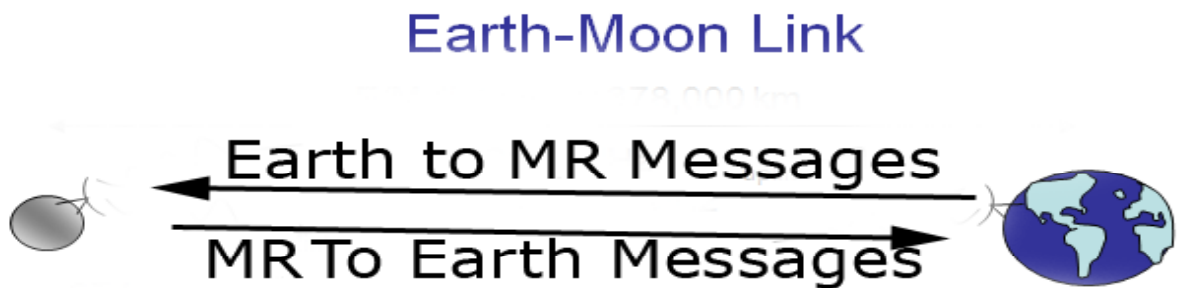


## Summary of VagaLune Lunar Module (LM) Communication Message Types

### Introduction

The data encoding choices made between a spacecraft and an Earth station dictate the manner in which data is transmitted between them. The VagaLune project will incorporate a proprietary encoding scheme for both Earth station to Lunar Module (LM) and Earth station to Moon Rover (MR). The focus of this document will be to outline the message types that will be exchanged between the Earth station and the MR.



### Power Management Message Types

The Power Management (PM) Messages are used to exchange information to the power systems operating on the MR. These messages are used to query usage status on the MR and issue commands to adjust the power usage of various sub systems on the MR.

#### MR to Earth Station Messages

##### *Current Position Power Generation*

Message used to indicate the current levels of power generated by the MR solar panels and the status of the Lithium-Ion battery

##### *Current Power Usage*

Message Used to relay the current usage of power by individual systems on the MR

##### *Diagnostic Message*

Message used to indicate any faults and the status of components in the PM system.

#### Earth Station to MR Messages

##### *Enter Hibernation Message*

Message used to indicate the MR to go into hibernation mode.



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### *Leave Hibernation Message*

Message used to indicate the MR to exit hibernation mode

### *Power System Adjustment Message*

Message to adjust the power usage on the MR

### *Change reporting settings*

Change the intervals at which the MR PM transmits Status Messages

## **Moon Rover Autonomous Navigation Software Message Types**

The Moon Rover Autonomous Navigation Software (MRANS) is tasked with controlling the rover motion. The messages that communicate with the MRANS are used to exchange data on the position of the rover, and issue commands to move the rover.

### **MR to Earth Station Messages**

#### *Current View Message*

Message for transmitting the current reference image for issuing navigation commands.

#### *Rover Motion Systems Status*

Status on the rover motion sub systems

#### *Robotic Systems Status Report*

Status and Fault Code reporting on any robotic motion and Auto Nav system.

### **Earth Station to MR Messages**

#### *Request for Data*

Message for requesting the status of MRANS and the robotic motion systems

#### *Autonav Message*

Message issuing the command for the rover to move to a specific point in the current view

#### *Manual Motion Message*

Message for issuing the command for the rover to move without the use of the Autonav system.



## MR Communication Monitoring Software Message Types

The MR Communication Monitoring Software (MRCMS) operates as the software front end on both the MR to Earth station and Earth station to MR communication link. The message types for this sub system focus on the management and status of the communication systems.

### MR to Earth Station Messages

*Communication Chain Status Messages*

Message for relaying the current status of the communication chain, uplink / downlink

### Earth Station to MR Messages

*Request for Data*

Message for requesting the status of the Communications Link.

*Reporting Interval Update Message*

Message for changing the pre-defined message reporting intervals for the MRMCS on the MR.

## Image and Video Control Software Messages

The Image and Video Control Software (IVCS) messages are used to exchange both data and control information from the onboard cameras on the MR

### MR to Earth Station Messages

*Still Camera Position and Status*

Information on the still camera position and camera status

*JPEG Encoder Status*

Status of the JPEG Encoder System, including current encoding parameters and resolution for transmitted messages

*Still Image Payload Message*

Message for transmitting the contents of an encoded JPEG image from the still camera

*HDTV Camera Position and Status*

Information on the HDTV camera position and status

*H.264 Encoder Status*

Status of the H.264 Encoder System, including current encoding parameters and resolution and frame rate for recorded videos.

*HDTV Payload Message*

Message containing the encoded H.264 HDTV data.



## Earth Station to MR Messages

### *Request for Status - Still Image*

Message for requesting the status of the still image systems.

### *Still Picture Command Message*

Message for issuing commands to the still camera. Used for moving the camera and issuing commands to take still images

### *Still Image Parameter Update*

Message for updating the parameters for the JPEG encoder.

### *Request for Status - HDTV*

Message for requesting the status of the HDTV systems.

### *HDTV Command Message*

Message for issuing commands to the HDTV. Issuing commands to reposition the camera, and start/stop the transmission of HDTV video.

### *HDTV Parameter Update*

Message for updating the parameters for the HDTV encoding and transmission system.

## Moon Rover Robotic Systems Control Software Message Types

The Moon Rover Robotic Systems Control Software (MRRSCS) is used to control robotic systems on the MR other than the systems associated with motion.

## MR to Earth Station Messages

### *Solar Panel Deployment Status*

Message for relaying the current mechanical orientation of the solar panel .

### *Antenna Deployment Status*

Mechanical Orientation readings from the MR antenna

### *Robotic Systems Status Report*

Status and Fault Code reporting on any robotic control system.

## Earth Station to MR Messages

### *Request for Data*

Message for requesting the status of the Solar Panels or Antenna robotic systems.



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### *Manual Position of Solar Panels*

Message for relaying the instructions to manually override the MRRSCS and reposition the solar panels.

### *Manual Position of Antenna*

Message for relaying the instructions to manually override the MRRSCS and reposition the antenna array.

### *Reporting Interval Update Message*

Message for changing the pre-defined message reporting intervals for the MRRSCS on the MR.

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