



FORENEX FES4335U1 Graphics Control Module Owner's Manual

[Home](#) » [FORENEX](#) » FORENEX FES4335U1 Graphics Control Module Owner's Manual 

Contents

- [1 FORENEX FES4335U1 Graphics Control Module](#)
- [2 Revision histories](#)
- [3 General Description](#)
- [4 Pin Assignment](#)
- [5 Operation Specifications](#)
 - [5.1 Electrical specifications](#)
 - [5.2 Recommended operating condition](#)
 - [5.3 Hardware specification](#)
 - [5.4 Serial communication option \(1/2/3\)](#)
- [6 Software](#)
 - [6.1 Command \(Stream /Format /protocol\)](#)
- [7 Appendix \(Tips\)](#)
- [8 Documents / Resources](#)
- [9 Related Posts](#)

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FORENEX FES4335U1 Graphics Control Module



Revision histories

Rev. No.	Date	Substantial Changes
1.0	2017/01	First issue.
1.1	2022/02	1. Update communication option 1/2/3
		2. Showing FR-DCE and FR-E2S board

General Description

- FES4335U1-50C is a low cost, high efficiency and smart of TFT-LCD display control module which can provide characters or 2D graphics application within an embedded 768KB of display RAM.
- FES4335U1-50C offers serial interface (UART-TTL) to establish a hardware communication with an external simple MCU (as like 8051 etc.), and providing the “Commands Table” for graphical effect calling and execution.
- According to the “Commands Table” of graphics APIs, the external MCU only need to transmit the corresponding command code with parameters into FES4335U1-50C over serial interface. The command decoder inside of FES4335U1-50C would go to implement the graphics task by automatically.

Item	Specification	Remark
LCD size	5.0 (Diagonal)	inch

Resolution	800 x 3(RGB) x 480	dot
Color arrangement	18bit colors (RGB- Vertical Stripe)	
Display type	Normally White. Transmissive type	
Active area	108.0(W) x 64.8(H)	mm
Module size	131.0(W) x 90.5(H) x 12.6(D)	mm
View angle	L:60/ R:60/ T:60/ B:60	°
Contrast ratio	Typ. 600 @ ($\theta=0^\circ$)	CR
Backlight type	Build-in LED driver	
Brightness(Luminance)	Typ. 850	cd/m ²
Touch type	PCAP	
Interface	UART, 115200/ N/ 8/ 1	
Software offer	<i>Forenex's Free editing tool</i>	Note1
Images FlashROM	(Typ.)8MB/16MB	
FlashROM for images storage	7 pages (8MB)/ 14 pages (16MB)	

Picture switching speed	About 100ms/frame	
Picture downloading	<i>FG875D_Command_Encoder.exe</i>	
Operation Temp	-20°C to 70°C	
Storage Temp	-30°C to 80°C	

Note1: The Forenex's Free editing tool that (FG875D_Command_Encoder.exe) is a windows app. In the utility, all of usable APIs that summarized in command Table can be selected and auto-encoding. Refer to document (FG875D_Commands Table_vx.pdf) and (FG4335x_software_Note_V1.pdf) for detail usage description for each command.

Pin Assignment

UART Input interface (W1)

Connector on board (W1): Wafer_4pin/ 1.25mm/ side entry			
Connector Matching Suggest: Molex 51021 or compliant			
Pin num	Description	I/O	Note
Pin1	VCC		DC5V
Pin2	TX	O	
Pin3	RX	I	
Pin4	GND		

GPIO interface (W3)

Connector on board (W3): Wafer_4pin/ 1.25mm/ side entry

Connector Matching Suggest: Molex 51021 or compliant

Pin num	Description	I/O	Note
Pin1	GPI 0	I	2
Pin2	GPI 1	I	2
Pin3	GPI 2	I	2
Pin4	GPI 3	I	2
Pin5	GPO 0	O	3
Pin6	GPO 1	O	3
Pin7	GPO 2	O	3
Pin8	GPO 3	O	3
Pin9	GND		

- **NOTE2:** The GPO_0 ~ 3 are output with a series resister 100 Ohm.
- **NOTE3:** The GPI_0 ~ 3 are 3.3V input with 5V tolerant.

Operation Specifications

Electrical specifications

Absolute Maximum Ratings

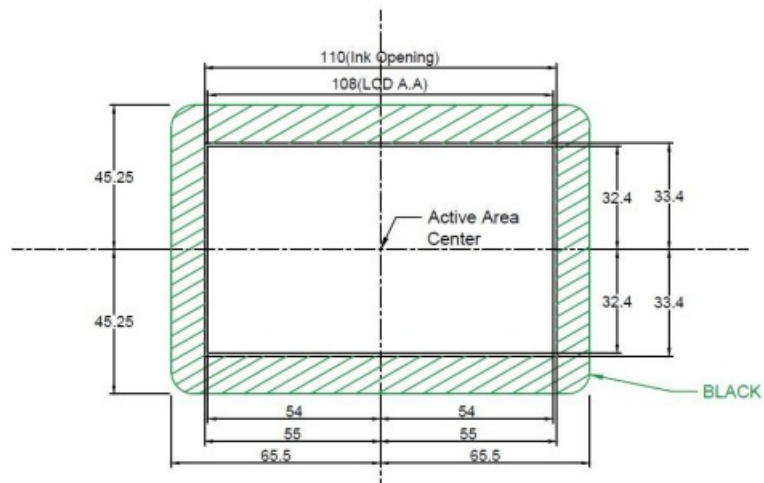
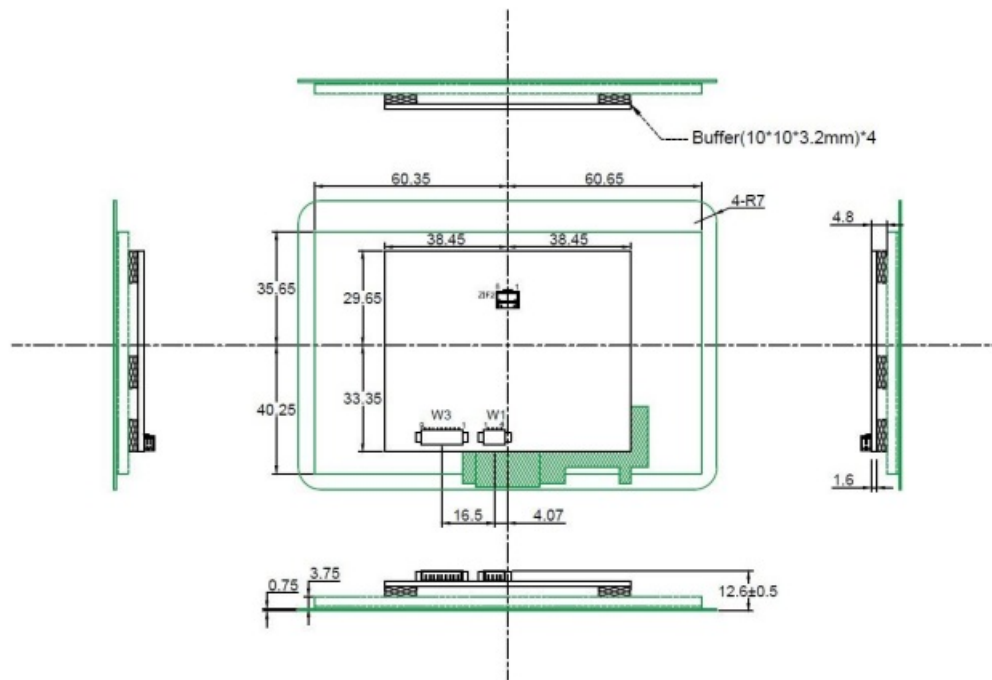
Item	Symbol	Min.	Max.	Unit	Note
Power Voltage	VCC	-0.3	5.2	V	
Operating Temperature	TOP	-20	70	°C	
Storage Temperature	TST	-30	80	°C	

The absolute maximum rating values of this product are not allowed to be exceeded at any time.

Recommended operating condition

Symbol	Description	Min.	Typ.	Max.	Unit	Note
VCC	Supply voltage	4.75	5	5.25	V	
I(VCC)	Supply Current	–	640	650	mA	
UART-(Tx/Rx),GPIOs signal level						
VIH	Input High Voltage	2	3.3	5	V	
VIL	Input Low Voltage	-0.3	–	0.8	V	
VOH	Output High Voltage	2.4	–	–	V	
VOL	Output Low Voltage	–	–	0.4	V	
Ileak	Input Leakage Current	-10	–	10	uA	
Optical Specifications (θ=0°)						
CR	Contrast Ratio	500	600	–		
L	Luminance	700	850	–	cd/m ²	
Power consumption @ 5V input, Brightness 100%						
Consumption		5.0" , 800×480		3.25	W	

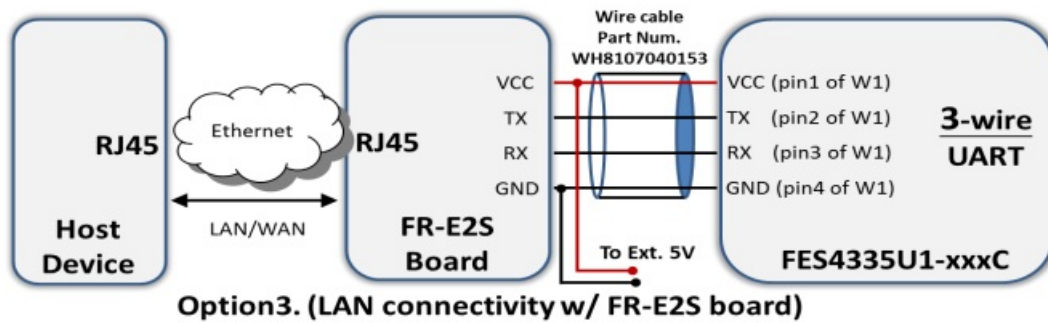
Mechanical specification



Hardware specification

Block Diagram

Option3: By Ethernet with an external board FR-E2S (UART to Ethernet converter)



Software

Communication (handshaking)

- Due to the serial interfaces (UART), the FES4335U1 series have offered to establish communication with an external host.
- The host is able to transmit a command stream to FES4335U1 for a task implementation asking.
- According to the capacity of transmission, the command stream format is simply defined into two categories.
- Standard Command Stream: This is an essential command stream format for each one task which is listed in the Commands Table. (Refer to FG875D_Commands Table_vx.pdf).
- Bulk Data Transmission Stream: Only provide to some tasks will ask for a bulk data transmission, and the asking has confirmed during the standard command stream stage.
- Currently only below two tasks which will ask for a Bulk Data Transmission protocol.

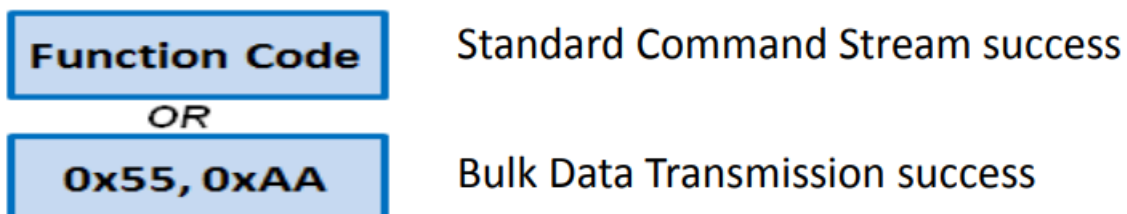
1. FG875D_WriteToSerialROM (function code 0x21).
2. FG875D_Display_Block_RW (function code 0x24).

- According to the Commands Table, each command has a unique function code for a specific operation task.
- Therefore, once the FES4335U1 has received a complete of Standard Command Stream and which part of checksum is checked firstly. After that, the part of function code would be identified and implemented along with parameters part.
- There are a specifically code area 0x50~0x5F where will dedicate to define some message code and also be isolated from the all of function code.

Return message code	ASCII	hex	Description
Wrong code	"X"	0x58	Checksum error
Waiting code	"W"	0x57	FES4335 is busy
Ready code	"S"	0x53	FES4335 is ready
Timeout code	"T"	0x54	Receive Timeout
Touch Interrupt code	"P"	0x50	Touch panel has been touched
Command success code	Function code		Command implement success
Bulk transmission success code	0x55,0xAA		Bulk data transmission success

If there is no error encountered during transmission.

- The FES4335U1 will implement command according to function code that has received in Standard Command Stream Stage, and return function code to Host for success checking. or
- Return function code (0x55,0xAA) to indicate this time of Bulk Data Transmission has completed without problem in "Bulk Data Transmission stage".
- Return Success code or (0x55,0xAA), informing a success status.



- Host could send next new command stream.
- If there is any unexpected condition has encountered during transmission.
- The FES4335 will return a corresponding error code message and along with the received function code for error checking.
- If return Wrong code (0x58) like below. (indicate a Checksum error has occurred)



Standard Command Stream stage error

or



Bulk Data Transmission stage error

Host should repeat the previously command stream.

- If return Timeout code (0x54) like below, (indicate a Timeout error has occurred)



Standard Command Stream stage error

or



Bulk Data Transmission stage error

Host should repeat the previously command stream.

- Return Wait code (0x57) like below, (indicate a wait status has occurred)



Standard Command Stream is Busy

or



Bulk Data Transmission is Busy

- To inform host that FES4335U1 is in a busy status.

Host should temporary stop transmission until FES4335U1 return Ready code (0x53) and then continue the command stream or bulk data stream those do not finish data yet.

- Return Ready code (0x53) like below, (indicate a ready message has occurred)



or



- Standard Command Stream is Ready
- Bulk Data Transmission is Ready
- To inform host that FES4335U1 has released from the period of busy status.
- The Host can continue the rest of command stream or bulk data stream.
- A specific code to inform the touch interrupt has occurred and also would return the coordinate (x,y) value of touch panel automatically.
- Return Touch interrupt code (0x50) with coordinate (x,y) value like below,

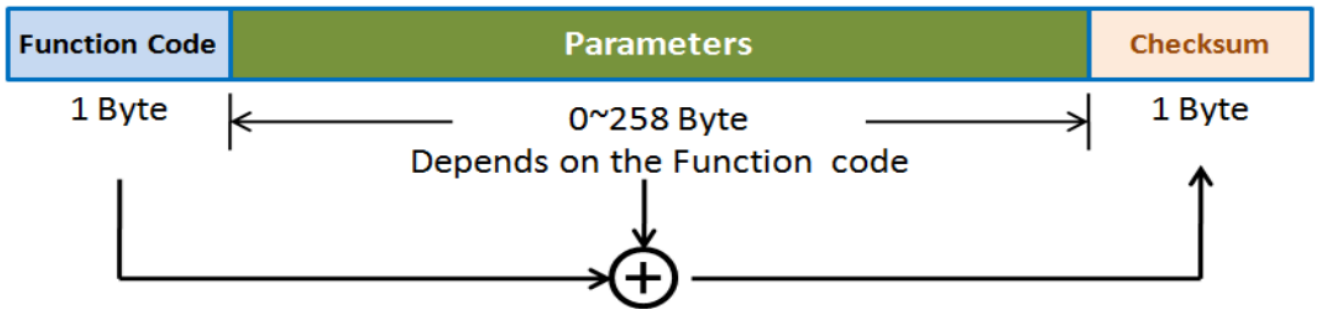


- **a.** In a bulk data transmission stage, the FES4335U1 will temporary to disable touch function and stop return the coordinate (x,y) of touch.
- **b.** Out of a bulk data transmission stage. FES4335U1 would automatically return the coordinate (x,y) of touch when a touch interrupt has occurred.
- **c.** Host could also to poll the coordinate (x,y) value by sending Function code 0x03 (APIs:FG875D_Detect_Touch).

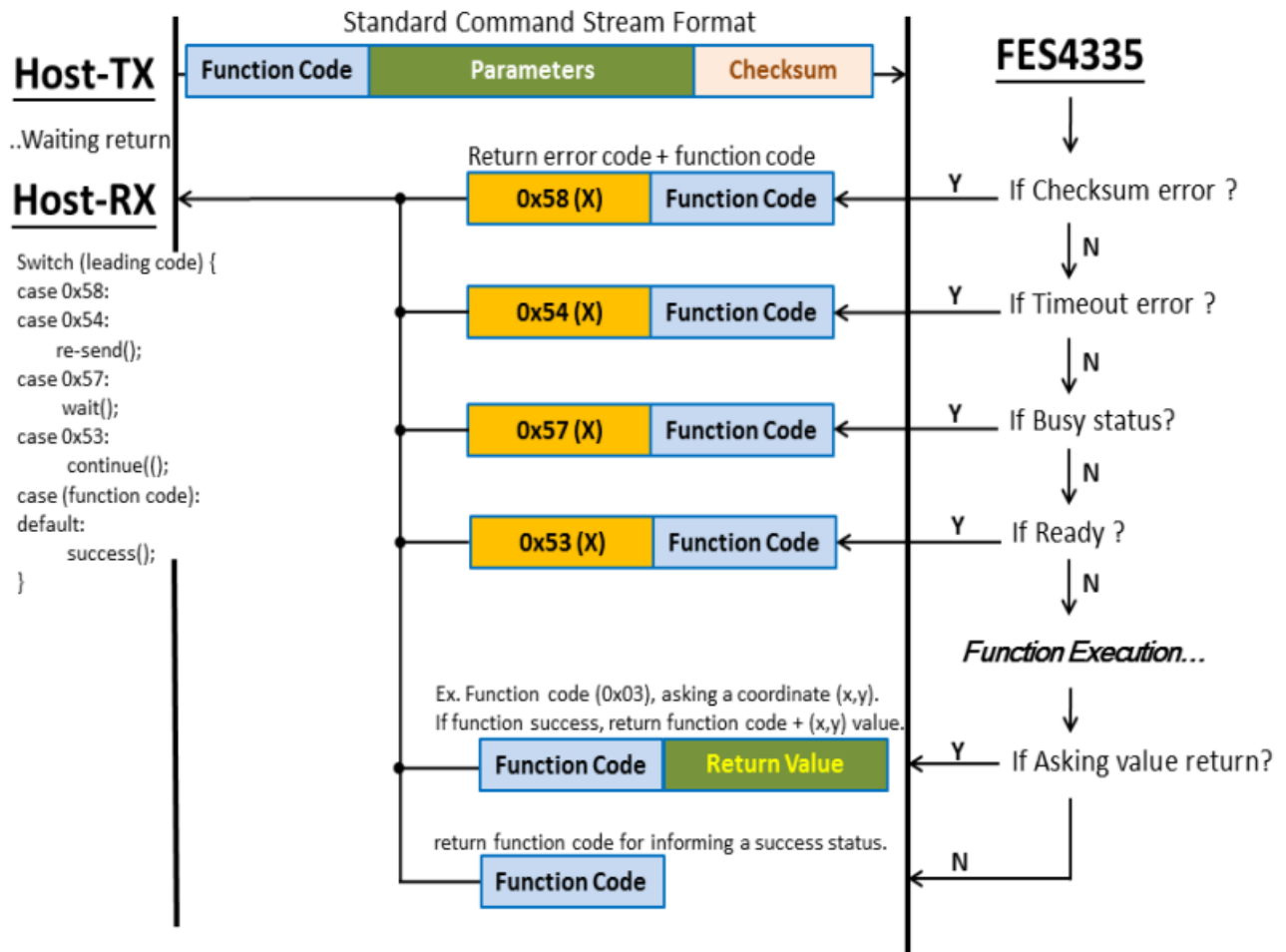
Command (Stream /Format /protocol)

Standard Command Stream

- **Format:** This format combines a byte of function code and several parameter bytes and a byte of checksum code.



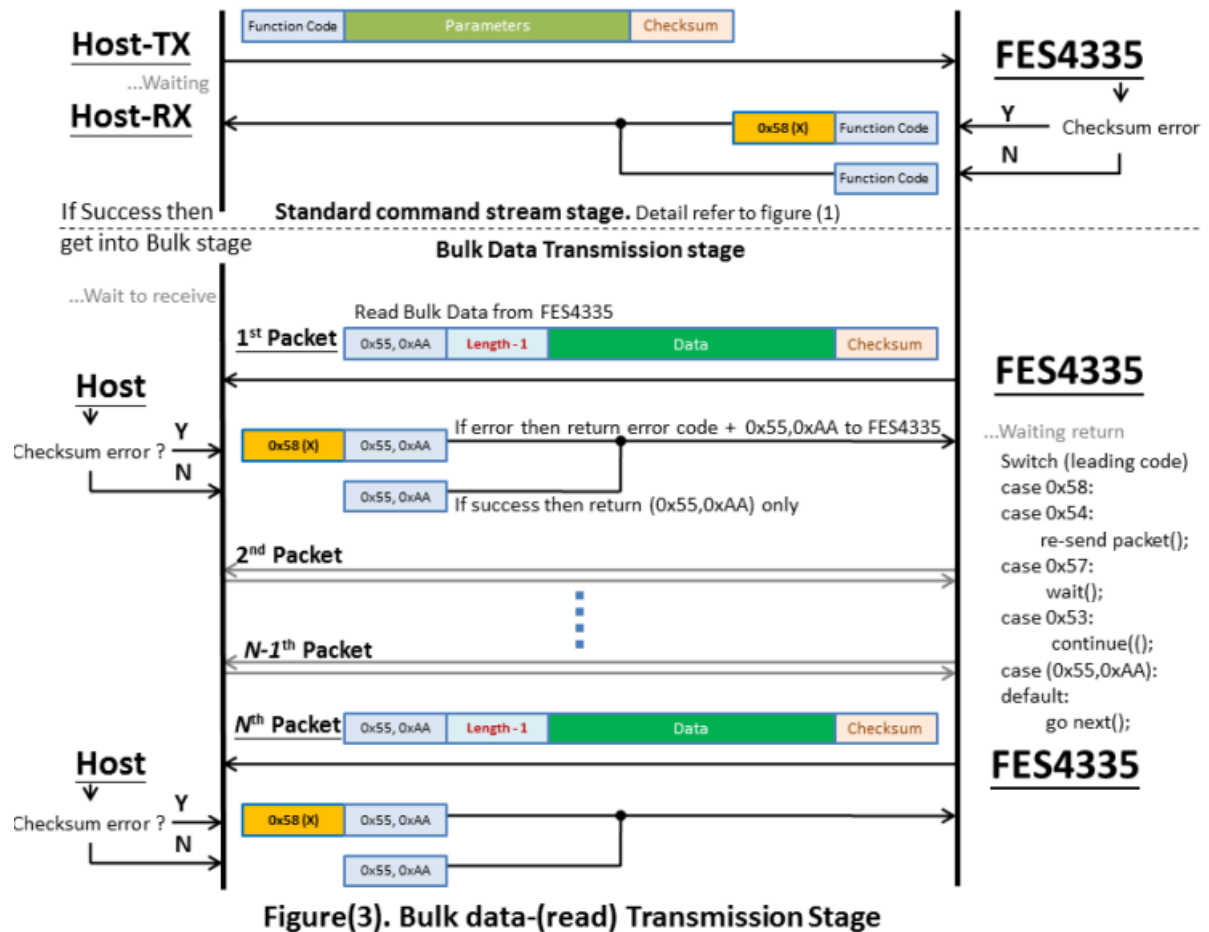
- **Protocol:**



Figure(1). Standard Command Stream Stage

Bulk Data Transmission

- Since the function code in Standard Command Stream is (0x21) or (0x24) that will ask a bulk data transmission task after those function code have be identified by FES4335U1. In this case, the whole communication process will be separated into two stages (Standard Command Stream stage + Bulk Data Transmission protocol stage).
- **Format:** This format is available for bulk data transmission stage only.
- The leading code (0x55,0xAA) will replace function code to indicate a Bulk Data Transmission beginning and then the value be set into length byte is indicated how many data byte will comes up in continuously. Notice to set length byte with real data quantity minus 1.





Appendix (Tips)

- Three steps to show still images on screen more quickly.
- **Step1): Converting image to a .bin file:**
 - Due to the FES4335U1's Flash-ROM only accepts the (.bin) file of the image. Therefore, firstly use the utility FES87x_Image_Tool.exe that is able to convert the (.BMP/.JPG) file into (.BIN) file. Refer to document FES87x_Image_Tool_User_Guide_v1.0.pdf for detail.
- **Step 2): Loading .bin file to the internal SPI-FlashROM(AMIC A25LQ64).**
 1. Using the function code 0x21 (APIs:FG875D_WriteToSerialROM) to require FES4335U1 to go into the bulk data transmission stage.
 2. After the Command success code(0x21) is returned from FES4335U1, then external MPU be allowed to transmit images according to the protocol description about the bulk data-(write) transmission on section 4-2-2. Refer to figure (2).
 3. **Another way to skip ① & ②:**

On PC side, to execute utility software (FG875D_command_encoder.exe) that is a useful free tool from Forenex. and choose function item (FG875D_WriteToSerialROM) in selection dialog. After then, the utility software will take care all about communication protocol and uploading image file into SPI-FlashROM.
- Regarding to the usage of utility software (FG875D_command_encoder.exe), please refer to document "FG875D_Command_Encoder-UsersMenu.pdf".
- **Step3):** Using the function code 0x22 (APIs: FG875D_DisplayIMG_FromSerialROM) to require FES4335 to

display images from internal SPI_FlashROM to an indicated location of panel.

Documents / Resources

	<p>FORENEX FES4335U1 Graphics Control Module [pdf] Owner's Manual</p> <p>FES4335U1 Graphics Control Module, Graphics Control Module, FES4335U1 Module, Module, FES4335U1</p>
	<p>FORENEX FES4335U1 Graphics Control Module [pdf] Owner's Manual</p> <p>FES4335U1 Graphics Control Module, Graphics Control Module, FES4335U1 Graphics Module , Module, Graphics Module, FES4335U1</p>