



Serial Goldelox Getting Started – the SPE Application

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Description

This application note is intended to demonstrating to the user the interconnection of the 4D Systems Diablo16 display module with a ZIGBEE personal area network module.

Before getting started, the following are required:

- Any of the following 4D Goldelox display modules:

[uOLED-96-G2](#) [uOLED-128-G2](#) [uOLED-160-G2](#)
[uLCD-144-G2](#)

or any superseded module that supports the Serial environment

- [4D Programming Cable](#) or [uUSB-PA5](#)
- [Workshop 4 IDE](#) (installed according to the installation document)
- When downloading an application note, a list of recommended application notes is shown. It is assumed that the user has read or has a working knowledge of the topics presented in these recommended application notes.

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Application Overview

The Goldelox processor can be programmed to act as a serial slave device, responding to serial commands received from any host controller. Communication between the slave (the 4D Goldelox display) and the host must follow the Serial Protocol, which defines a set of commands with associated parameters. These commands enable the host controller to make the slave device display primitives, text, and images, play audio and video, and log data to a micro-SD card in the simplest manner available. For more information on the Serial Protocol, refer to the [Goldelox Serial Command Set Reference Manual](#).

This application note shows how to configure a 4D display to act as a serial slave and how to use the Serial Commander (one of the several tools available in Workshop) to send commands to the display. Thru the use of the Serial Commander, the programmer will be acquainted with the Serial Protocol or more specifically the nature and format of the serial commands. This knowledge will then allow the user to properly program any external host controller for the display module.

Setup Procedure

Launch Workshop 4

There is a shortcut for Workshop 4 on the desktop. Launch Workshop 4 by double-clicking on the icon.



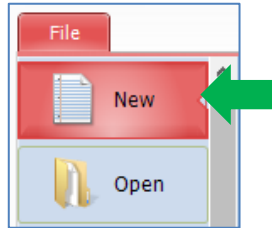
Create a New Project

Workshop 4 opens and displays the **Recent** page.



To create a new project, there are two options.

Click on the top left-most icon, New.



Or Click on the icon beside Create a new Project.



Create a new 4D Systems Project
Start building a new Visi, Genie, Designer or Serial program.



Create a new 4D Labs Project
Start building a new Visi, Genie, Designer or Serial program.
Coming Soon.



Create a new Project
Start building a new program using the same settings as you last used (Visi-Genie Gen4-uLCD-50DT)

The Choose-Your-Product window appears.

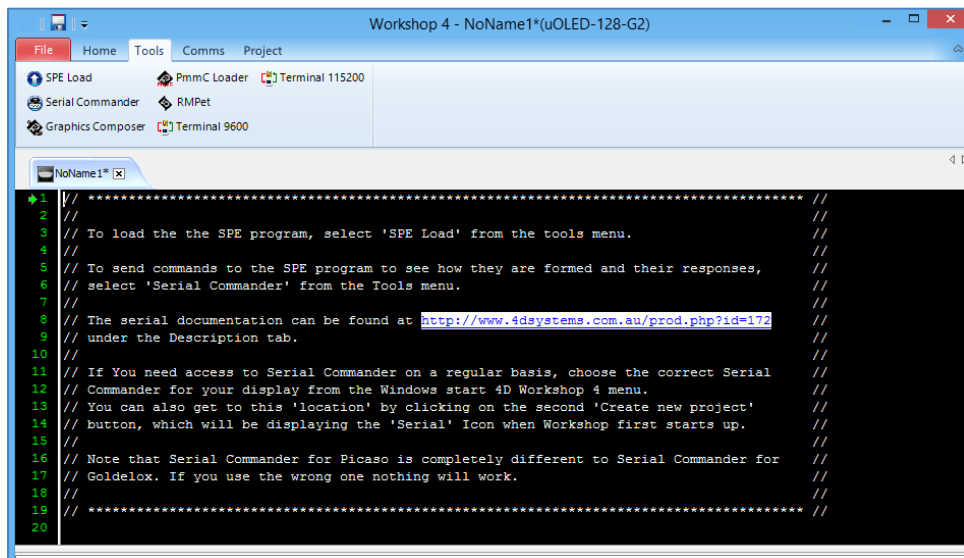


Select the appropriate screen and preferred orientation. The screen used in this example is the **uOLED-128-G2 (Portrait orientation)**.

Select Serial

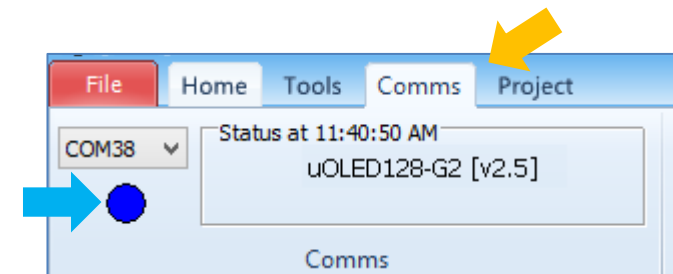


A new Serial project opens and displays some information.



Connect the Display Module

Connect the display module to the PC using a [4D USB Programming Cable](#) or a [uUSB-PA5](#) programming adaptor. Go to the Comms menu to check if the module is detected. The light goes blue when the connection is established. Below is an example of how the Comms tab will look like if a uOLED-128-G2 is connected to the PC.

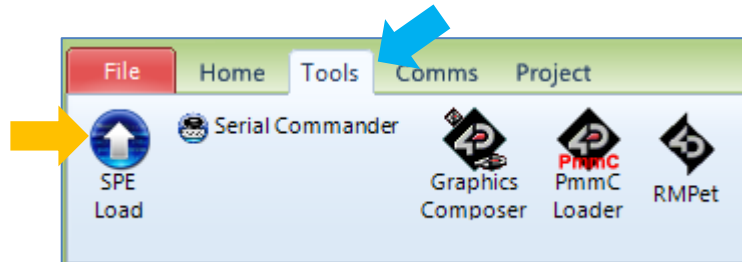


If not familiar with how to actually connect a 4D display to the PC using a 4D USB programming cable or a uUSB-PA5 and with how to update the firmware, the user should consult the document:

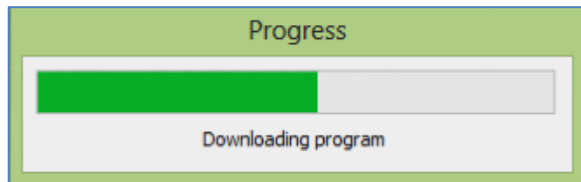
[General How to Update the PmmC for Goldelox](#)

Load the SPE Application

Under the Tools menu, click on the SPE Load icon.



The application is now downloaded to the display module.



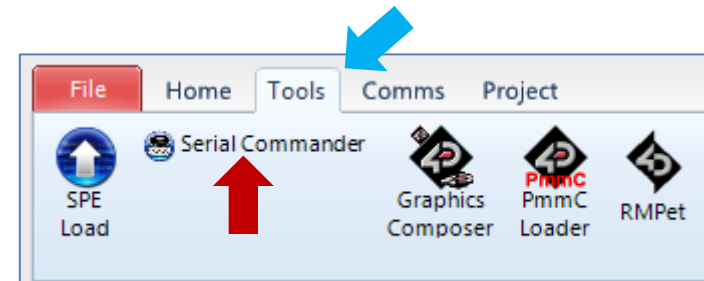
The SPE splash screen should now be shown on the display module.



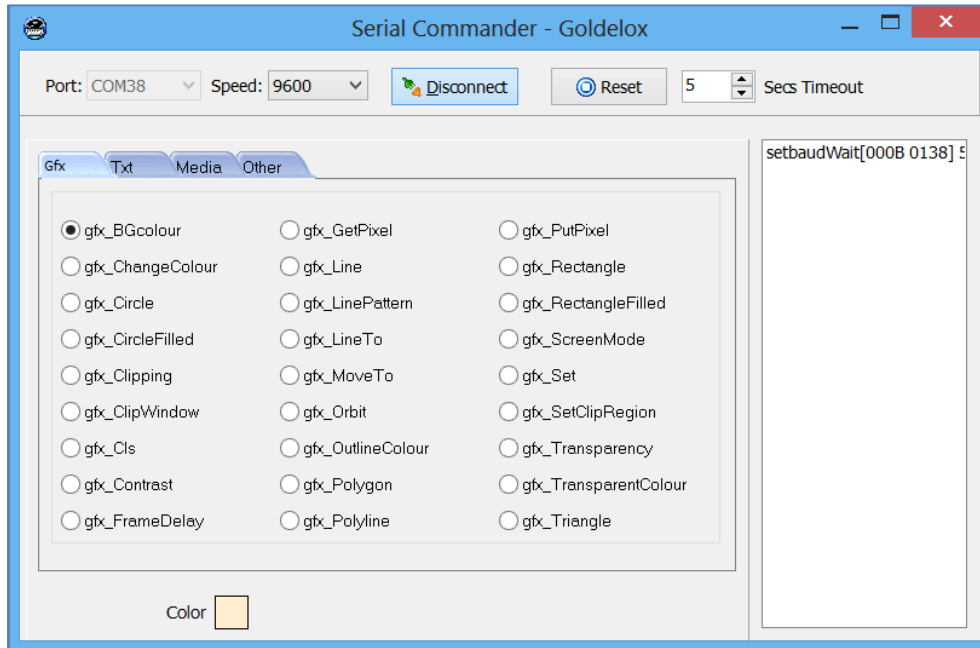
The default baud rate is 9600 and the latest firmware is loaded on to the display. To learn how to modify the default settings, refer to **Section 2.2 (Additional Configuration Parameters for Serial Communication)** of the [Goldelox Serial Command Set Reference Manual](#).

Launch the Serial Commander

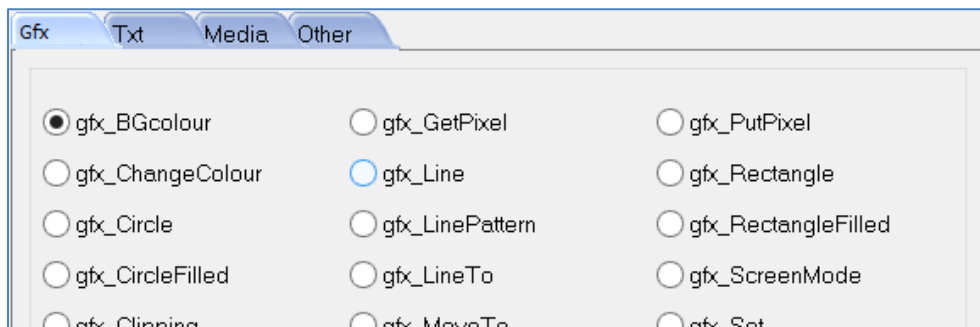
The **Serial Commander** icon is found under the **Tools** menu in Workshop. Note that the Serial Commander is available in the Serial environment **only**.



The Serial Commander window appears.



Note how the commands are categorized. These commands are documented in the [Goldelox Serial Command Set Reference Manual](#).



The Serial Protocol

The Serial Protocol is made up of commands and parameters that are sent over the Serial Port in byte format to the display module. Each command is unique and has a specific set of parameters associated with it. Some commands expect a response from the display module (e.g., when the host is trying to detect the model of the display module). Some commands do not require a specific response (e.g., the command for clearing the screen). For the latter type, the display module will reply with an acknowledgement once the command is successfully executed. For commands that require a specific response, the display module may reply with a varying number of bytes, depending on the command and what the response is. Each command sent to the display will require a certain amount of time before the response is returned. This depends on the command and the operation that has to be performed. Commands should only be sent and their response received, before another command is sent. If two commands are sent before the first response is received, incorrect operation may follow.

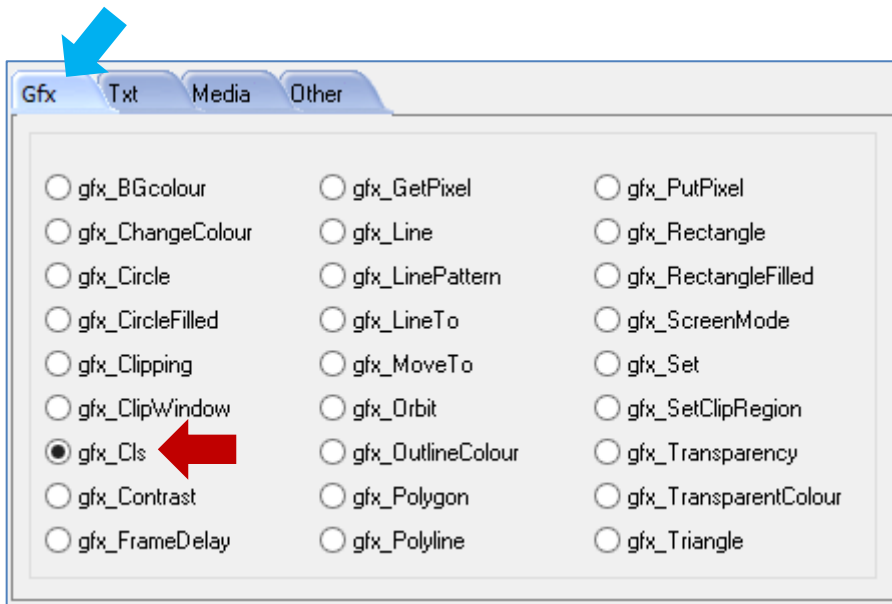
The following sections will now demonstrate the use of some serial commands.

Control the Display

The display module is going to receive and send messages to the host. This section explains to the user how to interpret these messages. An understanding of this section is necessary for the user to be able to properly program the host controller. The [Goldelox Serial Command Set Reference Manual](#) is recommended for advanced users.

Clear the Screen

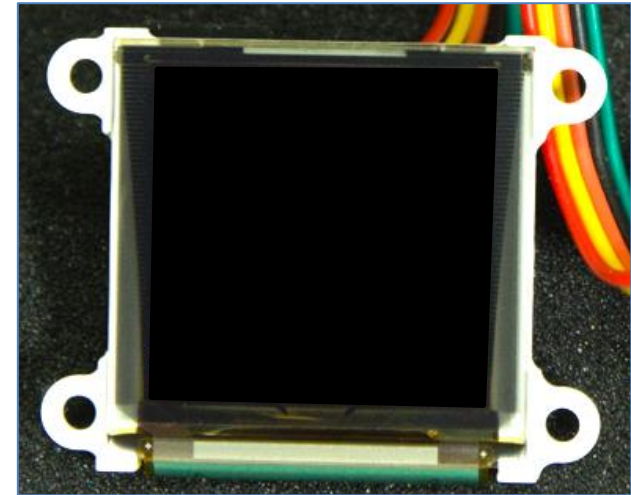
In the **Serial Commander** window, click on the **Gfx** (or Graphics) tab and select **gfx_Cls**.



Click on the send button.



The display module is now cleared.



Also, messages are sent to and received from the display module. The value inside the brackets is the message sent to the display module. The value inside the parentheses is the message received from the display module.

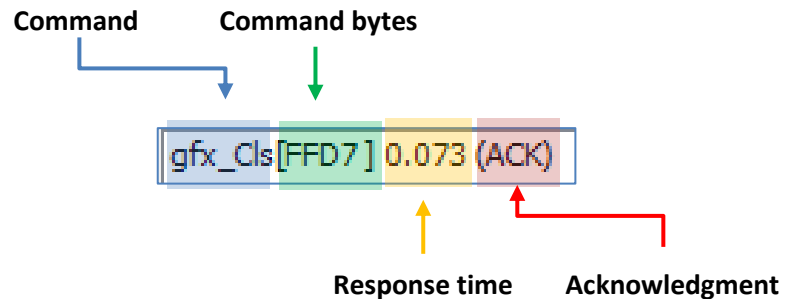
Message sent

```
gfx_Cls[FFD7] 0.073 (ACK)
```

Message received

The diagram shows the text 'gfx_Cls[FFD7] 0.073 (ACK)' enclosed in a box. A blue bracket above the text spans from 'gfx_Cls' to the end of the first space, labeled 'Message sent'. A red bracket below the text spans from the start of the second space to the end of the text, labeled 'Message received'.

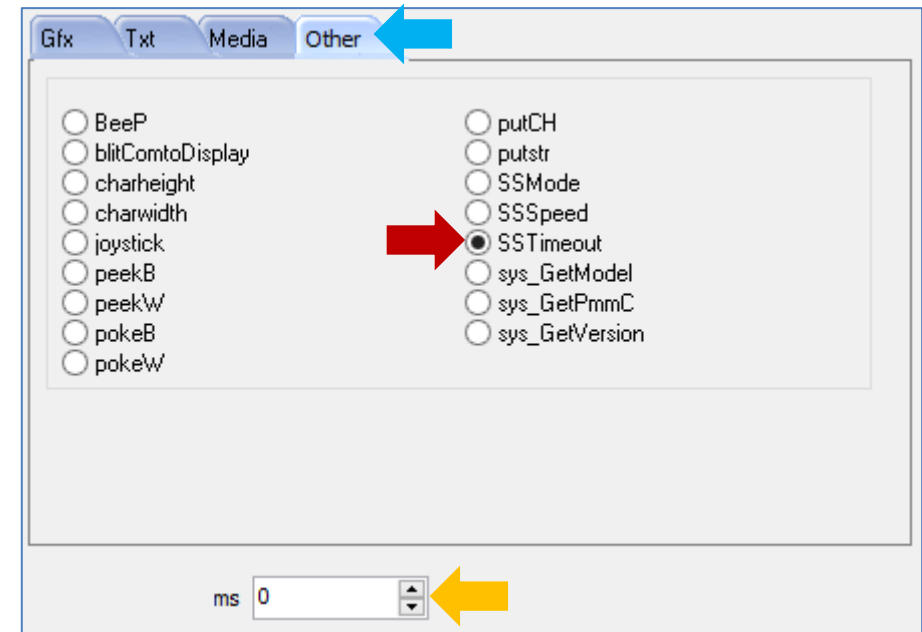
The equivalent byte values for the **gfx_Cls** command are **0xFF** (MSB) and **0xD7** (LSB). The display module responds with an acknowledgment (**ACK**) after **0.073** seconds. The byte value for **ACK** is **0x06** and is not shown.



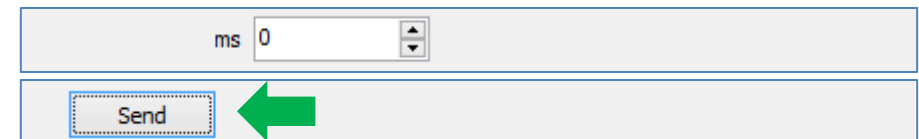
For more information on the **gfx_Cls** command, refer to section **5.2.1 Clear Screen** of the [Goldelox Serial Command Set Reference Manual](#).

Disable Screen Saver Scrolling

The screen of a uOLED-128-G2 will scroll by default. To disable scrolling, select **SSTimeout** under the tab "**Other**", as shown below.



Note that the box at the bottom shows **0 (ms)**. Click on the Send button.



The screen should now stop scrolling. The message area displays the messages sent to and received from the display module.

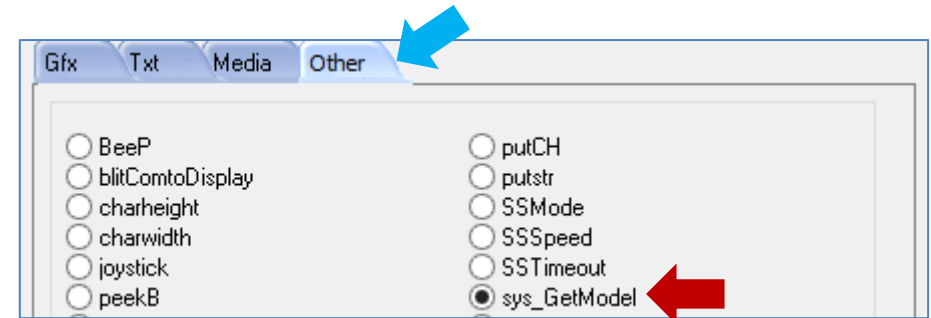
```
SSTimeout[000C 0000] 0.010 (ACK)
```

The format for the **SSTimeout** command is defined in section **5.9.4 Screen Saver Timeout** of the [Goldelox Serial Command Set Reference Manual](#).

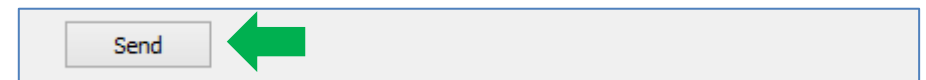
5.9.4. Screen Saver Timeout		
Serial Command	cmd (word), timeout(word)	
	cmd	0x000C
	timeout	Specifies the screen saver timeout in milliseconds. Timeout value could be 1-65535. 0 disables the screen saver.
Response	acknowledge (byte)	
	acknowledge	0x06: ACK byte if successful Anything else implies mismatch between command and response.
Description	This command will set the screen saver Timeout. 0 is set to disable the screen saver.	
	Default screen saver timeout settings could be adjusted as shown in section 2.2. Note: This feature is display dependent. Not all the display screens offer Screen Saver feature. Such as, uLCD-144-G2 does not support Screen Saver.	

Detect the Screen Model

To illustrate the use of commands that require a specific response from the display module, the command **sys_GetModel** will now be sent. Under the tab "Other", select **sys_GetModel** as shown below.



At the bottom part of the serial commander window click on the Send button.



The message area displays the following.

```
sys_GetModel[0007 ] 0.034 (ACK 12 0x000C, "uOLED-128-G2")
```

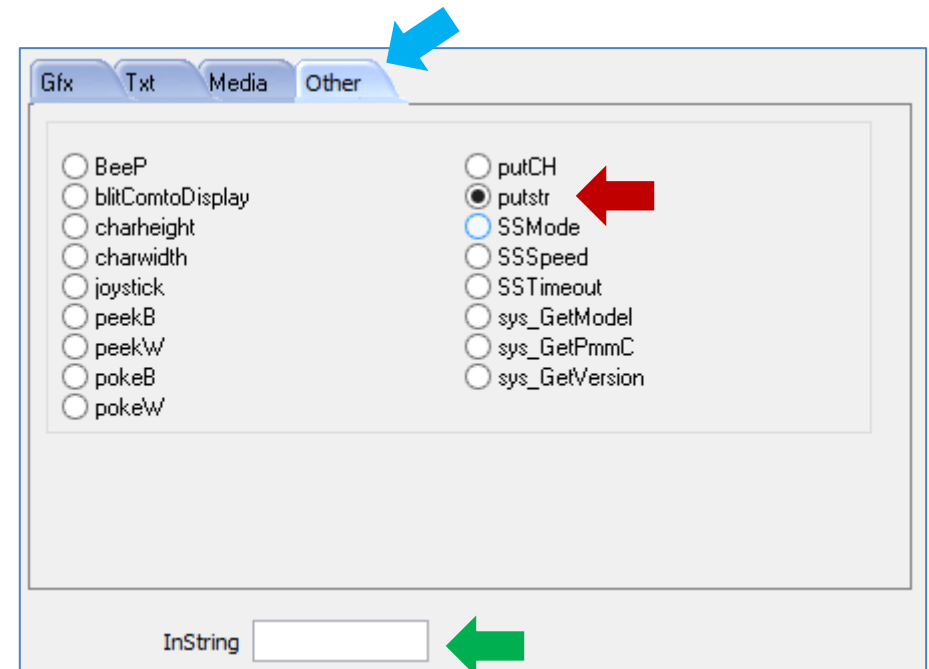
Section **5.9.1 Get Display Model** of the [Goldelox Serial Command Set Reference Manual](#) gives the following information.

5.9.1. Get Display Model

Serial Command	cmd (word)	
	cmd	0x0007
Response	acknowledge (byte), model (string)	
	acknowledge	0x06: ACK byte if successful Anything else implies mismatch between command and response.
	count	Number of characters in the model name to return
	model	Display Module's model name. Without NULL terminator.
Description	Returns the Display Model in the form of a string without Null terminator.	

Print a String

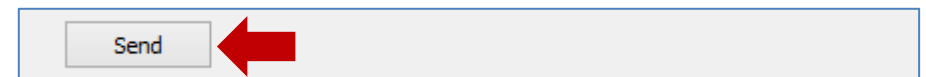
Another example of a command that contains a specific set of parameters is the command **putstr**. Under the tab "Other" select **putstr**.



Input the string "Hello World" into the **InString** box.



Click on the Send button.



The string "Hello World" should now be printed on the screen.



The message area displays the following.

```
putstr[0006 "Hello World"] 0.034 (ACK)
```

The **putstr** command is sent with the user-defined string as the parameter. Refer to section **5.1.3 Put String** of the [Goldelox Serial Command Set Reference Manual](#) for more information. Experimentation with the different commands using the Serial Commander is now left to the user as an exercise. The user may use the [Goldelox Serial Command Set Reference Manual](#) as a reference.

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