Mars Microphone to LIDAR Interface Specification

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This is my understanding of the LIDAR to Mars Microphone interface as agreed between myself and Sasha Lipatov on January 27, 1997, updated by subsequent communications.

1. Mechanical

The Mars Microphone (MM) will consist of a 5cm x 5cm x 1.8cm box which shall bolt on to the LIDAR sensor assembly, with an attached 20cm harness terminating in a Cannon Micro-D connector. This unit will weigh approximately 50g.

2. Power

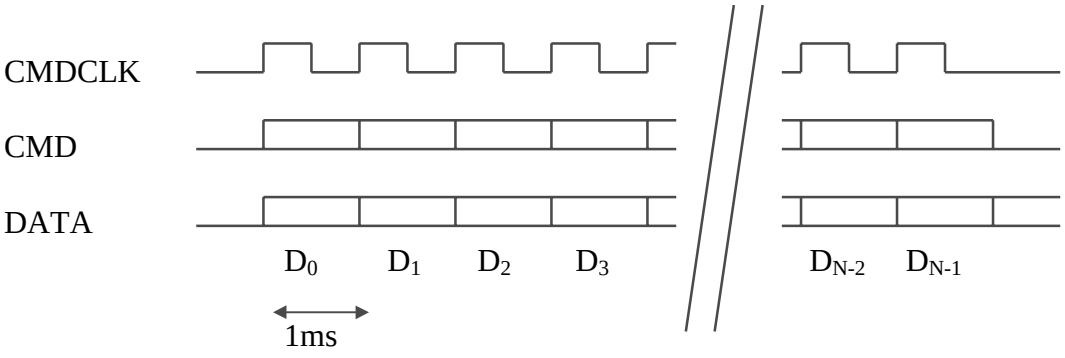
LIDAR will provide MM with a regulated +5V±10% supply at a nominal 30mA, plus a clean reference +5V±5% supply at less than 1.5mA, with less that 10mV peak-to-peak noise.

3. Electrical Interface

The signal interface between LIDAR and MM shall consist of a bi-directional serial digital interface. The signals will operate at CMOS digital levels (0V is logic 0, 5V is logic 1). The serial interface from LIDAR to MM shall be used for sending time codes, mode settings (forwarded from the ground), and requests for telemetry blocks. The serial interface from MM to LIDAR shall carry telemetry blocks on demand to be transferred to the spacecraft.

3.1 Serial Interface Timing

The LIDAR to MM interface shall consist of 3 signals with timing shown below:



CMDCLK and CMD signals are generated by the LIDAR. DATA is generated by MM. MM shall sample CMD shortly after the rising edge of CMDCLK, and change DATA to the next bit of telemetry at that time. CMD and DATA are transferred Least Significant Bit (LSB) first.

3.2 Commands

Commands are transferred in groups of 8 bit 'Bytes'. Each command message shall contain the following six bytes:

Byte 0	Sync Byte, value AA hex
Byte 1	Command Code
Byte 2	Command Data Byte 1
Byte 3	Command Data Byte 2
Byte 4	Command Data Byte 3
Byte 5	Sync Byte, value 0F hex

With the following command codes:

Code	Function	Description
01	Time	The three Command Data Bytes contain a time code with one second resolution. This code is sent one to 9 seconds after the MM is turned on. The three bytes of time code is sent least significant byte first, and consists of a binary counter which counts seconds from a TBD epoch which can be converted to UT on the ground.
02	Mode	Change the MM instrument Mode to the value in Command Data Byte 1 Command Data Byte 2 & 3 unused.
03	Send Data	Request that the MM send one telemetry block. Command Data bytes 1, 2 & 3 unused.
04	Shut Down	Sent about 5 seconds before MM is turned off Command Data bytes 1,2 & 3 unused.

CMD will be ignored until a valid Sync Byte pattern is received. It is expected that CMD will be held low except when a command is being sent.

3.3 Telemetry

Telemetry is sent in response to a 'Send Data' command from LIDAR. The first bit of the telemetry shall be put onto the DATA line shortly after the first rising edge of CMDCLK after the end of the Send Data command. Telemetry is transferred Least Significant Bit (LSB) first, in groups of 8 bit Bytes. A Telemetry Block shall consist of 2047 Bytes sent together in response to a single Send Data command. Each block shall contain the following:

Byte 0	Sync byte, with value AA hex
Byte 1	Sequence Byte; this byte is a block sequence counter that increments each block sent.
Byte 2	MM instrument mode at the time the packet was sent (a copy of the byte sent in the Mode command).
Byte 3-2045:	These are MM telemetry data, including identifying information like time stamps and instrument status in a TBD format.
Byte 2046:	Sync byte, value BB hex

DATA will be set to zero after the last bit of the telemetry block has been sent, and will remain zero until a new Send Data command is received.

Telemetry will be collected in complete blocks. Telemetry rate depends on the operation mode of the LIDAR, typically about 20Kbytes (10 blocks) a day when MM is on.

4. Connector Definition

The MM will include a 20cm harness to connect to LIDAR, terminated in a 9 pin female Cannon Micro-D connector, type ST12018-9T26 or equivalent. Berkeley will provide the connector and its mate. The connector pin-out will be as follows:

Pin	Source	Signal
1	LIDAR	+5V digital power
2	LIDAR	Ground
3		Spare
4	LIDAR	CMDCLK
5	LIDAR	CMD
6		Spare
7	MM	DATA
8	LIDAR	+5V analog power (reference)
9		Overshield (connected to chassis ground in MM and LIDAR)

5. Schedule

The following is the preliminary schedule of deliveries:

TBD June, 2 Days before LIDAR interface test at JPL, at Planetary Society:

Interface test of breadboard Microphone with LIDAR (electrical signal test unit, plus a mechanical fit check unit). Unit to be accompanied by Dave Curtis for two days of tests to verify interface

30 July, delivery to IKI:

Qualification Unit, for environmental tests

1 October, delivery to IKI:

Flight Unit