

Setting up Navi GT31 for speed sailing by Tom Chalko

GT31 firmware available from this website is a firmware with **extended features**, tested by Locosys, myself and other people, developed to maximize the enjoyment of using GT31 in sport. These features include Speed Genie, compact binary file formats, bio-feedback, [SDOP](#) and nice screen font, among others. Please report any strange firmware behavior [here](#) to assist progress.



A. Choosing SD card. Some brands/sizes of SD cards may not be compatible with GT31. Check the readme.txt file associated with firmware updates to see which cards you should avoid and which cards were found to work fine. Make the test described in section C1d. **B. Firmware Upgrade**

Attention: the firmware upgrade procedure has changed to become compatible with all firmware versions (V1.2 V1.3 and V1.4) that are currently in use. New upgrade procedure is **faster** and **safer** for your GT31 than the procedure previously published on this website.

Before you begin your GT31 firmware upgrade, you need to identify which "V" version of the firmware is installed in your GT31. There are V1.2, V1.3 and V1.4 versions in use. Since Locosys no longer maintains V1.2, it is not provided here.

All V1.2 V1.3 and V1.4 varieties of GT31 firmware provide exactly the same GPS-Doppler speed accuracy and performance, because they use exactly the same code and parameters for the SiRF3 GPS-engine inside GT31 (published [here](#)). Firmware versions downloaded from this website after V1.2B1405 (after 14 May 2009) provide [SDOP](#) data that is required for error-margin computations and Speed Records. Later versions include bug fixes and various User Interface improvements. Please read README file associated (and zipped) with a version to discover what changes were made in respect to previous versions.

The difference between V1.4 and V1.3 are a) different power-up boot kernel and b) different memory range for Data Logger. For this reason 2-file update is needed when upgrading to V1.4 from lower V versions. All new GT31s have V1.4 installed by default. Locosys states that "eventually" all GT31 units should have V1.4. Locosys also says that there is no need to upgrade to V1.4 if version that you currently use satisfies your needs.

0. Download the GT31 firmware:

GT31 V1.3: [GT31_FW_V1.3B1123T.ZIP](#)

GT31 V1.4: [GT31_FW_V1.4B0315T_WSF.ZIP](#)

GT32 (new twin-GT31) **V1.4:** [GT31_FW_V1.4D0428T.ZIP](#) (works on plain GT31 too)

GT32 are GT31 instruments that contain extra hardware module. This extra module comprises an additional GT31 gps-engine + 3 accelerometers operating at 50Hz + thermometer. So, **GT32** has two independent GT31 gps engines and 3-accelerometers logging to SD card. It is aimed for people who carry multiple GT31 units in their effort to improve speed measurement accuracy. **GT32** is cheaper, more compact and more accurate (providing better repeatability and reproducibility) than two GT31 instruments.

1. After you downloaded the appropriate ZIP file above, you need to "unzip" the content. The file with

extension *.s is the firmware. V1.4 firmware has two *.s files, one firmware file and a GT31boot file. After unzipping, please read README and UPDATE-INSTRUCTIONS files

2. Install **GT31Updater V0.71 or higher** software, if not already installed (it is included in zip archive)
3. Install **USB-serial driver from GT31 CD**, if not already installed. The driver is necessary to communicate with GT31.
4. Clear GT31 Data Logger (DATA LOGGER>CLEAR>YES)
5. Turn your GT31 OFF
6. Remove the SD card and find a tiny sliding switch "inside the card slot" on the pcb, on "display side" of the card slot. The switch has a black lever and metallic body. The default position of the switch lever is labelled in white on pcb.
7. slide the switch lever using a match or a similar object away from the white mark
8. As a precaution, exit all Windows applications and disconnect from Internet. Run **GT31Updater V0.71** (or later). **Select the correct COM port** from the pop-up menu and choose **"INTERNAL"** mode. Then use "browse" function to select and load 2 files that you unzipped in step 1, one at a time:
 - a) V31BOOT_V4D.s (you only need to update this when upgrading to V1.4 from lower V versions)
 - b) V1.4 firmware

It may be necessary to quit and re-start GT31 Upgrader V0.71 after the first file update.

9. when Updater finishes, disconnect GT31 from USB cable, move the switch lever to its normal position, labelled white on pcb. Your GT31 should be ready to use. Power in ON, go to Settings and select Version. You should see the Version Number corresponding to the name of the file in step 1 and 8b.



Prototype of fully waterproof case for GT31/GT32. The case has wide angle of view and 2 straps. When you use Speed Genie there is no need to push any buttons when you measure your average speeds. Turning on/off and basic manual operation is done using a magnet. Charging and access to SD card requires disassembling the case using a screwdriver.

C . GT31 Settings

There are 2 methods of setting-up Settings in GT31:

- **manual**: using buttons in GT31 itself
- **using NavilinkII** : this method enables you to backup/share/restore complete set of GT31 settings. [Download my settings file](#) and use NavilinkII>Settings>Write function to load this setting file to your GT31. This setting file works for V1.3 and V1.4 firmware listed above.

Setting up GT31 manually

1. MEMORY CARD

- a. **LOG SWITCH** should be ON-FIX. There is no point to log any data when there is no position fix.
- b. **NMEA ITEMS** should be set to "SBN 1 SEC", which is default for all "extended features" firmware downloaded from this website. If you want the most complete data set from your sailing session, use SBN

(binary) format logging.

c. MIN SPEED should be set somewhere between 2 and 5, unless you are specifically interested to log data when you are stationary.

d. FORMAT CARD. Read readme.txt file to find which cards are compatible with G31. Format the card a few times in a row. If you succeed each time, you can rely on the SD card that you use.

e. FILE SIZE should be set to CARD SIZE. This means that you do not put any limit on file size.

2. SETTINGS

a. USERNAME. It is important to set your name, so that data files are properly identified.

b. SPEED AVG TIME = 10 seconds if you aim for 10s runs, or 21s if you aim for 500m world record.

c. SPEED GENIE = between 20-to-30 knots (37-55 km/h if UNITS are set to m). SPEED GENIE anticipates what you want to see. It automatically changes SPEED screens, resets MAX and MAXAVG speeds so that you do not need to push any buttons when you sail. SPEED GENIE is only active in the SPEED menu. The 1-99 value in SPEED GENIE is a speed threshold for activation of the real-time speed measurement screen. NEW: Speed Genie automatically saves 14 MAX speeds and 10 best n-second averages (n is set in 2b). You can RESTORE any value and make a photo showing your speed achievement. When SPEED GENIE is on (set to non-zero value) GT31 internal chipset parameters are optimized for maximum possible accuracy and reproducibility in speed measurement.

Speed Genie Sound: GT31 Speed Genie provides *bio-feedback sound/light indicators*: acceleration, max n-second average speed increase and also audio-announces the max avg speed result. Sounds are designed for GT31 mounted inside the helmet to provide sailors audio-feedback so that they can focus their eyes on sailing to improve safety and maximize speeds. LED bio-feedback is designed for arm-mounted GT31. Set (ALERT>SPEED GENIE>ON) to enable Speed Genie helmet bio-feedback. If you need sound, set (ALERT>BUZZER>ON). The bio-feedback is delayed about ~2 seconds, due to the limited bandwidth of the GT31 Doppler system. Please see README file for details.

3. DATA LOGGER

Data Logger is an internal memory for GPS data logging, arranged in a circular buffer that automatically overwrites the oldest data when full. It has the capacity for ~4.5 hours of logging GPS data every second with full precision. It allows Navi GT31 to be used without SD card. Set INTERVAL=1s. Setting MIN SPEED=5 helps to extend the logging time, because memory is not wasted to store stationary and low-speed data.

You may wish to CLEAR the data logger content before each sailing session. Before executing CLEAR please SAVE the content to SD card. Using this method regularly ensures that you will have a backup of all your GPS data on your SD card. Of course you can back-up SD card content to your computer.

The most convenient way of clearing Data Logger and other GT31 data before each sailing session is to use MISC>DELETE>ALL>YES function. This operation clears "best runs" memory too.

4. BACKLIGHT

If you need maximum battery life, make sure that you set SETTINGS>BACKLIGHT>OFF, because light consumes a large proportion of GT31 power. GT31 with BACKLIGHT=OFF has been tested to work at full accuracy and with SD card for 25 hours continuously.

5. MISC

The most convenient functions of MISC are SAVE TO CARD and DELETE.

SAVE TO CARD - saves all GT31 memory items to SD card files. SD card must be present.

DELETE - clears all GT31 memory and Data Logger that have been saved using SAVE TO CARD

Using MISC items User can choose screens for Speed Genie result display.

Following screens can be enabled (ON) or disabled (OFF)

1. MAX/NS MAX - screen showing MAX run speed and best N-second average
2. HISTORY MAX - screen that compares current run with history best run

3. MAX SPEED - MAX speed of the run in LARGE font

4. NS MAX AVG - in LARGE FONT

When more than one screen is enabled (ON) they will appear in a "rolling" sequence.

When you have only 1 second to look at all Speed Genie results, enable only screen 1.

NEW FONT - enables highly readable Large font. Set it ON to enjoy clearer speed display

6. OTHER settings

Other settings are almost irrelevant for speed sailing. You may consider setting UNITS (NM or m), BACKLIGHT etc... in SETTINGS to suit you.

BEFORE SAILING

Power up your GT31. If you have set up the SPEED GENIE as in C2b - GT31 will enter the SPEED menu automatically after it established connections with GPS satellites. SD card Logging activity is confirmed by flashing log indicator. Move GT31 with speed above the threshold you set in step C1c and **check it.**

You may wish to clear the "history" of your best speed runs, to keep track of your best daily achievements. The best way to do this is enter MISC menu and do 2 things:

1. SAVE TO CARD>SAVE ALL (this will save datalogger data and best run history to SD card)
2. DELETE>DEL ALL (this will clear data logger and history)

USING TWO GT31

When you use two GT31 to measure the same speed you should take care to put their GPS antennae as close to one another as possible. Since GT31 antenna is located next to the joystick - this means that when two GT31 are inserted into an aquapack - joysticks should be close to one another. This means that one of the GT31 screens will be "upside down". If you want to read both screens right way up, use MISC>SCREEN FLIP settings to flip the "upside down" screen for easy reading.

When you neglect to place two GPS antennae close together, each GPS will read different speeds every time when there is rotation of the GT31 pair and/or the distance between them changes. For example when antennae are 10cm apart, and your arm that holds them rotates 30 degrees in 1 second, the speed difference measured by 2 units can be as large as 0.1 knot during your hand stroke. The speed difference depends on the direction of rotation and is typically smaller than 0.1 knots, but it is obvious that taking care of keeping both GT31 antennae as close as possible is clearly a step to improve the reproducibility of speed measurement by enabling two GT31 to cross-verify and re-confirm readings of one another.

Another good way to ensure the reproducibility and repeatability of speed measurement during sailing is to place both GT31 units [inside the helmet](#). Not only GT31 antennae can be close together, but also rotation stroke magnitudes are restricted, because human head is subject to continuous bio-feedback from the body to minimize its motion, even if the rest of the body vibrates in bumpy chop.

GT31 used in a helmet experiences the best possible satellite signal from the maximum possible number of satellites, which contributes to increasing reproducibility and reliability of speed measurement.

The best way to improve reproducibility and repeatability of speed measurements is to use **GT32** (twin GT31).