

How to make commands for BIRDS-4 missions

V0

May 24, 2021

Command line

- BIRDS-4 uses 11 bytes to send commands to our satellites

• **03 00 35 00 00 10 00 01 00 00 01**

Satellite ID
01-Guaranisat-1
02-Maya-2
03-Tsuru

For
commands
directed to
COM PIC
(like CW
shut-up
command)

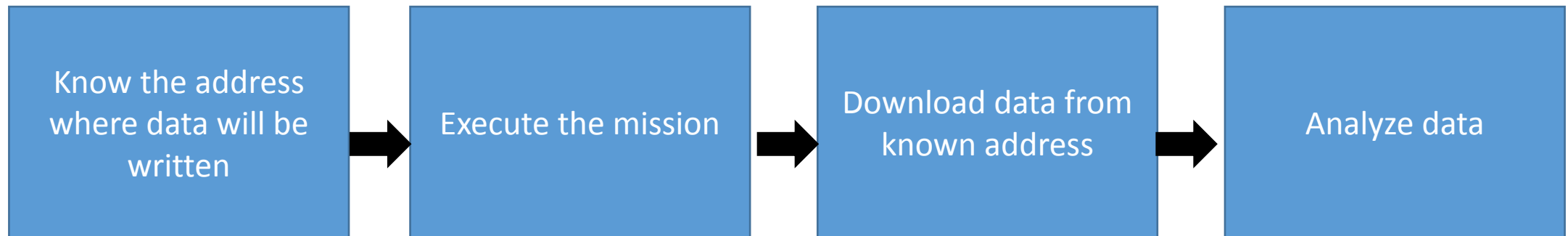
A0: Commands directed to main PIC
35: DL Data from COM shared flash
27: DL Data from COM local flash

Command
mode

Reservation
timer (in
minutes)

Other
mission
specific
commands

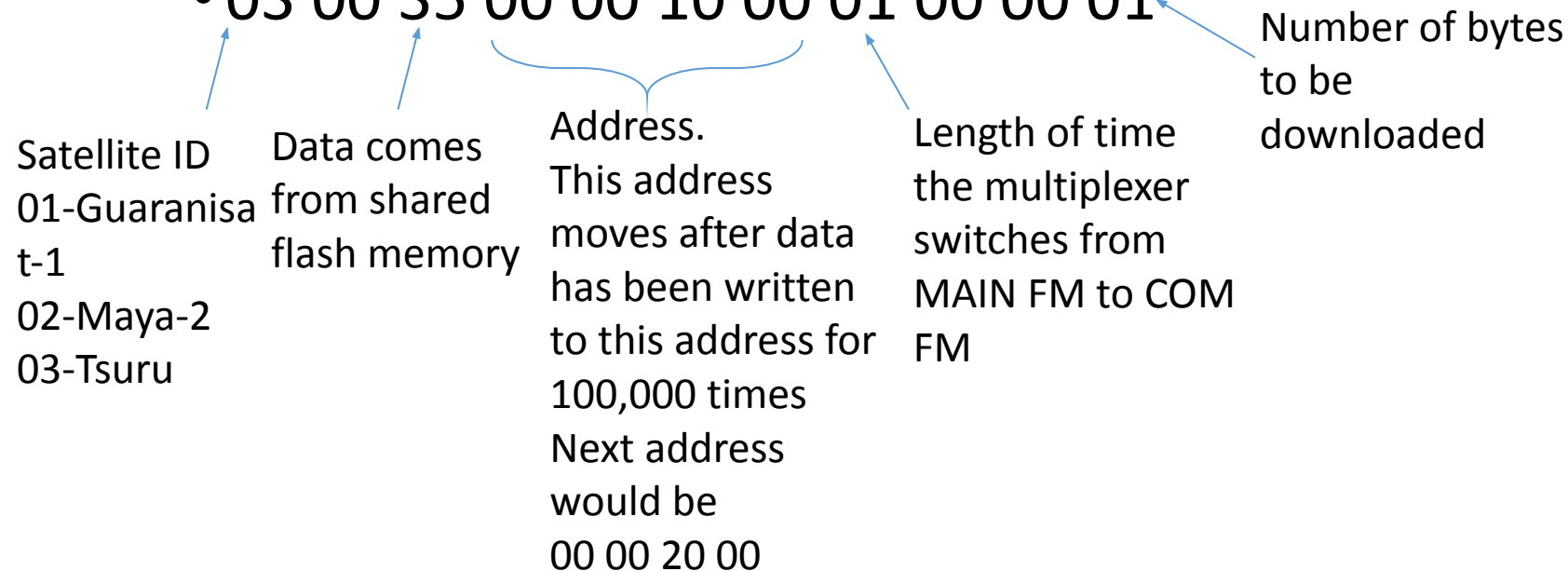
Flow of mission



Knowing address of data

- For missions that have data to be downloaded, Data address must be determined first prior to mission execution. After mission is executed, if mission execution was executed, the data address should move.
- For CAM/HK/HSSC/CW/Satellite log this is the command:

• 03 00 35 00 00 10 00 01 00 00 01



Knowing address of data

- You would receive something like this

C0 00 4A 47 36 59 42 57 30 4A 47 36 59 4D 58 30 3E F0 FF F0 FF 00 00
01 00 04 00 00 00 05 00 00 00 06 00 4D 00 20 00 00 00 D3 16 9C 04 4E
8F 5D 04 72 00 00 06 66 00 00 06 76 36 60 01 00 00 EA 6D FF FF FF FF
FF
FF FF FF FF FF FF FF FF FF FF FF FF C0

Data Header

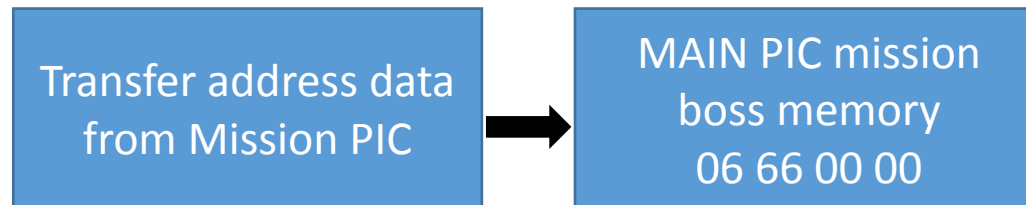
These are the
address data

Knowing address of data

- Addresses Data: 00 04 00 00 / 00 05 00 00 / 00 06 00 4D / 00 20 00 00 / 00 D3 16 9C / 04 4E 8F 5D / 04 72 00 00 / 06 66 00 00 / 06 76 36 60
- Actual pointer addresses according to data downloaded
- FLAG DATA: 00 04 00 00
- RSV TABLE: 00 05 00 00
- SAT LOG: 00 06 00 4D
- CAM: 00 20 00 00
- HK: 00 D3 16 9C
- CW: 04 4E 8F 5D
- ADCS: 04 72 00 00
- MISSION BOSS: 06 66 00 00
- HIGH SAMPLING: 06 76 36 60

Knowing address of data

- For SFWARD, PSC, NTU, TMCR



*For SFWARD mission, another transfer has to be done from SFWARD (MB2) to Mission PIC

- For transferring address info from Mission PIC to Main PIC this is the command:

• 03 00 35 D0 00 XX XX XX XX 00 01

Transfer
command

Mission address

Number of
packets to be
transferred

Mission Address:
PSC: 00 00 00 00
TMCR: 02 AA FD 57
NTU: 04 00 FC 00
SFWARD: 05 55 FA AB

Knowing address of data

- After transferring, wait at least 15 seconds before downloading the data using the:

- 03 00 35 06 66 00 00 01 00 00 01

Download
command

Mission boss
address in Main PIC

Time of
multiplexer
switch

Number of
packets to be
downloaded

- You should receive something like this:

- C0 00 4A 47 36 59 42 57 30 4A 47 36 59 4D 58 30 3E F0 FF F0 FF 00 00 01 00
01 28 FD FF
FF
FF C0

These are the
address data

Execute mission

- Now that you know where your data will be stored, you can now send the command to execute the missions
 - For Mission boss related mission, to turn them OFF/deactivate:
 - 03 00 A0 D~~X~~ 00 ~~A0~~ 00 00 00 00 00 00
- Mode of mission: A0 – turn OFF

Mission ID:

D0 – Transfer data

D1 – PSC

D2 – TMCR

D3 – NTU

D4 – SFWARD

D5 – HNT

D6 – ARBS

Execute mission: PSC

03 00 A0 D1 00 A1 00 00 00 00 00

- A1 – activate mission
- Dictate time before next measurement – usually just 00 01

03 00 A0 D1 XX A1 00 01 00 00 00

- PSC will continue measuring until stop/turn-of command is sent. So “Turn OFF command” should be scheduled after sending “activate command”

03 00 A0 D1 XX A0 00 00 00 00 00

- Take note of when the satellite is under sun light and eclipse when activating and deactivating PSC

Execute mission: TMCR

03 00 A0 D2 00 AX 00 00 00 00 00

- A1 – mode 1: measures device 1 every 30 minutes and device 2 and 3 after 1 hour
- A8 – mode 8: user defines period of measurement
- usually use A8 mode with period of measurement as 20 minutes (00 14)

03 00 A0 D2 XX A8 00 14 00 00 00

- TMCR will continue measuring until stop/turn-of command is sent. So “Turn OFF command” should be scheduled after sending “activate command”

03 00 A0 D2 FF A0 00 00 00 00 00

- We want to run the mission as often as possible to allow degradation of the device to happen
- Best time would be between 1st pass and 2nd pass of each day

Execute mission: NTU

03 00 A0 D3 00 AX 00 00 00 00 00

- A1 – mode 1: activates mission indefinitely
- A2 – mode 8: user defines period of measurement
- usually use A1 mode

03 00 A0 D3 00 A1 00 00 00 00 00

- NTU device is activated until stop/turn-of command is sent.
- NTU is interrupt based program so it affects the Mission boss operation when activate. “Turn OFF command” should be sent if MB related command is to be executed
- We want to run the mission as often as possible to have better chances of latch-ups happening
- Best time would be between end of 2nd pass of each day

Execute mission: SFWARD

03 00 A0 D4 00 AX 00 00 00 00 00

- A1 – activates mission user defines how long payload is activated
- A2 – transfer data from SFWARD memory to MB user defines address of data

03 00 A0 D4 00 A1 00 0F 00 00 00

- Activate during duration of pass. If goal is to allow other nations to access payload, time can be lengthened or delay can be added.

Execute mission: High sampling

03 00 A0 FA 00 XX 00 00 00 00 00

- FA – activates mission user defines how long HSSC is done. Time is double the defined value

03 00 A0 FA 00 32 00 00 00 00 00

- Usually run for 100 minutes

Execute mission: CAM

03 00 A0 C0 00 XX 00 00 00 00 00

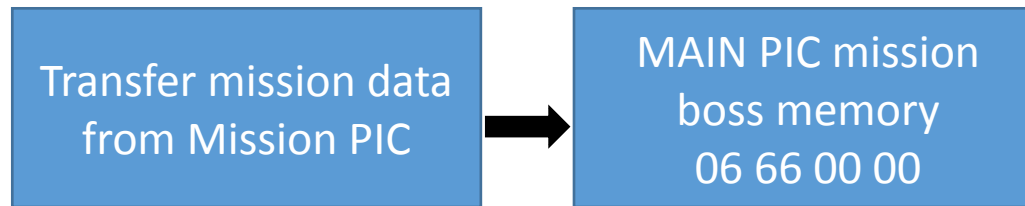
- A0 – 320x240 high compression, A1 – 320x240 mid compression, A2 – 320 x240 low compression
- B0 – 640x480 high compression, B1 – 640x480 mid compression, B2 – 640x480 low compression
- C0 – 1280x960, C1 – 2560x1920

03 00 A0 C0 00 XX 00 00 00 00 00

- Decide on what area to photograph and define time of delay

Downloading data: SFWARD, PSC, NTU, TMCR

- Transfer data from Mission PIC to Main from known Data address



*For SFWARD mission, another transfer has to be done from SFWARD (MB2) to Mission PIC

- For transferring data from Mission PIC to Main PIC this is the command:

03 00 35 D0 00 XX XX XX XX ZZ ZZ

Transfer
command

Mission data address

Number of
packets to be
transferred

Downloading data: SFWARD, PSC, NTU, TMCR

- Send Download data command

03 00 35 06 66 00 00 01 00 ZZ ZZ

- You can download again the address pointer to know how much data should be transferred/downloaded for each mission
- Usually the MUX timer is set to 1 minute and 50 packets (0x32) is downloaded
- Remember: you cannot send other command to Main PIC, aside from download again. You need to wait for MUX timer to expire before next command is sent

Downloading data: HSSC and CAM

03 00 35 XX XX XX XX 01 ZZ ZZ

Mission data address

Number of
packets to be
downloaded



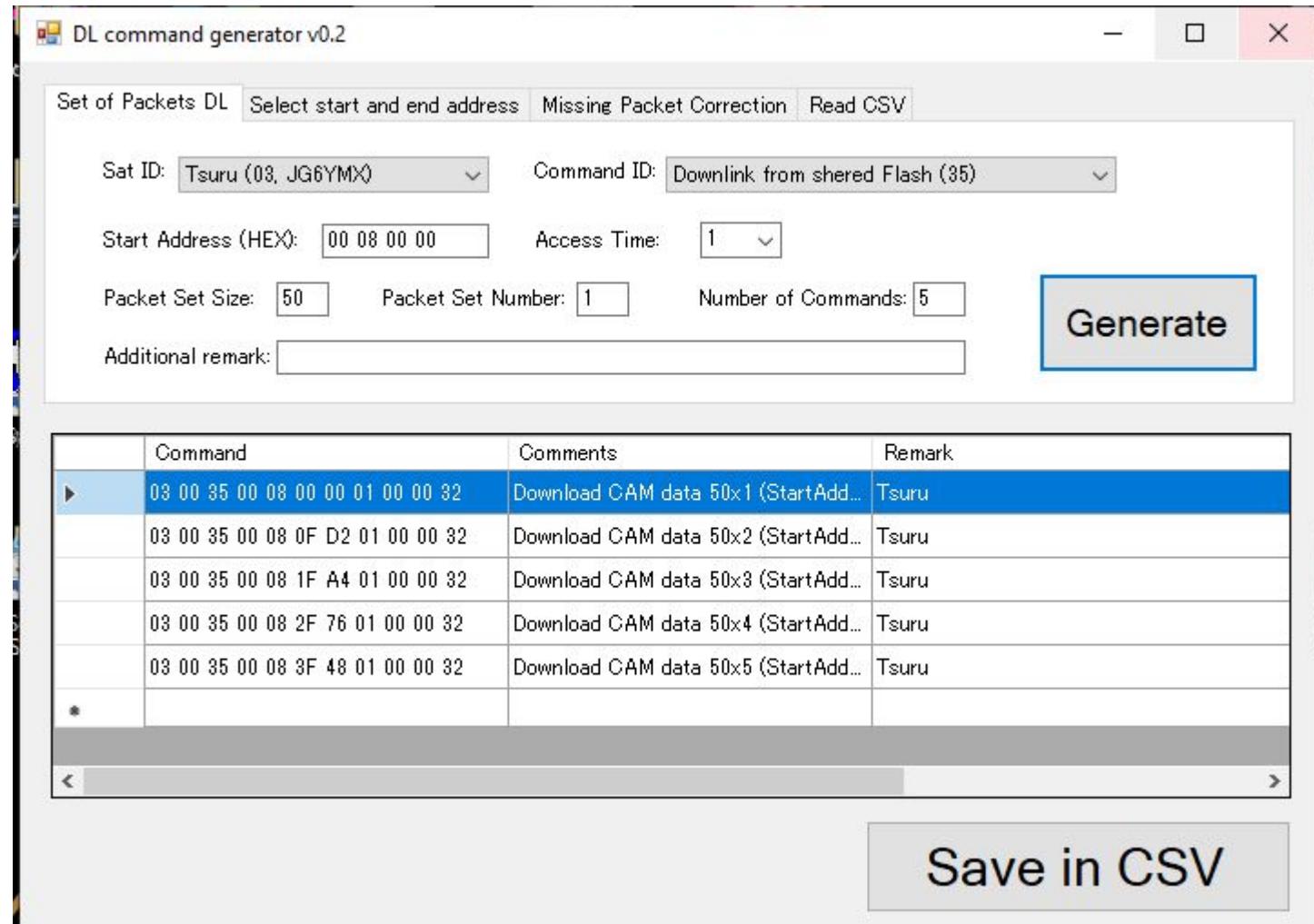
- To help in writing the commands for download, the DL command generator software can be used

A screenshot of the "DL command generator v0.2" software interface. The window has a title bar and standard Windows controls. It features several tabs: "Set of Packets DL", "Select start and end address", "Missing Packet Correction", and "Read CSV". The "Set of Packets DL" tab is active. Inside, there are input fields for "Sat ID" (a dropdown menu), "Command ID" (a dropdown menu showing "Downlink from shered Flash (35)"), "Start Address (HEX)" (a text box with four dashes), "Access Time" (a dropdown menu showing "5"), "Packet Set Size" (a text box with "50"), "Packet Set Number" (a text box with "1"), and "Number of Commands" (a text box with "5"). There is also an "Additional remark" text box. A "Generate" button is located to the right of these fields. Below the input fields is a table with four columns: "Command", "Comments", and "Remark". The table has one row with an asterisk in the first column. At the bottom right of the window is a "Save in CSV" button.

Command	Comments	Remark
*		

Downloading data: HSSC and CAM

You can save the CSV
and copy+paste the
commands to the
command list



The image shows a software window titled "DL command generator v0.2". It has a tabbed interface with "Set of Packets DL" selected. Below the tabs are input fields for "Sat ID" (Tsuru (03, JG6YMX)), "Command ID" (Downlink from shered Flash (35)), "Start Address (HEX)" (00 08 00 00), "Access Time" (1), "Packet Set Size" (50), "Packet Set Number" (1), and "Number of Commands" (5). There is an "Additional remark" text box and a "Generate" button. Below these is a table with 4 columns: Command, Comments, and Remark. The table contains 5 rows of data for downloading CAM data. At the bottom right is a "Save in CSV" button.

Command	Comments	Remark
03 00 35 00 08 00 00 01 00 00 32	Download CAM data 50x1 (StartAdd...	Tsuru
03 00 35 00 08 0F D2 01 00 00 32	Download CAM data 50x2 (StartAdd...	Tsuru
03 00 35 00 08 1F A4 01 00 00 32	Download CAM data 50x3 (StartAdd...	Tsuru
03 00 35 00 08 2F 76 01 00 00 32	Download CAM data 50x4 (StartAdd...	Tsuru
03 00 35 00 08 3F 48 01 00 00 32	Download CAM data 50x5 (StartAdd...	Tsuru

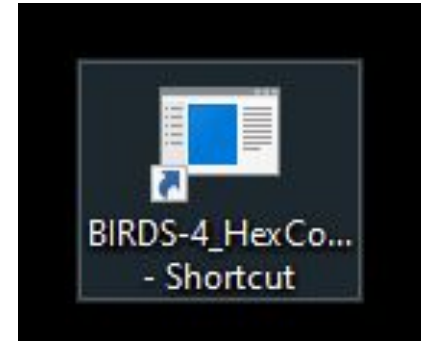
Missing packets














- When missing packets happen, decide whether to just download the whole set again or the missing packets.
 - If the number of missing packets commands is greater than 10, it might be better to just send the download command again
- If your operation has missing packets, don't forget to put the DL missing transfer commands to next operation

Analyzing data

- After data is completed ('FFs' are found), process the data using the hex combiner
- After completing the data set for a mission, save them on the folder with starting address indicated

Ham OP repos>operation data



	CAM	2021/05/26 16:28	File folder
	CW	2021/03/30 2:29	File folder
	CW auto receive script	2021/04/01 22:54	File folder
	EM test with BIRDS5 board	2021/05/10 0:19	File folder
	HK	2021/03/17 20:09	File folder
	HSSC	2021/03/17 20:09	File folder
	LOG	2021/03/17 20:09	File folder
	March 2021	2021/04/17 16:13	File folder
	NTU	2021/03/17 20:10	File folder
	PSC	2021/05/17 5:27	File folder
	SFWARD	2021/03/17 20:09	File folder
	TMCR	2021/03/17 20:09	File folder
	~	2021/05/26 16:28	File folder