number of steps per worm and axis revolution. The precision of 64 microsteps allows precise goto and sidereal tracking. Being compatible with the Synta protocol, you can drive it with a Synscan handset or with EQMOD directly, on Windows and on Linux. It is also compatible with any type of motor and it is capable to supply up to 1A of current for each winding. You can also wire the connected steppers in any way and setup the pinout combination from the configuration utility without having to resolder the connection wires.

It is equipped with these inputs / outputs:

1. Synscan-compatible handset Input/Output
2. ST4 auto guider input
3. Stepper output for Right Ascension
4. Stepper output for Declination
5. 12v power supply input

## The microstepping function

When tracking in sidereal speed, and when moving at fine speed the mounting, the controller enters microstepping mode. Microstepping mode is an operational mode that permits to subdivide the single steps in 256 microsteps. The total number of steps is then much higher and a greater resolution is possible.

## The ST-4 or GPIO port

The GT1 and the GT2 are equipped with an ST-4 autoguider port, which can be customized for specific functionalities like incremental encoder readings or to drive leds or other peripherals. When updating the firmware, or when configuring the device, you can choose how to use the GPIO port, if you desire the default ST-4 function, or to change its function, or else to not use it at all. See Figure 1.

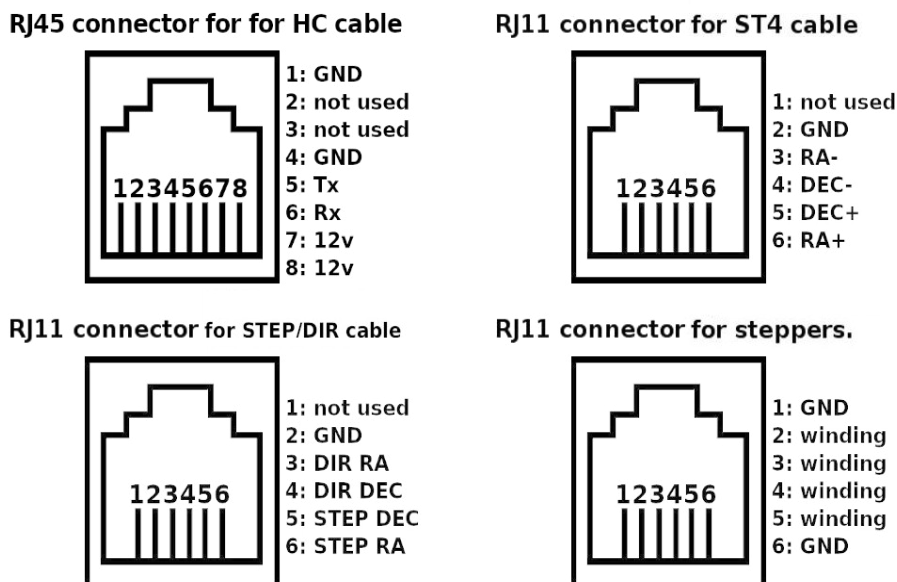


Figure 1: The pinout of the GT1 connectors

## **The connection to motors or actuators**

The GT1 and the GT2 are capable to supply 1A on 8 different lanes. Usually these outputs are used for stepping motors as in the default configuration, but we don't exclude future improvements or configurations for different usage/motor or load types. The default configuration permits to connect and drive two stepper motors ranging from 12 to 15 volts supply. The configuration utility permits connecting the windings in any order and a single parameter or setting permits their correct usage and direction.

## **The communication port**

The GT1 and the GT2 communicate with the driving PC application or the SynScan® controller through the Communication port (or HC port). The communication happens using a standard RS232 protocol running at 9600bps, one stop bit, no parity, no flow control.

If the user prefers to not use a SynScan® controller, then there is the chance to simulate its protocol and drive the GT1 and the GT2 controllers from a Personal Computer or an SBC box. The GT1 and GT2 are compatible with EQAscom, Green Swamp Server and INDI EQMod drivers for ASCOM and INDI platforms respectively. It is not an aim of this document to specify the characteristics of these software neither to explain the features of the SynScan protocol.

## The configuration utility

AHP offers a configuration utility for the GT controllers. With this utility you can update the firmware of your GT controller, you can configure it to best fit into your mount configuration and test your settings in realtime.

### Firmware configuration

The Firmware of the GT controller permits various configurations of gear ratios, maximum speed allowed, acceleration and microstepping maximum speed. These settings can be changed and saved into the internal memory of the GT controller using the configuration software. Illustration 2 shows the graphical layout of the configuration utility.

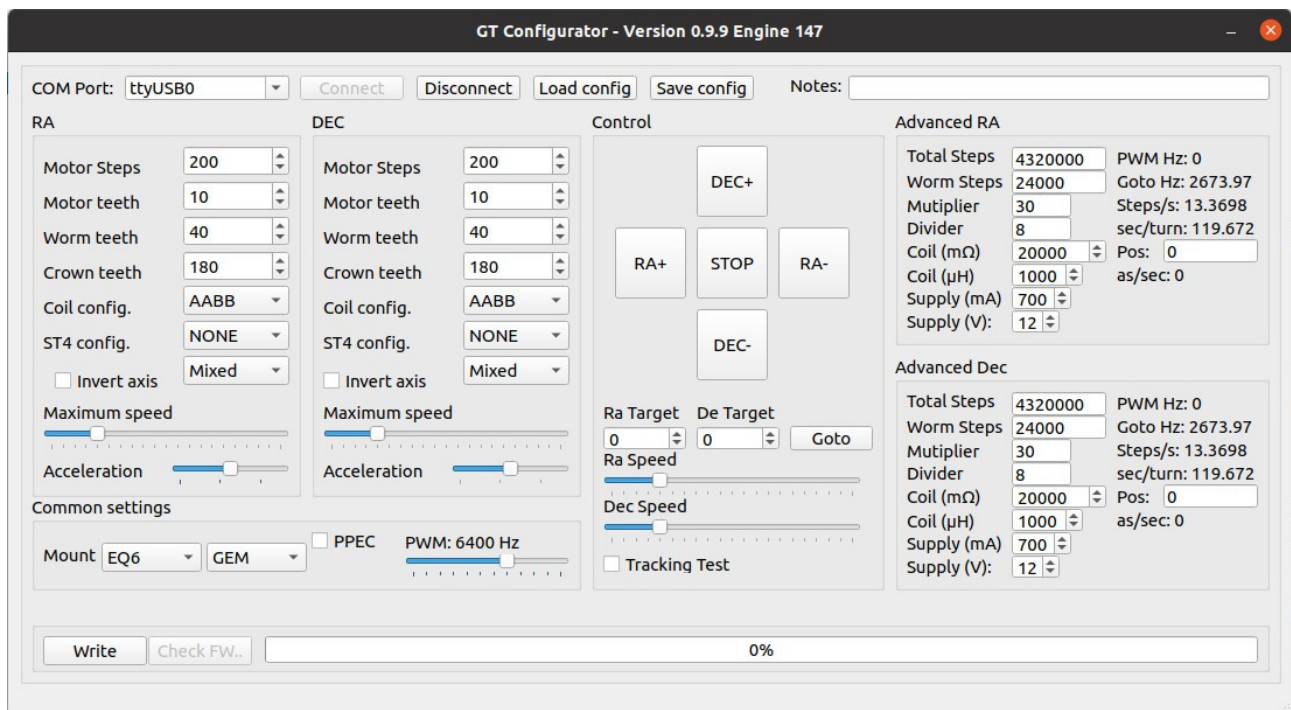


Figure 2: The configuration utility

## Calculation of gear ratios

Gear ratios are calculated using as base unit the gear teeth. Generally telescope mounts use a crown/worm gear configuration, most of the times they are equipped with a gear reduction on the motor to the worm.

The GT configurator reads the controller or the SkyWatcher motor control board parameters and presets the gear ratio fields after the first connection.

Stepper motors are positional motors, having a number of steps to complete a 360 degrees turn. The useful fields on the configuration utility to setup a correct gear ratio are:

- Motor steps: number of steps of the stepper motors to complete a 360 degrees turn
- Motor teeth: number of teeth of the gear at the motor
- Worm teeth: number of teeth of the gear at the worm gear
- Crown teeth: number of teeth of the crown gear.

The parameter “Motor Teeth”, divided by “Worm Teeth” gives the reduction ratio of the motor to the worm gear. While the “Worm Teeth” divided by “Crown Teeth” can be the reduction ratio of worm to the crown. These values can also be used in belts and pulley configurations. The microsteps are calculated automatically by the configuration utility and cannot be altered.

## **Coil config**

With the coil configuration setting you may choose a different wiring configuration of the stepper motors attached to the GT1. Keep in mind that this wiring can work on 6p4c RJ11 wires in bipolar winding mode.

There are three configurations:

- **AABB:** A winding on the first and second wire, B winding on the third and fourth wire.
- **ABAB:** A winding on the first and third wire, B winding on the second and fourth wire.
- **ABBA:** A winding on the first and fourth wire, B winding on the second and third wire.

## **ST4 config**

This setting can let you choose the GPIO mode of your autoguiding port:

- **NONE:** Autoguiding port not used at all
- **ST4:** ST-4 camera or autoguider connected to the autoguiding port
- **DRIVER:** DIR/STEP power driver attached to the autoguiding port, this mode lets you connect your GT controller to more powerful devices and motors.

## **Stepping mode**

The stepping mode control permits you to choose how to drive your stepping motors in microstepping, half-step or mixed mode (half-step goto and fast slewing, microstepping in tracking and low speed slew).



## **Invert axis**

This setting, if checked, inverts the forward direction of the selected axis.

## **Maximum speed**

This setting limits the maximum slew and goto rate to a multiplication of the sidereal rate, calculated by the crown/reduction ratio value.

## **Acceleration**

This setting limits the acceleration angle of the GT1 to reach the maximum speed. The higher its value, the shortest time will be taken to reach the maximum speed.

## **Common settings**

### **Mount type**

The setting “Mount type” settings is useful when one uses the SynScan® handset to drive the mount, in case you’re using an EQ mount, the SynScan® handset automatically reads this information and changes its configuration to best fit on your setup. You can use different kinds of mounts, ranging from classical equatorial mounts to AZ-EQ mounts to Alt-Azimuth mountings.

## **PEC**

The GT controllers offers the PPEC (Periodic Error Correction). This setting will permit to the SynScan handset and other desktop software to set the error correction during tracking. The GT1 saves this setting in-memory and the next time you start the GT1 it will read the saved setting.

## **PWM Frequency**

This setting changes the PWM frequency of the microstepping routine. During tracking the torque increases among with the PWM frequency although it's more noisy.

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## **Configuration files**

Each time you want to update the configuration of your GT controller, you must click on the “Write” button, and you can save your current settings into a configuration file by clicking on the “save config” button. You may later load your file or share with others different configurations.

## **Maximum speed vs. gear ratio**

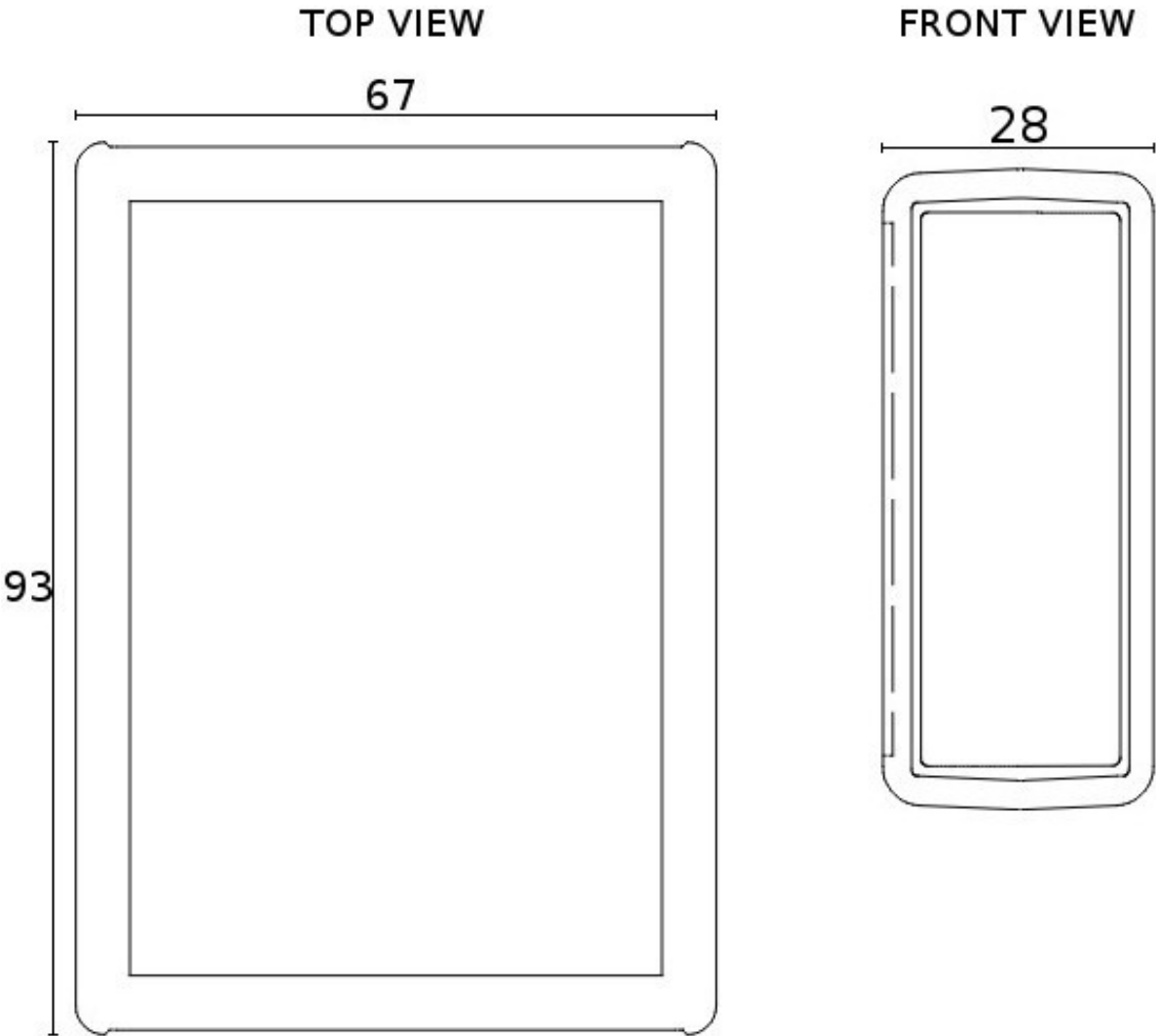
Pay much attention when setting a high maximum speed, especially when the gear ratio is very high. Some stepper motors cannot handle high speeds and can stall when the driving frequency is very high for them. Usually the configuration utility shows a maximum speed and auto-calculate it based on the gear ratios, but a high speed can not be handled well by the motors.

## **Damage & security prescriptions**

During tests of your configurations please keep much attention to the safety of objects, persons and animals, don't let the devices in places accessible by children and electrical parts must be away from too wet ambients. If you use big or heavy instrumentation, please test at the lower speed possible, and let all testing area free from objects that can block or damage or be damaged to/by the instrument driven by the GT controller. AHP® team declares itself and its employers not responsible by usage of its peripherals and devices without the right care.

# Dimensions

All dmensions are in mm.



For more informations, please visit:

<https://www.iliaplatone.com>

GT controllers official page:

<https://www.iliaplatone.com/controllers-drivers>

EQMod home page:

<http://eq-mod.sourceforge.net>

GSS home page:

<https://greenswamp.org/>

INDI Library home page:

<http://indilib.org>

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