

## Slocum Glider G3S New Processor Guide

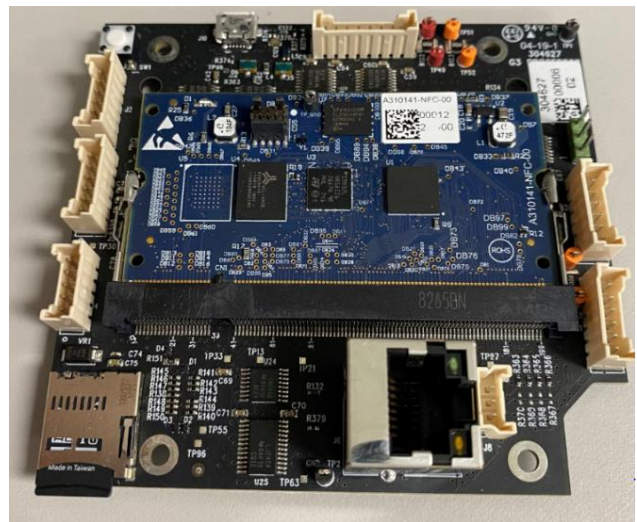
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In the Spring of 2020, Teledyne Webb Research began shipping Slocum Gliders with a new processor (these are often referred to as “G3S” gliders). This processor replaced the original Persistor processor as the onboard, low-power controller of the Slocum Glider. The goal of the project was to replace the processor and provide the user with the existing control and interface structure while consuming the same amount of energy. The user must be aware of critical differences. This guide will highlight the differences.

It is highly recommended that new users attend a Slocum Glider training session. Contact [glidersupport@teledyne.com](mailto:glidersupport@teledyne.com) to inquire about upcoming training sessions or with any questions about this document or the new processor.

### Hardware

The new processor is a STM32L4 CPU utilizing OpenRTOS running up to 120 MHz, with 8 Mbytes RAM and 32 Mbytes of flash memory. The TWR provided Swissbit SDHC 32 Gbyte cards hold all of the glider or science related files; missions, configuration, logs, etc. The use of consumer SD cards is not recommended. The SD cards are small and fragile, if you must handle them, do so carefully - most processes can be done without removing the SD cards from the glider.



### Software

Software support will continue in the same manner. New releases of Flight and Science code for the G3S gliders starting with version RELEASE\_10\_0 can be found at the Slocum Glider user forum (“Resources> formerly [www.webbresearch.com](http://www.webbresearch.com)> Earlier releases” or “G3S New SM32 Processor> G3S Code Release”). As always, Teledyne Webb Research (TWR) highly recommends reading the ‘readme.txt’ before installing new software on a vehicle. Software version 10.04 is scheduled for release in February 2021.

<https://datahost.webbresearch.com/>

<https://datahost.webbresearch.com/files.php?cwd=/glider/>

## G3 Manuals

If you are not familiar with the Slocum G3 Glider, the “Slocum G3 Glider Maintenance Manual” and “Slocum G3 Glider Operators Manual” are helpful resources. (These can be found on the TWR Forum under Resources> Glider Training Documents> Slocum Glider Manuals)

<https://datahost.webbresearch.com/download/file.php?id=191>

<https://datahost.webbresearch.com/download/file.php?id=190>

## Main Differences

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One notable difference between the persistor based software and the STM32 based software is that the operating system is now called ‘GliderShell’ instead of ‘PicoDos.’ All related commands have consistently changed (i.e. ‘exit pico’ is now ‘exit shell’).

\*For users with G3S gliders on Release version 10.00 or 10.01 see the notes at the end of this document.

The table below shows the differences between common commands and features.

<b>Persistor</b>	<b>STM32</b>
exit pico	exit shell
boot pico	boot shell
app	app
boot app	boot app (Note: Will not actually boot the app, just set the vehicle to boot app)
consci	consci
exit	exit
send/s/zs *.*	send/s/zs *.* (Note: * will also work now)
burnapp	flash-flight or flash-science
u4stalk	uart (Note: uart now uses the actual comms port ID from the science bay motherboard, i.e. J0, J1, J2)
talk	talk (Note: Some device names have changed, ‘talk ?’ will list all available device names)
date	date (time command not supported)
adtest	adtest (Note: ‘adtest all’ shows all channels as before. ‘adtest <channel>’ will show a single channel. ‘adtest ?’ will list all channels.)
\ (backslash used to separate directories in file paths)	/ (forward-slash used to separate directories in file paths)

## Syntax Examples

```
!type mafiles/yol4.ma
```

```
!zs config/sbdlist.dat
```

```
!szs config/*.dat
```

```
uart `uart (port ID)' `baud rate' `escape character (optional)' `powerbit'
```

Example from SciDos: `uart j3 9600 c 0`

## Help Menu

```
GliderDos N -1 >help
```

?	ballast	ballvalve	boot
callback	capture	cat	CD
chdir	CLRDEVERRS	compass_cal	consci
COPY	core	CP	date
DEL	DELLOG	DEVICES?	DF
digifin	DIR	drift_table	echo
EXECUTE	exit	freport	GET
HARDWARE?	HEAP	HELP	hs
LAB_MODE	LIST	loadmission	logging
LONGTERM	LONGTERM_PUT	LS	MBD
MKDIR	MV	PRUNEDISK	PURGELOGS
PUT	RENAME	REPORT	RM
RMDIR	run	SBD	SEND
sequence	SETDEVLIMIT	SETNUMWARN	SIMUL?
SRF_DISPLAY	strobe	sync_time	SZR
SZS	talk	tvalve	TYPE
USE	VER	WHERE	whoru
WHY?	wiggle	ZERO_OCEAN_PRESSUREZR	
ZS			

help list all commands in alphabetical order  
 help -full list all commands with their help msgs  
 help <cmd> .. <cmd> prints the help msgs for listed commands  
 command names in lower case are NOT executable in mission via !

## Legacy Scripts

G3 SM32 processors are not supported by all legacy scripts. Existing scripts that support the new processor can be found in the forum at the following post:

<https://datahost.webbresearch.com/viewtopic.php?f=11&t=427>

## Science Sensor Limitations

The new hardware presently supports a maximum of 4 sensors, please inquire if you are interested in running more than 4 sensors.

Do not connect a MicroRider to J1. Use ports J0, J2, or J3 for the MicroRider. The current default configuration reserves J1 for an optode.

## File Transfer

In some cases, the full file path may be necessary when sending files.

## Time Handling

Persistor users are familiar with a slowly drifting clock and the option to “snyc\_time.” This is no longer required. System time is now updated to GPS time at each surfacing.

## Log Files

Log files from the new system have a slightly different format. dbd2asc version 2.5 or newer is required to read the log data. All released versions of Slocum Fleet Mission Controller (SFMC) have the newer version. Older dock-servers or customer-integrated shoreside systems may require an upgrade.

The most recent version of ‘windoze-bin’ .exe files can be found on the TWR forum (Resources> formerly www.webbresearch.com> windows .EXE tools):

<https://datahost.webbresearch.com/zipdir.php?dir=/glider/production/windoze-bin>

## New Feature Procedures

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### Addressing “Smart Batteries” (Rechargeable Smart Batteries)

- From SFMC dock-server, communicate over serial perspective (Configuration > System Status... in the ‘Dock Server Ports’ section, under the ‘Connected’ column, click the terminal icon for connected glider indicated by a green box).
- From ‘GliderShell’
  - Run the talk program “talk battery”
  - Query the smart data for each pack “\$R,0”
    - It is likely that this command will have to be run several times to obtain information from all packs

### Burning Software

The following procedure is to be used if users intend to update a glider’s firmware and plan to only update the apps without opening the glider. As always, we recommend having a backup of important glider-specific files and data.

1. Boot glider. If in boot shell, proceed to step 2.
  - a. If in boot app, get control of glider by typing “ctrl-c” and “callback 30”.
  - b. Exit to shell by typing “exit shell”.
  - c. Once glider has restarted in GliderShell, type “boot shell”. This will force the glider to boot into shell instead of the glider application.
2. Switch the console to the science processor by typing “consci”.
  - a. When science begins booting the app, at some point it will say “science booting in standalone mode, do you want to continue booting”. At that prompt, enter “n”.
  - b. Several seconds later, it will then ask you if you want to restart or boot to shell, enter “s” for boot to shell here.

3. At first SciShell prompt, put science processor into boot shell by typing “boot shell”. This will prevent the science processor from automatically booting the app.
4. From the TWR code release, drag and drop the flash-science.gex file from the target-science directory to SFMC’s to-glider folder.
5. Type “dockzr \*\*” to send this to the science processor. This file transfer should take a few minutes.
6. Once transferred, type “flash-science” to flash (update) the science application. The user will then be asked if they want to proceed with flashing the application, at that prompt type “y”. Flashing the application should take less than a minute, approximately.
7. When the application has been flashed, type “app”. The app will boot just as in Step 2, where it will soon say “science booting in standalone mode, do you want to continue booting”. At this prompt, type “n”, then type “s” to boot to shell.
8. If this is successful, type “boot app”. This will cause the science application to boot when science is powered on.
9. Unplug the Freewave for approximately 10 seconds and plug it back in. The glider should then return to GliderShell.
10. From the TWR code release, drag and drop the flash-flight.gex file from the target-flight directory to SFMC’s to-glider folder.
11. Type “dockzr \*\*” to send this to the flight processor. This file transfer should take a few minutes.
12. Once transferred, type “flash-flight” to flash (update) the flight application. The user will then be asked if they want to proceed with flashing the application, at that prompt type “y”. Flashing the application should take less than a minute, approximately.
13. When the application has been flashed, type “app -lab”. The glider should boot into GliderLab. At the first GliderLab prompt, type “callback 30”, followed by “exit shell”.
14. Once back at a GliderShell prompt, type “boot app”. Note that this command will *not* actually boot the app as it used to do with persistors. The glider will now boot the app on start up.

### High-Speed Communications (hs)

- High Speed (hs) allows for communications to the glider through a direct serial connection at a higher baud rate. The standard baud rate is 115200; the high-speed baud rate is 921600.

	hs off	hs on
Baud Rate	115200	921600
Connection	Direct Serial Freewave	Direct Serial

- Note: not all laptop serial ports and USB-to-serial adapters are capable of the high-speed rate.

- Note: high speed is not supported by the dockserver (an alternative terminal emulator can be used, Tera Term and ProComm are popular options among glider users).
- If the direct communications cable is connected to the glider's comms port the glider will not connect to freewave.
- If connected with a direct communications cable and in SciShell, the process to switch back to the glider processor is similar to the one used with freewave communication – power cycle the glider or disconnect and reconnect the direct connection with the glider.
- The high-speed rate (921600) only works over the direct (hard-wired) serial connection.
- Important, turn off high speed (921600) before switching to Freewave (115200) communications, otherwise communications will be lost.
- The communications baud rate will automatically return to 115200 when the glider is power cycled, or when the CPU's for flight and science are reset, i.e. (reset button), 'exit reset', 'reboot', etc.
- High speed is currently available in GliderShell, SciShell, and GliderDos/LAB.
- Help from the command line (GliderShell, SciShell, and GliderDos/LAB):

```
SciShell> hs

Usage: hs on|off      - Go to High Speed RS232 Mode
```

- High speed mode is recommended for uploading new Flight and Science executables (.gex files) in GliderShell and SciShell, examples in the table below:

	Operator Terminal	Vehicle Shell
<b>flight</b>	<ul style="list-style-type: none"> <li>- Switch high speed on</li> <li>- Change baud rate of terminal program from 115200 to 921600</li> <li>- Sending: flash-flight.gex</li> <li>Bytes Sent: 944672</li> <li>BPS:14882</li> <li>Transfer complete</li> </ul>	<pre>GliderShell&gt; GliderShell&gt; hs on  GliderShell&gt; GliderShell&gt; zr  START ❓*B0100000027fed4</pre>





Similarly, if a 'send' command were issued in high speed mode for multiple files residing on different processors, the baud rate would need to be changed to 115200 to allow the science files to send, then changed back to 921600 in order for the flight file transfer to complete.

- The 'zs' command can be used to transfer flight and science log files from GliderShell and SciShell in high speed mode. Unlike using the 'send' command from GliderDos, one would have to use the 'mv' command to move the files to c:/sentlogs when done, examples in the table below:

	Operator Terminal	Vehicle Shell
<b>flight</b>	<ul style="list-style-type: none"> <li>- Switch high speed on</li> <li>- Change baud rate of terminal program from 115200 to 921600</li> <li>- Send log files</li> <li>- Move log files to sentlogs</li> <li>- Switch high speed off</li> <li>- Change baud rate of terminal program from 921600 to 115200</li> </ul>	<pre>GliderShell&gt; ?erShell&gt; hs on  GliderShell&gt; GliderShell&gt; zs c:/logs/0055*  About to send 4 files Prechecking 4 files: hit control-C to abort  total_size of prechecked files = 15472 bytes START **B00  Done!  GliderShell&gt; mv c:/logs/0055* c:/sentlogs  moved 4 files  GliderShell&gt; GliderShell&gt; hs off  ?  GliderShell&gt;</pre>
<b>science</b>	<ul style="list-style-type: none"> <li>- consci to science</li> </ul>	<pre>GliderShell&gt; consci  Switching to science Drop Freewave to return to glider</pre>





## \*Notes for Release V10.00 and V10.01

The first two software releases, 10.00 & 10.01 (Release\_10\_0 and Release\_10\_01), for the G3S glider supports two different drives, C: and D:, on both the Flight and Science processors. The C: drive contains all configuration-related files; config, bin, missions, mfiles, and state directories. The D: drive contains all data-related files; logs and sentlogs directories. The current directory includes the drive, so the commands “cd d:/logs” or “cd c:/config” will move between those directories as expected. The command ‘dir’ will list the current directory.

If your glider is running version 10.00 or 10.01, we recommend that you update to version 10.02 (Release\_10\_2) or later. One update in the 10.02 release is the merging of the C: and D: drives. All files, both configuration-related files and data-related files, will be in the same drive. For those familiar with gliders using the Persistor processor, the resulting directory structure will be nearly the same. As a result, there are additional steps that need to be taken when updating a glider to this release. These steps are detailed in the “README\_UPGRADE.pdf” document which can be found in the ‘RELEASE\_10\_2’ folder on the TWR Forum.

[https://datahost.webbresearch.com/files.php?cwd=/glider/RELEASE\\_10\\_2/README\\_UPGRADE.pdf](https://datahost.webbresearch.com/files.php?cwd=/glider/RELEASE_10_2/README_UPGRADE.pdf)

[https://datahost.webbresearch.com/files.php?cwd=/glider/RELEASE\\_10\\_2](https://datahost.webbresearch.com/files.php?cwd=/glider/RELEASE_10_2)

## Edits

Initials	Date	Change
JG	1/8/2020	Initial
JG	3/23/2020	Added procedure for updating application
RC	3/23/2020	Added High Speed communications documentation.
BA	3/25/2020	Reorganized for an initial guide
DP	3/27/2020	Added log files section, reformatted
MJB	3/27/2020	Formatting and readability
BA	3/31/2020	Draft A - minor edits for release into the wild
CG	1/28/2020	Draft B - Updates