FS83 sFAM serial command description 2.2
(FW 83.04A or above)

31-March-2023

<u>What's new in this release:</u>

1. Change "Convert image to JPEG "command from 0x51 to 0x36

Changes are in blue color.

A. General guideline

StartByte	Command Byte	Param1	Param2	Error/Flag	CheckSum	StopByte
1byte	1byte	4byte	4byte	1byte	1byte	1byte

1. Start code: 1 byte. Indicates the beginning of a packet. 0x40, corresponding to '@.'
2. Command: 1 byte. Refer to the Command Table in a later chapter of this document.
3. Param1: 4 bytes. Indicates User ID or system parameters.
4. Param2: 4 bytes. Indicate User ID (2 bytes), Finger ID (FID) and Group ID (GID) or the size of binary data following the command packet such as fingerprint templates or images.
5. Error/Flag: 1 byte. Indicates flag data in the request command sent to the module, and error code in the response command received from the module, respectively.
6. Checksum: 1 byte. Checks the validity of a packet. Checksum is a remainder of the sum of each field, from the Start code to Error/Flag, divided by 256 (0x100).
7. End code: 1 byte. LF ('\n', 0x0D). Indicates the end of a packet. Also used as a code indicating the end of a binary data such as fingerprint templates.

COM port parameters:
115200, 8bit, 1 stop bit, no parity, no handshaking

Sample – minutia list from one fingerprint image.
Template – user data in data base (each template consists 1..10 samples)

Note: Whole 13-byte data should be sent from host before sending extra data. i.e. D5, D7, D14
Whole 13-byte data should be received by host before receiving extra data. i.e. D2-4,D11-13

Following is the location of FID and GID in Param2 (Least Significant Byte first). **The location of FID and GID should be correct**. Otherwise, there may be malfunction.

LSB MSB

Param1				Param2			
User ID	User ID	User ID	User ID	User ID	User ID	FID	GID

i.e. If User ID is 0x0B0A12345678, Group ID is 0x90 and FID is 0x01, the sequence of Param1 and Param2 will be:
0x78,0x56,0x34,0x12,0x0A,0x0B,0x01,0x90

B. Basic commands for fingerprint registration and recognition

1. Check finger

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x4B	0x00000000	0x00000000	0x00	Check and inform host if there is finger on the scanning window
Return to Host	0x00 Last Dosage Number(1,47,36)	Contrast value	0x00000000 (Can have some debug information)	0x40 (if finger is) 0x41(if there isn't finger)	

2. Capture fingerprint image

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x49	0x00000000 0x00000008 (PIV)	0x00000000	0x00	Image of existing on a window finger is stored to FAM's RAM
Return to Host	Final Dosage Number (1…255)	Contrast value	Number White pixels	0x40 (0x41)	

If the Param1 of the command = 0x00000008, it is use to capture a PIV image;

3. Process the captured fingerprint image

	Code of command	Param1	Param2	Flag/Error	Description

Request from Host	0x50	0x00000000	0x00000000	Bit[0]==1/0-make/don't make SDK3.5 sample;
				Bit[1]== 0/1-make/don't make SDK3.0 sample;
				Bits[2..7] –reserved, must set to 0;
					Process image to sample

Return to Host	0xXX	0x00000000	0x00000000	0x40 (0x42,0x43)	

4. Find the fingerprint of an ordinary user (1 to 1 matching)

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x52	User ID	User ID , 0x0000	0x00	Compare current sample with ID template
Return to Host	(Result>>2)	User ID	User ID , FID and GID	0x40 (0x4d,0x45)	

This function used for compare RamSlotN = 1;

5. Find the fingerprint of a VIP user (1 to many matching)

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x52	0x00000000	0x00000000	0x01	Compare current sample with VIP users templates database
Return to Host	(Result>>2)	User ID	User ID ,FID and GID	0x40 (0x4d,0x45)	

This function used for compare RamSlotN = 1;

6. Compare current sample with template in RAM

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x52	RamSlotN	0x00000000	0x02	Compare current sample with template in RAM
Return to Host	(Result>>2)	0x00000000	0x00000000	0x40 (0x45)	

RamSlotN must be in range 0..3.

7. Compare two templates in RAM

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x52	RamSlotN_0	RamSlotN_1	0x03	Compare two templates in RAM
Return to Host	0x00	0x00000000	0x00000000	0x40 (0x45)	

RamSlotN_# must be in range 0..3.

Security level is minimal between Global Secure Level and Secure level from RamSlotN_0.

When this function is used, current sample (from function Process image to sample) will be lost.

8. Find the fingerprint in group (1 to many matching)

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x52	0x00000000	GID	0x05	Compare current sample with GID
Return to Host	(Result>>2)	User ID	FID and GID	0x40 (0x4d,0x45)	

This function used for compare RamSlotN = 1

9. Store the fingerprint template to FAM flash memory

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x41(with Smart Sample Selection), 0x58(without Smart Sample Selection)	User ID	User ID ,FID and GID	#bXxxxXXXX	Storage template to FAM flash memory
Return to Host	0x00	User ID	User ID ,FID and GID	0x40 (0x46) (0x4e)	

User ID must be in range 0.. 0xFFFFFFFFFFFF.

Flag

bit[1:0]	- security level for individual user(0 - minimum,1,2,3 - maximum);
bit[2]	- VIP / ordinary user: if bit[2] ==1 – VIP, bit[2] == 0 ordinary;
bit[3]	- Suspend user. If bit[3]==1 – User suspended by matching(return error RESULT_USER_SUSPENDED). If bit[3]==0, normal
bit[4..6]	- reserved for future use;
bit[7]	- if bit[7] == 0, then template add to database with ID, security level, VIP/ordinary, as set in current command;
bit[7]	- if bit[7] == 1, then template stored with default parameters (use this bit equal one only after command “Upload individual template”) and ID, security level, VIP/ordinary, in current command ignored;

This function used for source template RamSlotN = 0;

10. Store the sample in FAM RAM

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x53	Sample N	0x00000000	0x00	Store current sample in RAM
Return to Host	0xXX	Sample N	0x00000000	0x40	

Sample N is reserved in range 0..9. The number of samples depends on fingerprint features.

This function used for target RamSlotN = 0;

11. Cancel/Escape

	Code of command	Param1	Param2	Flag/Error	Description
Request from Host	0x4C	0x00000000	0x00000000	0x00	Escape from current sequence
Return to Host	0x00	0x00000000	0x00000000	0x40	

You cannot interrupt command!

You can interrupt sequence (Add user sequence or Recognize sequence) after any command without use this command.

C. System administration commands

1. Get hardware and firmware version number

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x00	0x00000000	0x00000000	0x00	Get version F/W,H/W
Return to Host	0x00	F/W low byte, 0x00, F/W high byte, 0x00	H/W low byte, F/W subversion byte, H/W high byte, 0x00	0x40	

2. Get free memory space of FAM's NAND flash memory

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x4F	0x00000000	0x00000000	0x00	Get free space.
Return to Host	0x00	Number of free pages	NAND page size	0x40	

3. Toggle the user status between VIP and ordinary user

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x47	User ID	UserID(2 bytes) 0x0000	#bxxxxXXXX	Toggle the user status between VIP and ordinary user
Return to Host	0xXX	User ID	UserID(2 bytes) 0x0000	0x40 (0x4D) (0x47)	

User ID must be in range 0.. 0xFFFFFFFFFFFF (FID and GID ignored, status will changed for all Finger ID in current User ID).

Flag

bit[1:0]	- security level for individual user(0 - minimum,1,2,3 - maximum);
bit[2]	- VIP / ordinary user: if bit[2] ==1 – VIP, bit[2] == 0 ordinary;
bit[3]	- suspend user: if bit[3]==1 – suspend, bit[3]==0 – normal;
bit[4..7]	- reserved for future use;

4. Set security level for all users

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x4A	Security level(0..3)	0x00000000	0x00(for get level only) 0x01 (for change level and write it to flash)	Set/get security level for all users.
Return to Host	0x00	Security level(0..3)	Threshold (100...500)	0x40	

0 – minimum, 3 – maximum(default).

D. Data manipulating commands

1. Erase all templates.

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x45	N/A	N/A	0x00	NAND flash is erased and host is informed about number of free 528 bytes pages
Return to Host	0x00	Number of free pages	N/A	0x40	

2. Download RAW image (320x480)

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x44	OffSet	Length	0x00	Raw image is sent from FAM to host
Return to Host	0x00	0x00000000	Length	0x40	

If(OffSet == 0)

+ Line0(320bytes) + Line1(320bytes) +.....(depends of length) ..+ CheckSum + 0x0D; (to Host)

3. Download image in JPEG format(320x480)

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x43	0x00 (Quality default is 17), or set manually	0x00000000	0x00	Raw image is converted to JPEG and send it to host
Return to Host	0x00	0x00000000	Length	0x40	

If(Flag == 0x40) Length bytes + CheckSum + 0x0D; (to Host)

4. Convert image to JPEG format(320x480)

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x36	0x00 (Quality default is 17), or set manually	0x00000000	0x00	Raw image is converted to JPEG (please use command 0x44 for download it)
Return to Host	0x00	0x00000000	Length	0x40	

5. Download individual template

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x54	User ID, (Not used if Flag==0x01)	User ID ,FID and GID (Not used if Flag==0x01)	0x00 (With ID), 0x01 (Without ID; Download current (raw) template)	Template with (without) ID is sent from FAM to host
Return to Host	0x00	0x00000000	Length	0x40, 0x4D, 0x47	

+ Byte0 .....Byte(length-1) ..+ CheckSum1 + 0x0D;

This function used RamSlotN = 1 (If Flag = 0), RamSlotN = 0 (If Flag = 1);

6. Download current sample

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x4d	0x00000000	0x00000000	0x00, 0x01, 0x08, 0x18	Send current sample to host
Return to Host	0x00	0x00000000	Length	0x40	

+ Byte0 + Byte1+..... Byte(Length-1) + CheckSum1 + 0x0D;

If (Flag==0x00) Length = 664bytes; If (Flag==0x01) Length = 582bytes;

Flag = 0x08 (least 4 bits of flag 0..3) – download current sample in different format, bits[4] is format(0 –SDK 3.0; 1 – SDK 3.5)

i.e. For SDK3.0 format, Flag=0x08 (When process image(see B.3), the command flag should be 0x00)

For SDK3.5 format, Flag=0x18(When process image(see B.3), the command flag should be 0x03)

7. Upload current sample

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x4d	0	Length	0x02, 0x03, 0x0A, 0x1A	Receive sample from host
	+ Byte0 .....Byte(length-1) ..+ CheckSum1				
Return to Host	0x00	0x00000000	0x00000000	0x40, 0x47, 0x49, 0x4A	

If (Flag==0x02) Length = 664bytes; If (Flag==0x03) Length = 582bytes;

Flag = 0x0A (least 4 bits of flag 0..3) - download current sample in different format, bits[4] is format(0 –SDK 3.0; 1 – SDK 3.5)

i.e. SDK3.0 format, flag=0x0A. SDK3.5 format, flag=0x1A

8. Load individual template from Flash to RAM

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x54	User ID	User ID ,FID and GID	0x02 (RamSlotN = 0), 0x03 (RamSlotN = 1), 0x04 (RamSlotN = 2), 0x05 (RamSlotN = 3),	Template with ID is loaded from flash to RAM
Return to Host	0x00	0x00000000	0x00000000	0x40, 0x4D,0x47	

9. Upload individual template

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x55	RamSlotN	Length	0x00	Template sent from host to FAM
	+ Byte0 .....Byte(length-1) ..+ CheckSum1				
Return to Host	0x00	0x00000000	0x00000000	0x40, 0x49, 0x4A	

RamSlotN must be in range 0..3.

If you will use command Store the fingerprint template to FAM flash memory after this command please set RamSlotN = 0.

10. Erase individual template

	Code of command	Param1	Param2	Flag	Description

Request from Host	0x48	User ID	User ID ,FID (if Flag==0, ignored)	0x00(all FID in UserID);
				0x01(one FID)
					Erase individual template

Return to Host	0x00	0x00000000	0x00000000	0x40 (0x4D)	

User ID must be in range 0.. 0xFFFFFFFFFFFF.

11. Change communication baud rate

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x39	0x00000001 – 9600, 0x00000005 – 115200, 0x00000007 – 460800	0x00000000	0x00	Change communication rate
Return to Host	0x00	0x00000001 – 9600, 0x00000005 – 115200, 0x00000007 – 460800	0x00000000	0x40	

0 – 4800; 1 - 9600 ; 2 – 19200 ; 3 – 38400 ; 4 - 57600 ; 5 – 115200 ; 6 – 230400 ; 7 – 460800 ; 8 – 921600.

12. Software reboot

	Code of command	Param1	Param2	Flag	Description
Request from Host	0xFF	0x00000000	0x00000000	0x00	Reboot from flash memory.
Return to Host	0x00	0x00000000	0x00000000	0x40	

Reboot start after send response to host.

13. Get number Users (Templates) in Database

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x57	0x00000000	0x00000000	0x00	Get number Users in DataBase
Return to Host	0x00	Number Templates in database	Number of VIP Templates in database	0x40	

14. Download User List

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x57	0x00000000	0x00000000	0x01	Download User List.
Return to Host	0x00	Number Templates in database	Length in bytes	0x40	

- bytes0 + bytes1 +.....(depends of length) ..+ CheckSum1 + 0x0D;
- 12 bytes per template:
- bytes[0..7] – UserID+FID+GID; byte[8] – Flag byte; bytes[9..11]-reserved.

15. Get User information

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x2D	User ID	User ID, 0x0000	0x00	Get Users information from DataBase
Return to Host	User type #bxxxxXXXX	Fingers present(if corresponding bit set – finger present in DB)	User ID ,FID and GID	0x40, 0x4D	

Please note: return to host User type, FID and GID from last template in DataBase.
User type
bit[1:0] - security level for individual user(0 - minimum,1,2,3 - maximum);
bit[2] - VIP / ordinary user: if bit[2] ==1 – VIP, bit[2] == 0 ordinary;
bit[3] - suspend user: if bit[3]==1 – suspend, bit[3]==0 – normal;
bit[4..7] - reserved for future use;

16. Download data from Boot flash

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x42	External flash Address	Length	0x00	Download data from boot flash.
Return to Host	0x00	External flash Address	Length	0x40	

+ bytes0 + bytes1 +.....(depends of length) ..+ CheckSum1 + 0x0D;

Length must be in range 0x00 ...0xFFFF;

17. Download data from External Memory Blackfin

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x0F	Address	Length	0x00	Download data from External RAM.
Return to Host	0x00	0x00000000	0x00000000	0x40	

+ bytes0 + bytes1 +.....(depends of length) ..+ CheckSum1 + 0x0D;

18. Upload data to External Memory Blackfin

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x0D	Address	Length	0x00	Upload data to External RAM
	+ Byte0 .....Byte(Length-1) ..+ CheckSum1				
Return to Host	0x00	0x00000000	0x00000000	0x40, 0x49, 0x4A	

19. Write firmware from RAM to flash.

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x10	Length	0x00000000	0x00	Write firmware
Return to Host	0x00	0x00000000	Number of successful writes bytes	0x40, 0x47	

20. Convert RAW to WSQ

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x36	Quality/ Bitrate	0x00000000	0x01	Convert RAW image to WSQ
Return to Host	0x00	0x00000000	Converted WSQ size	0x40, 0x41	

Quality/ Bitrate range is 0x4B to 0xFF.

21. Download WSQ

	Code of command	Param1	Param2	Flag	Description
Request from Host	0x0F	0x00000000	WSQ size	0x00	Download WSQ
Return to Host	0x00	0x00000000	Converted WSQ size	0x40, 0x41	

E. Error Codes

Code	Description
0x40	RESULT_OK
0x41	RESULT_NO_IMAGE
0x42	RESULT_BAD_QUALITY
0x43	RESULT_TOO_LITTLE_POINTS
0x44	RESULT_EMPTY_BASE
0x45	RESULT_UNKNOWN_USER
0x46	RESULT_NO_SPACE
0x47	RESULT_BAD_ARGUMENT
0x49	RESULT_CRC_ERROR
0x4A	RESULT_RXD_TIMEOUT
0x4D	RESULT_USER_ID_IS_ABSENT
0x4E	RESULT_USER_ID_IS_USED_ALREADY
0x4F	RESULT_VERY_SIMILAR_SAMPLE
0x54	RESULT_USER_SUSPENDED
0x55	RESULT_UNKNOWN_COMMAND
0x57	RESULT_INVALID_STOP_BYTE
0x58	RESULT_HARDWARE_ERROR
0x59	RESULT_BAD_TEST_OBJECT
0x5A	RESULT_BAD_FLASH
0x5B	RESULT_TOO_MANY_VIP
0x5D	RESULT_TOO_BIG_GROUP

END