Mercury GS Manual

VERSION 01
DRAFT

Reference: KS-DOC-01350

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Table of Contents

1 Document History

Please see the following record of revisions:

Document Revision	Document Status	Change Description
01	DRAFT	Initial Revision

2 Applicable Documents

The following references are applicable to this document. The latest version of each document applies.

Document Reference	Document Title	Reference in this Document
KS-DOC-01104	OSSAT Mercury GS Specification	[Mercury GS Spec]
KS-DOC-01056	OSSAT Glossary	[OSSAT Glossary]

3 References

The following references are applicable to this document.

Document Reference	Document Title	Reference in this Document

4 Mercury GS

4.1 Introduction

This document aims to inform the reader on the use of the Mercury GS Ground Station Software. Terminology related to the Space Industry shall be used in this document. For further information regarding these terms, see the OSSAT Glossary and the Readme file of the repository. The software is broken up into tabs, and these shall be described in their own headings.

Mercury GS uses its own communications protocol, and formats frames automatically to be sent over a serial link. This protocol is described in the Mercury GS Spec.

NOTE: This protocol is not representative of one that would be used in Space. It is a simple protocol suitable for lab testing.

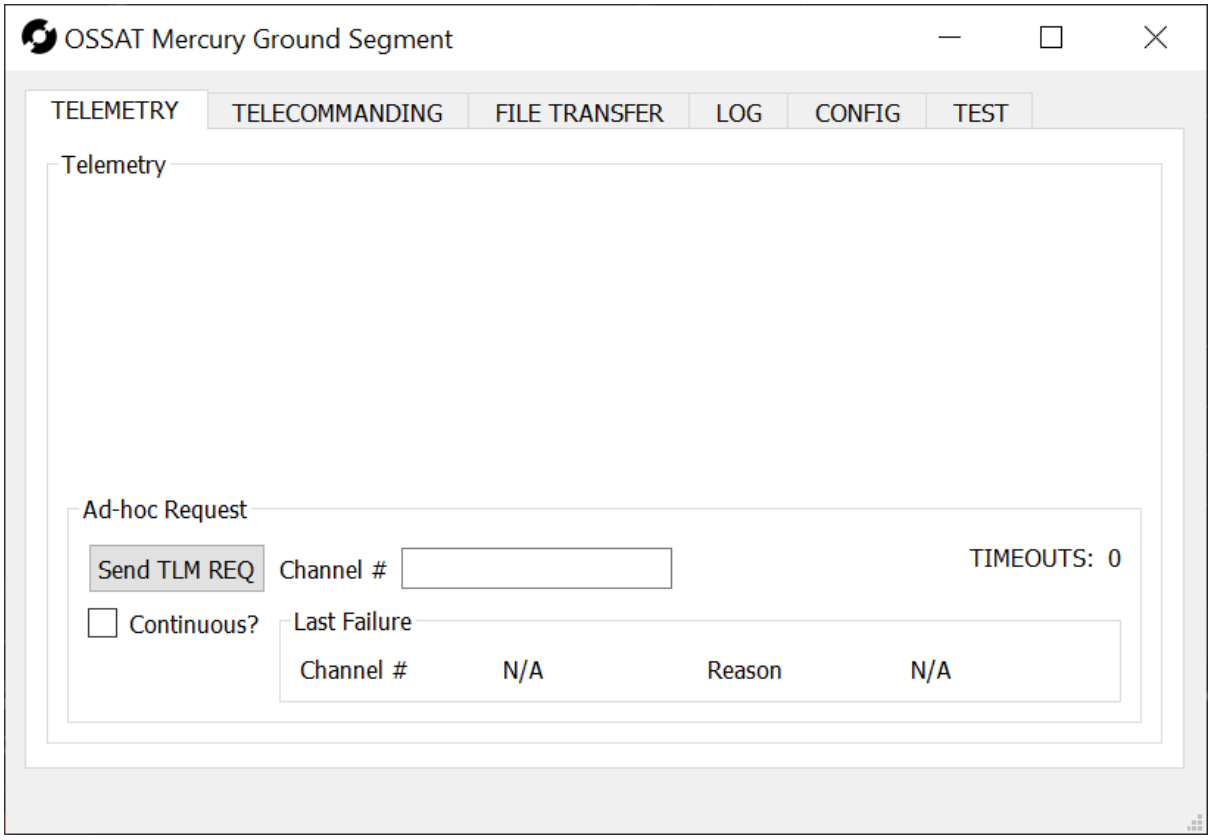
4.2 Testing Setup

To test this software without a satellite, you will need a terminal program and to set up two COM ports that are connected together. We suggest the use of Tera Term and HHD Virtual Serial Port Tools (https://freevirtualserialports.com/).

Detailed steps to achieve this setup are described in the Readme of the repository.

4.3 Telemetry

The below image shows the Telemetry tab of Mercury GS. This tab is used to send Telemetry Requests, receive, and display Telemetry Responses and Telemetry Rejection Responses.



4.3.1 Sending A Telemetry Request

To send a Telemetry Request follow these steps:

1. Type a channel number into the “Channel #” field.
2. Hit the “Send TLM REQ“ button.

NOTE: You will notice the “TIMEOUTS” value go up after sending a Telemetry Request. This is due to a lack of response within a timeout period.
If you send a Telemetry Response back to Mercury GS, with the same channel number and within the timeout period, then the timeout will not count up.
The timeout period can be adjusted in the CONFIG tab.

4.3.2 Sending A Telemetry Request Continuously

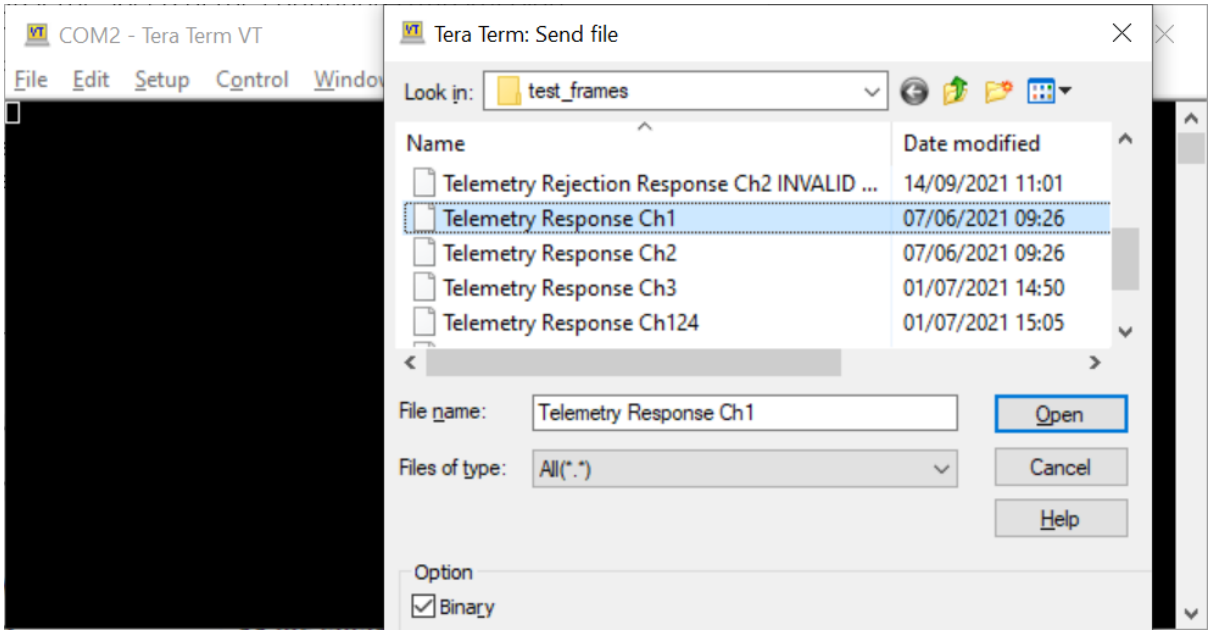
A Telemetry Request can be sent repeatedly to stress test the connection.
To send a Telemetry Request continuously, follow these steps:

1. Type a channel number into the “Channel #” field.
2. Click the “Continuous?” button.
3. Hit the “Send TLM REQ“ button.

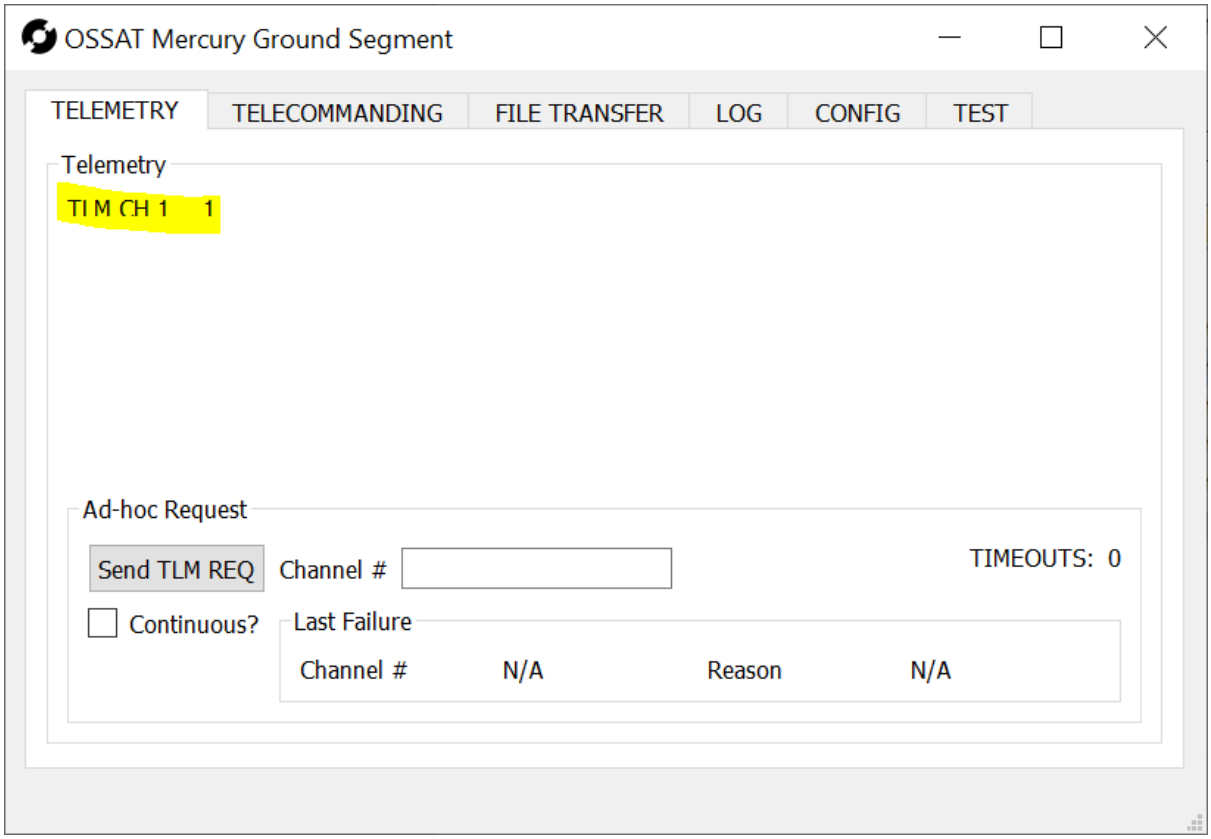
NOTE: The continuous transmission can be cancelled by unchecking the “Continuous?” button. You can also adjust the speed of the continuous transmission by adjusting the “TC/TLM Rate” field on the CONFIG tab, this can be done on the fly and the transmission speed adjusts accordingly.

4.3.3 Receiving a Telemetry Response

We will also want to receive Telemetry Responses from the spacecraft. Unfortunately, we don't all have satellites lying around. So, instead, we can use a terminal program (the steps required to setup the COM ports and a terminal are described in the repository Readme). Pull open your favourite terminal program, we have used Tera Term, and navigate to the Test Frames folder. Send one of the Telemetry Response files in binary.

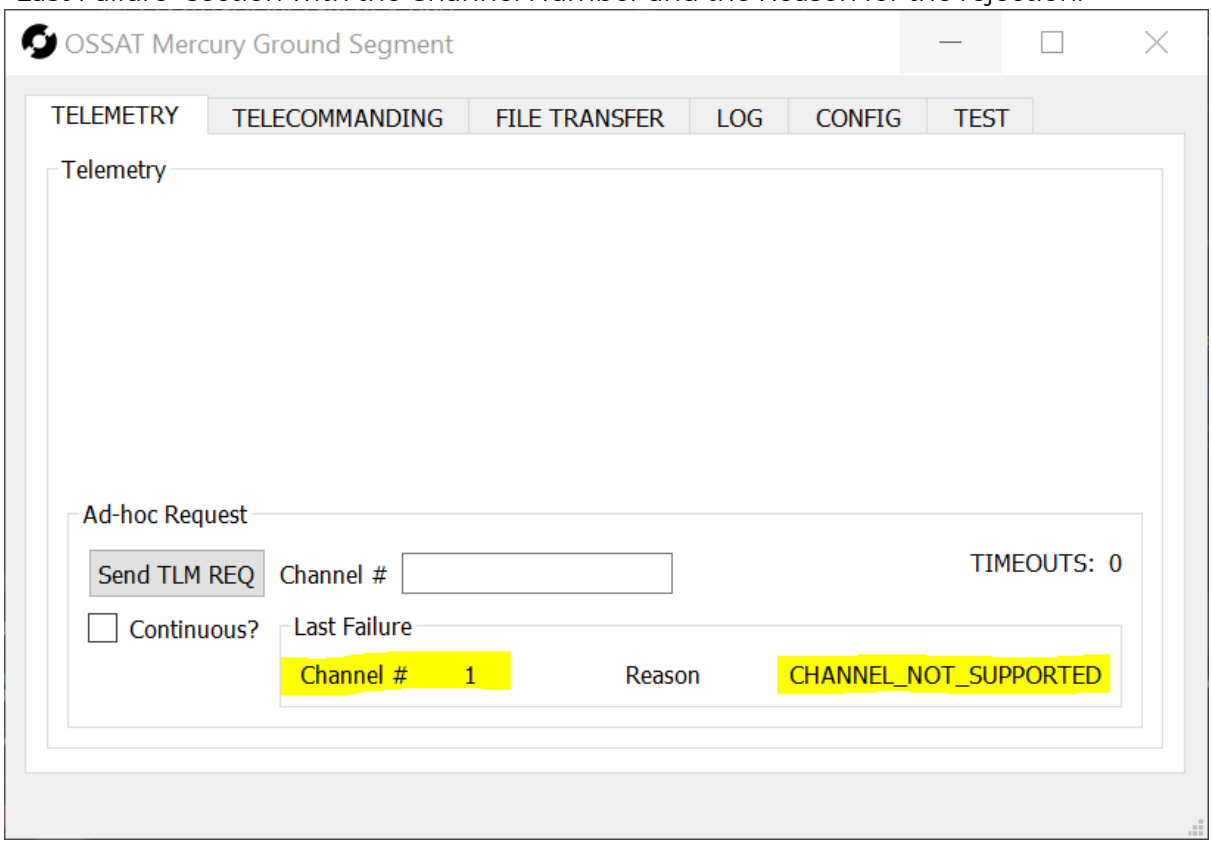


Once this has been successfully sent and received by Mercury GS, you will see the Telemetry Response show up under the "Telemetry" section.



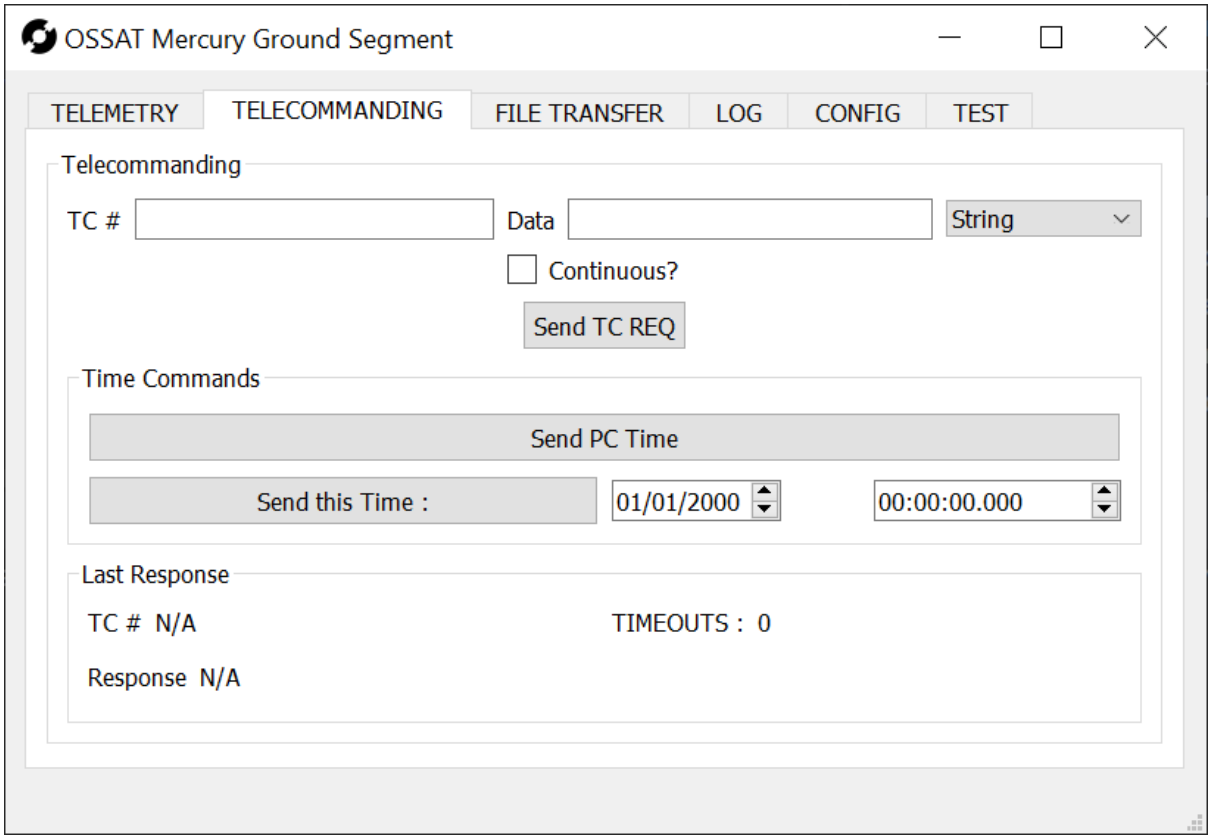
4.3.4 Receiving a Telemetry Rejection Response

Similar to a Telemetry Response, we can also receive a Telemetry Rejection Response. Use your terminal software to send a Rejection Response. It should display under the "Last Failure" section with the Channel Number and the Reason for the rejection.



4.4 Telecommands

As well as receiving and requesting Telemetry from the spacecraft, we will want to command it via Telecommands. See below the Telecommand tab of Mercury GS.



4.4.1 Sending A Telecommand Request

You can send a Telecommand Request by doing the following:

1. Input the Telecommand Number into the “TC #” field.
2. Select the type of the data in the drop-down menu. These can be: String, Float, or Integer.
3. Type the data you wish to send in the “Data” field. This is validated depending on the type selected in the previous step.
4. Click the “Send TC REQ” button.

NOTE: Telecommands can also transmit continuously and are also subject to timeouts. Continuous Rate and Timeout period can be configured in the CONFIG tab.

4.4.2 Sending the Time

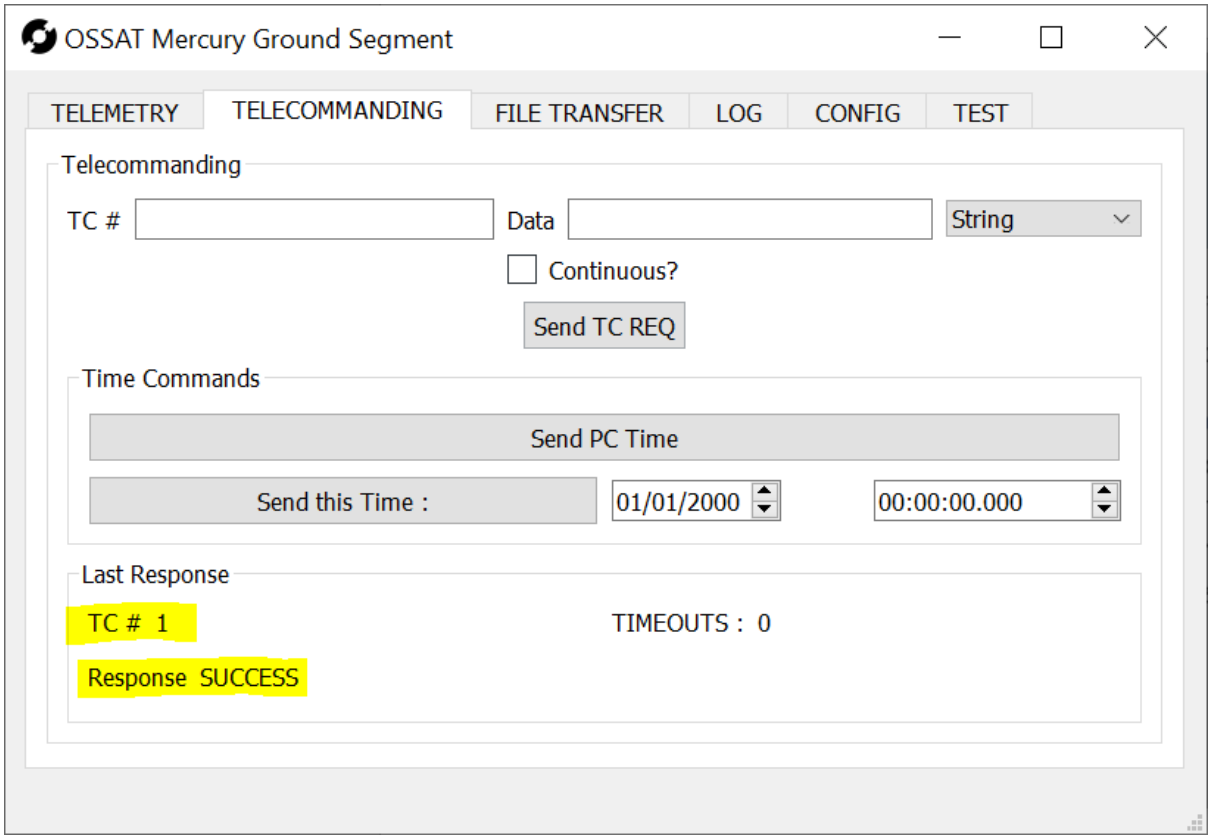
From Release 2.2, you will be able to transmit a Telecommand Request that specifically sends the time to the Spacecraft. To do this either:

- Press the “Send PC Time“ button.

- Enter a date and time into the fields next to the “Send this Time :” button and then hit the “Send this Time :” button.

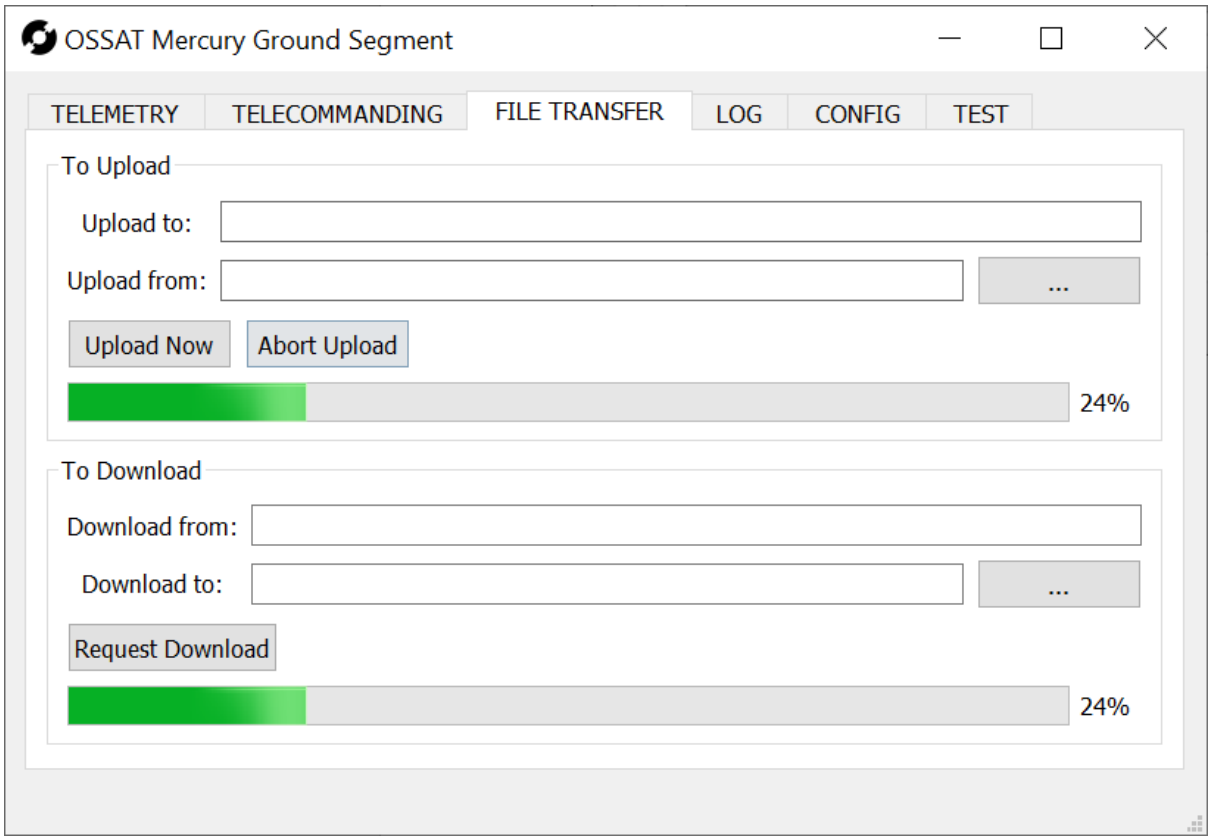
4.4.3 Receiving a Telecommand Response

We can also receive a response to a sent Telecommand. To do so follow the same steps as 4.3.3 (Receiving A Telemetry Response), but instead of sending a Telemetry Response, send a Telecommand Response.
This will show under the “Last Response” section.



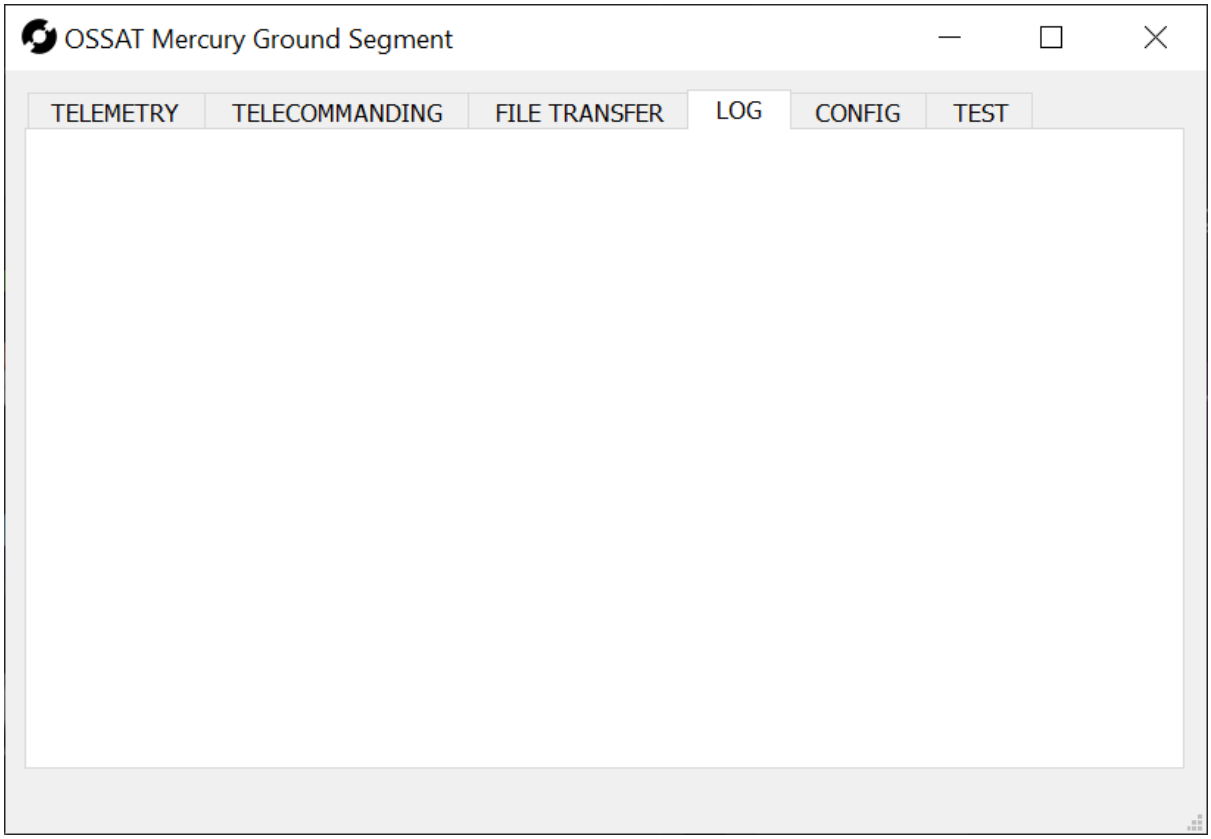
4.5 File Transfer

From Release 3.0, the tab shown below will be functional.



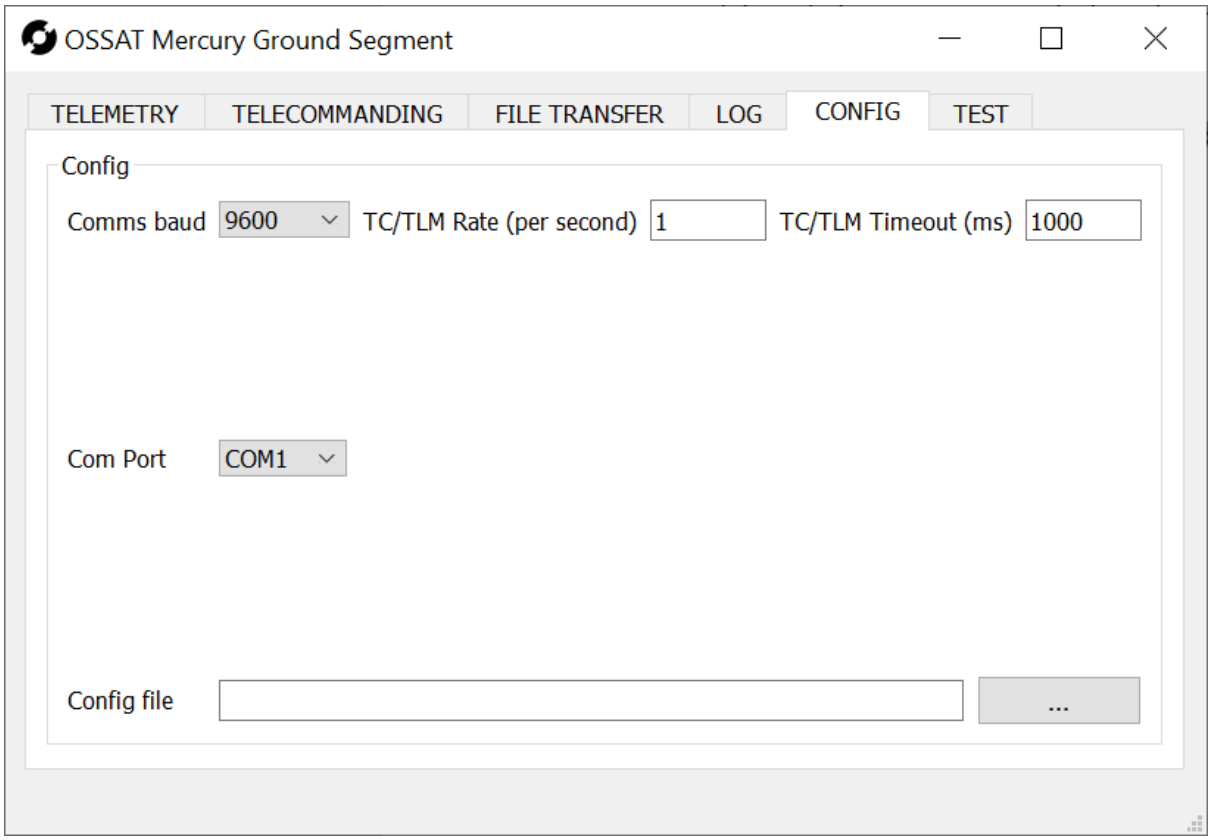
4.6 Log

From Release 3.0, the tab shown below will be functional.



4.7 Config

The below image shows the Config tab.



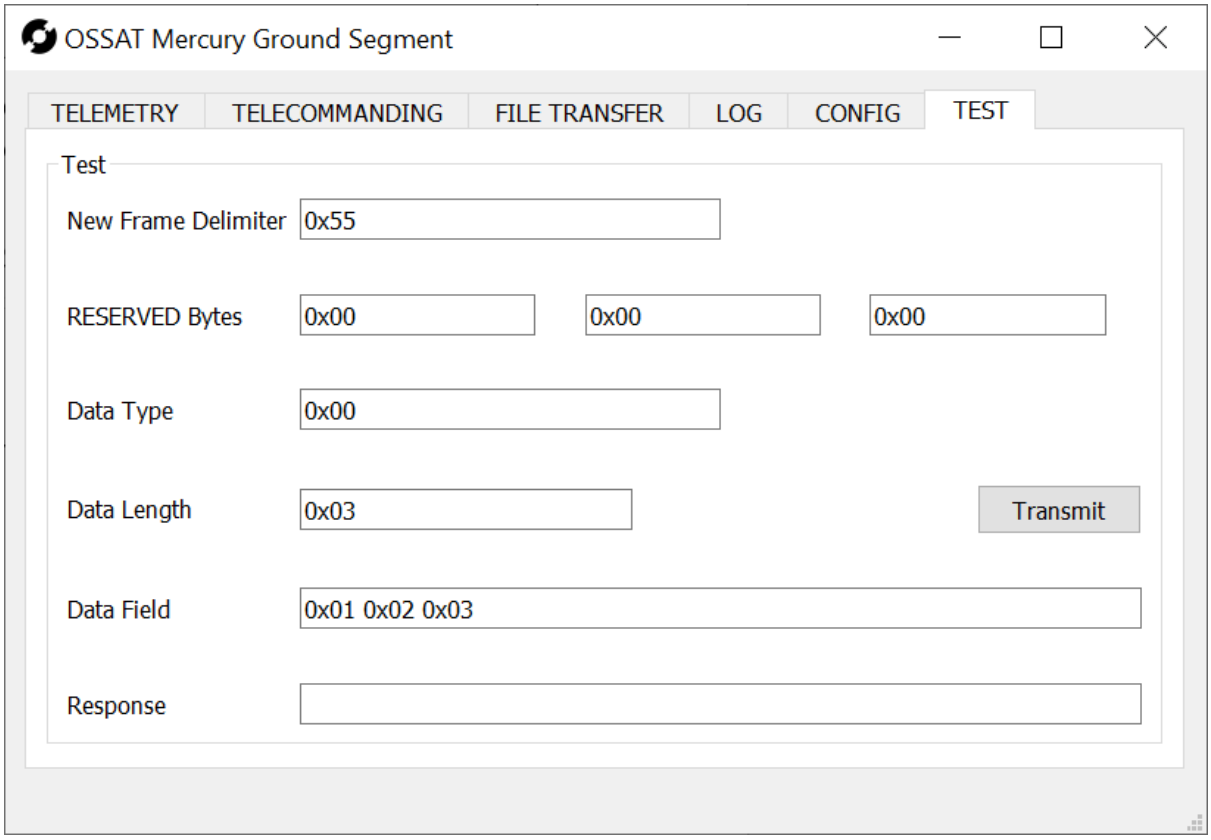
This tab can be used to adjust parameters of Mercury GS. You can change the Continuous Transmission rate in the “TC/TLM Rate” field. Or change the timeout period in the “TC/TLM Timeout” field.

You can also adjust the baud rate that Mercury GS talks over the serial port with the “Comms baud” drop down menu, as well as change the Com Port using the “Com Port” drop down menu.

All of these configurations can be changed by uploading a config file. This is done using the “Config file” field. NOTE: This feature is not yet implemented.

4.8 Test

We may want to test the capability of the Spacecraft to handle invalid frames. The Test tab is used to do this by creating frames that ignore Mercury's communications protocol and are just sent directly. This tab is shown below.



Create your message by filling in the fields with the hexadecimal values of the message you wish to send. And then press the "Transmit" button. All data received back from the Spacecraft within a one second window will be displayed in the "Response" field.

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