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)

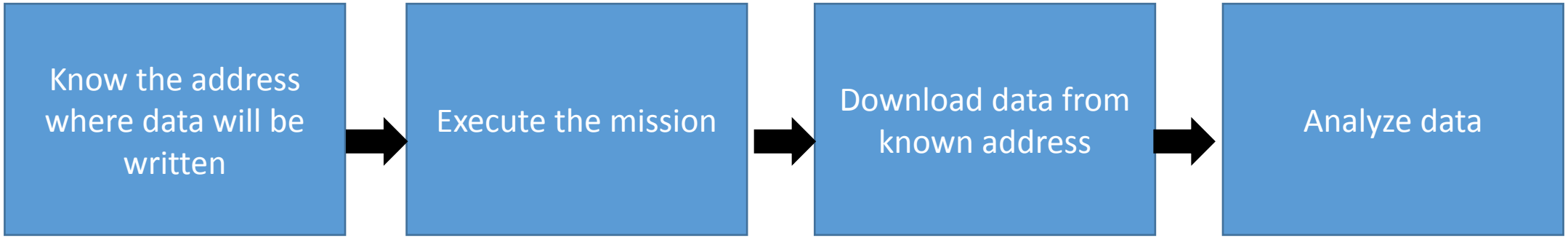
A0:Commands directed to main PIC
35: DL Data from COM shared flash
27: DL Data from COM local flash

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

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

Data comes from shared flash memory

Address.
This address moves after data has been written to this address for 100,000 times
Next address would be
00 00 20 00

Length of time the multiplexer switches from MAIN FM to COM FM

Number of bytes to be downloaded

Knowing address of data

Data Header

- 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 FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF C0

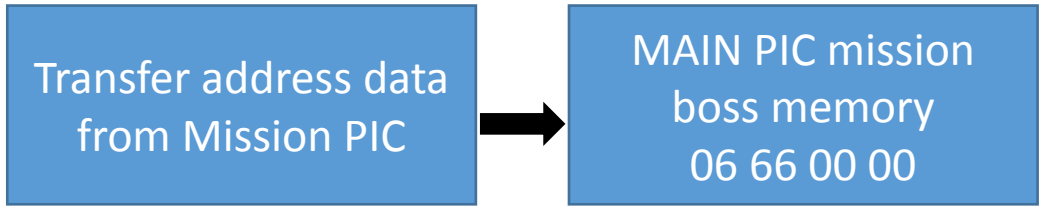
These are the address data

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 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 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 DX 00 A0 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 – APRS

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

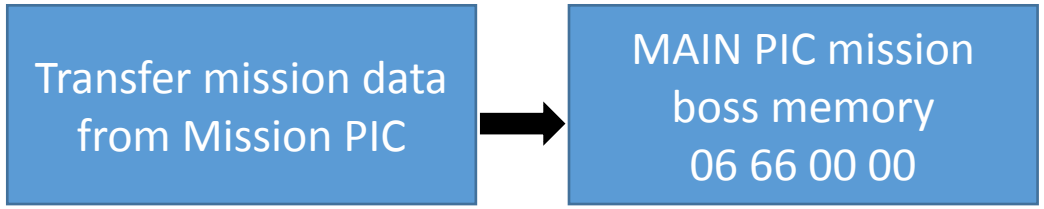
- A0 – 320x240 high compression, A1 – 320x240 mid compression, A2 – 320 x240 low compression
- B0 – 640x480 high compression, B1 – 640x480 mid compression, B2 – 640x480 low compression
- C0 – 1280x960, C1 – 2560x1920

03 00 A0 C0 00 XX 00 00 00 00 00

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

Dowloading 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

Dowloading 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

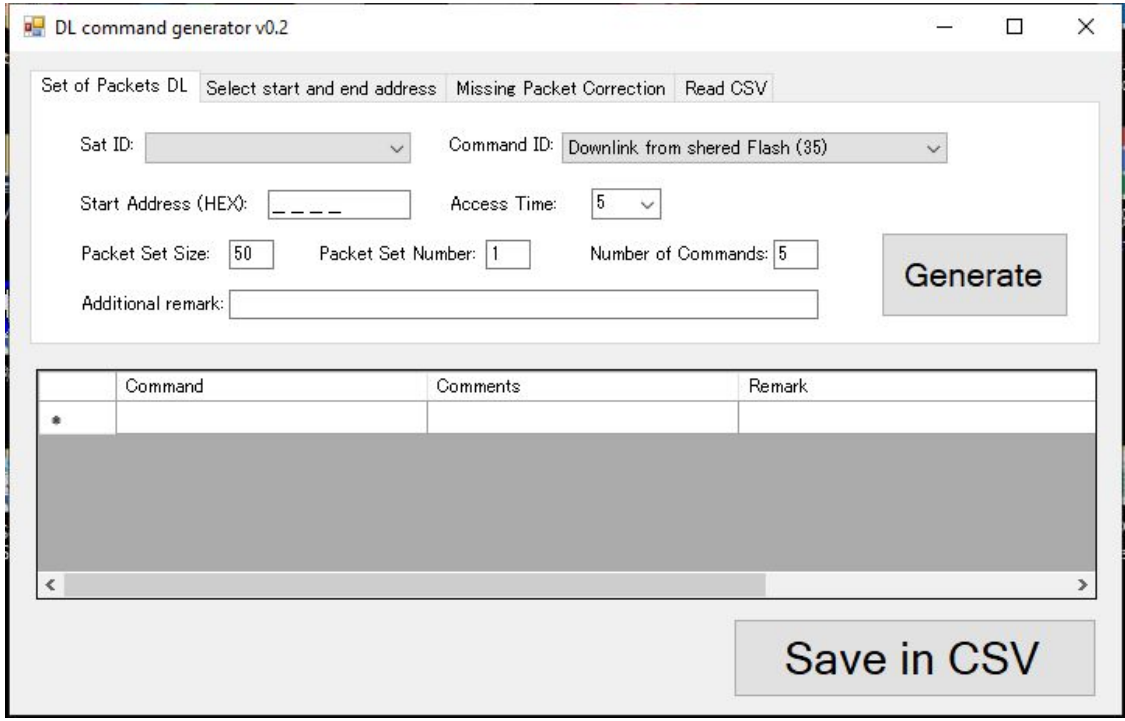
Dowloading data: HSSC and CAM

03 00 35 XX XX XX XX 01 ZZ ZZ

Mission data address

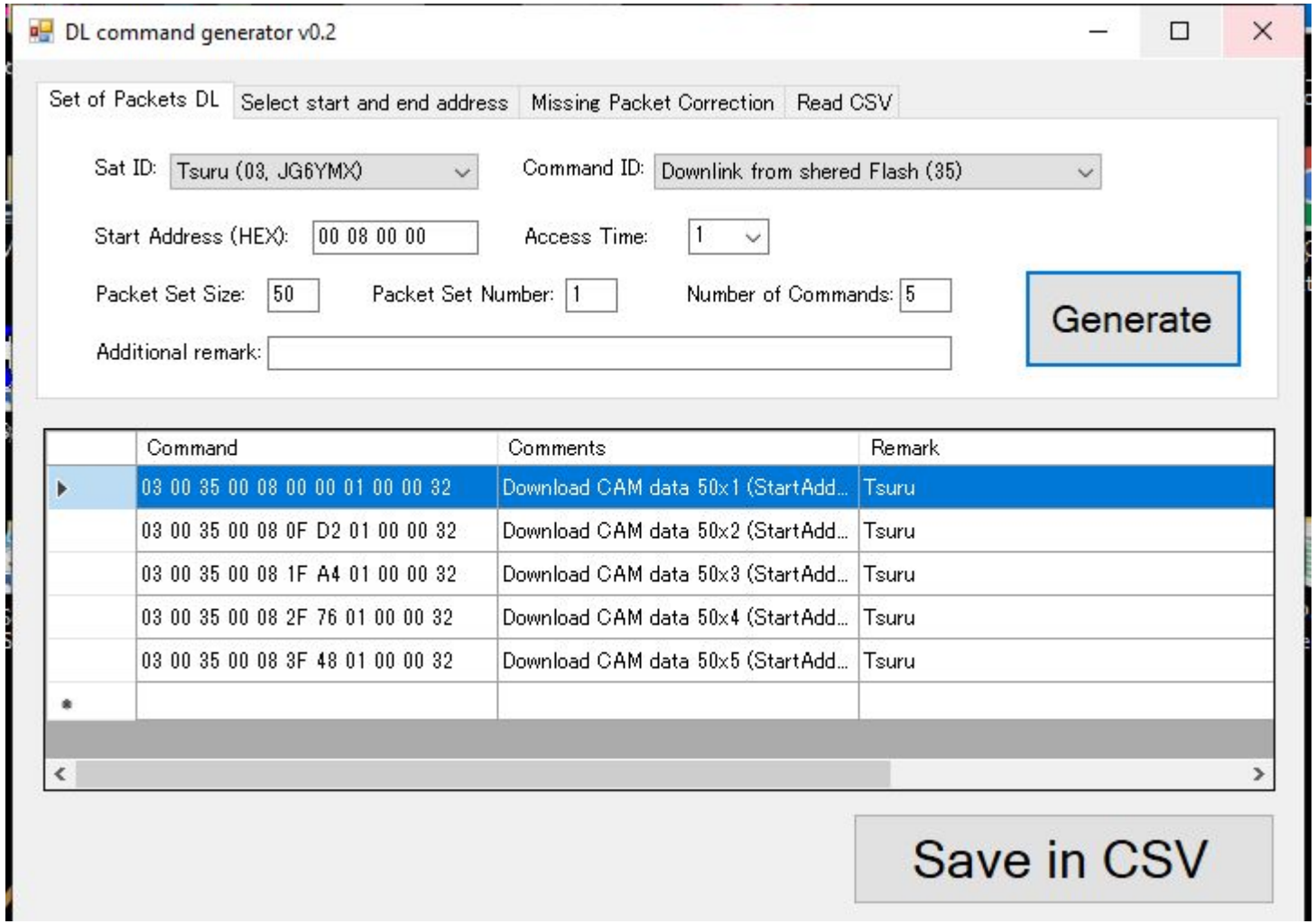
Number of packets to be downloaded

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



Dowloading data: HSSC and CAM

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

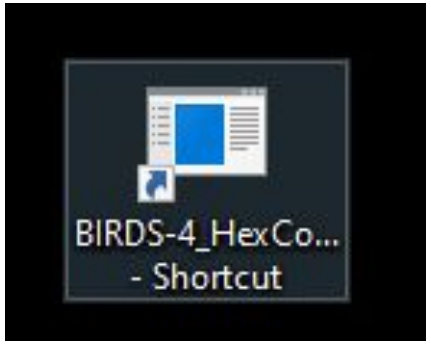


Missing packets

- 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