

A640H
Uncooled Thermal Imaging Module
Operating Commands User Manual
V1.0.0

Historical Versions

Version	Date	Description
V1.0.0	2024-08	Initial release

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1 Serial Port Settings

Table 1 Serial Port Settings

Baud Rate	Transmission Format			Parity Check
115200bps	Data bit: 8 bit	Start bit: 1 bit	Stop bit: 1 bit	None

Note: For each byte of information, the least significant bit (LSB) is transmitted first.

2 Module Command Reception Format

Table 2 Module Command Reception Format for Reading FPA Temperature

Head	Bytes	Word 0	Word 1	Operation Word	Parameter 1	Parameter 2	...	Parameter n	Parity Bit	Tail	
This section pertains to the command body.											
0xAA	0x04	0x01	0xC3	0x00	None	None	None	None	0x72	0xEB	0xAA

Notes:

- (1) The above numbers and letters are in the hexadecimal byte format and this note will not be given again in the following content;
- (2) The parity bit is the remainder when the sum of all bytes before the command parity bit is divided by 256;
- (3) The number of bytes in the command body is calculated from the command word 0 (included) to the parity bit byte(included);
- (4) The command head is fixed at 0xAA, and the command tail is fixed at 0xEB and 0xAA.

3 Format of Module Component Status Information

Table 3 Module Status Information Format for Reading FPA Temperature

Head	Bytes	Word 1	Operation Word	Return Value	Return Value	...	Return Value	Parity Bit	Tail	
This section pertains to the command body.										
0x55	0x05	0xC3	0x33	0xCB	0x11	None	None	0x2C	0xEB	0xAA

Notes:

- (1) The module status information reflects the completion status of the commands executed within the module.
- (2) For command words and return values, refer to the Module Command Reception and Status

Information Table. The low byte of the return value comes first. For example, if 4725 corresponds to hexadecimal 0x11CB, the return value will be 0xCB followed by 0x11.

(3) The number of bytes is the total of the command word, return value, and parity bit bytes.

(4) The operation word in the return information is fixed at 0x33.

(5) The command head in the return information is fixed at 0x55.

(6) The command footer in the return information is fixed at 0xEB and 0xAA.

Appendix 1 Common Functions

Instruction Description		Module Instruction Reception	Remarks
Setting Serial Port Baud Rate	Receive	Baud rate 9600: AA 06 01 77 02 02 00 2C EB AA Baud rate 19200: AA 06 01 77 02 04 00 2E EB AA Baud rate 38400: AA 06 01 77 02 08 00 32 EB AA Baud rate 57600: AA 06 01 77 02 40 00 6A EB AA Baud rate 115200: AA 06 01 77 02 10 00 3A EB AA	
	Return	55 04 77 33 01 04 EB AA	
Background Correction	Receive	AA 05 01 02 02 C0 74 EB AA	
	Return	55 04 02 33 01 8F EB AA	
Shutter Correction	Receive	AA 05 01 02 02 C1 75 EB AA	
	Return	55 04 02 33 01 8F EB AA	
Video defreezing	Receive	AA 05 01 3E 02 00 F0 EB AA	
	Return	55 04 3E 33 01 CB EB AA	
Video freezing	Receive	AA 05 01 3E 02 01 F1 EB AA	
	Return	55 04 3E 33 01 CB EB AA	
FPA Temperature Query	Receive	AA 04 01 C3 00 72 EB AA	The X2 is a high bit, the X1 is a low bit, and the X3 is a parity bit.
	Return	55 05 C3 33 X1 X2 X3 EB AA	
Save Settings	Receive	AA 04 01 7F 02 30 EB AA	
	Return	55 04 7F 33 01 0C EB AA	
Restoration to Factory Defaults	Receive	Public parameter restoration: AA 05 01 82 02 00 34 EB AA	
	Return	55 04 82 33 01 0F EB AA	
Enabling/Disabling TIF (Temporal Filtering)	Receive	On: AA 08 01 0A 01 00 00 00 02 C0 EB AA Off: AA 08 01 0A 01 00 00 00 00 BE EB AA	
	Return	55 04 0A 33 01 97 EB AA	
TIF-KMAX Settings (Temporal Filtering Iteration Factor)	Receive	AA 05 01 05 01 X1 X2 EB AA	X1 is the written data. X2 is the checksum
	Return	55 04 05 33 01 92 EB AA	
TIF-maxDelta Settings	Receive	AA 05 01 06 01 X1 X2 EB AA	X1 is the written data.

Instruction Description		Module Instruction Reception	Remarks
(Temporal Filtering Upper Threshold)	Return	55 04 06 33 01 93 EB AA	X2 is the checksum
TIF-minDelta Settings (Temporal Filtering Lower Threshold)	Receive	AA 05 01 07 01 X1 X2 EB AA	X1 is the written data. X2 is the checksum
	Return	55 04 07 33 01 94 EB AA	
GG	Receive	Clear: AA 05 01 A1 01 02 54 EB AA Get: AA 05 01 A1 01 00 52 EB AA Save: AA 05 01 A1 01 01 53 EB AA	
	Return	55 04 A1 33 01 2E EB AA	
Brightness/Contrast Adjustment	Receive	Manual mode: AA 05 01 1F 01 00 D0 EB AA Mode 1: AA 05 01 1F 01 01 D1 EB AA Mode 2: AA 05 01 1F 01 02 D2 EB AA	
	Return	55 04 1F 33 01 AC EB AA	
CLASS Selection (Gain Adjustment)	Receive	AA 05 01 19 01 X1 X2 EB AA	X1 is the set CLASS value (0: manual; 1-5: automatic). X2 is the checksum.
	Return	55 04 19 33 01 A6 EB AA	
BF (Enabling/Disabling Bilateral Filtering Algorithm)	Receive	Enable: AA 05 01 1B 02 01 CE EB AA Disable: AA 05 01 1B 02 00 CD EB AA	Valid when CLASS is set to 0.
	Return	55 04 1B 33 01 A8 EB AA	
BF Parameter Settings (Bilateral Filtering Algorithm Threshold)	Receive	AA 05 01 1D 02 X1 X2 EB AA	Valid when CLASS is set to 0.
	Return	55 04 1D 33 01 AA EB AA	
GS (Enabling/Disabling Gaussian Filtering Algorithm)	Receive	Enable: AA 05 01 1A 02 01 CD EB AA Disable: AA 05 01 1A 02 00 CC EB AA	Valid when CLASS is set to 0.
	Return	55 04 1A 33 01 A7 EB AA	
GS Parameter Settings (Gaussian Filtering Algorithm Threshold)	Receive	AA 05 01 1C 02 X1 X2 EB AA	Valid when CLASS is set to 0.
	Return	55 04 1C 33 01 A9 EB AA	
Contrast Settings	Receive	AA 05 01 22 01 XX RR EB AA	XX indicates the contrast value, range: 0 to 255. RR indicates the sum check.
	Return	55 04 22 33 01 AF EB AA	
Contrast Reading	Receive	AA 04 01 22 00 D1 EB AA	
	Return	55 04 22 33 XX RR EB AA	
StripeRemove Row (Enabling/Disabling Horizontal Strip Removal Algorithm)	Receive	Enable: AA 05 01 15 02 01 C8 EB AA Disable: AA 05 01 15 02 00 C7 EB AA	
	Return	55 04 15 33 01 A2 EB AA	
Remove Row Parameter (Horizontal Strip Removal Algorithm Threshold)	Receive	AA 05 01 17 02 X1 X2 EB AA	X1 is the set value. X2 is the checksum
	Return	55 04 17 33 01 A4 EB AA	
StripeRemove Col (Enabling/Disabling Vertical Strip Removal Algorithm)	Receive	Col on AA 05 01 16 02 01 C9 EB AA Col off AA 05 01 16 02 00 C8 EB AA	
	Return	55 04 16 33 01 A3 EB AA	
Remove Col Parameter (Threshold of Vertical	Receive	AA 05 01 18 02 X1 X2 EB AA	X1 is the set value. X2 is the checksum
	Return	55 04 18 33 01 A5 EB AA	

Instruction Description		Module Instruction Reception	Remarks
Strip Removal Algorithm)			
Setting brightness	Receive	AA 06 01 23 01 X1 X2 RR EB AA	X1 indicates the low 8 bites of the brightness value, and X2 indicates the high 8 bits. Range: 0 to 511. RR indicates the sum check.
	Return	55 04 23 33 01 B0 EB AA	
Brightness Reading	Receive	AA 04 01 23 00 D2 EB AA	
	Return	55 05 22 33 X1 X2 RR EB AA	
Digital Video Source	Receive	ORC AA 05 01 5C 01 00 0D EB AA NUC AA 05 01 5C 01 01 0E EB AA DRC AA 05 01 5C 01 02 0F EB AA DNS AA 05 01 5C 01 05 12 EB AA	
	Return	55 04 5C 33 01 E9 EB AA	
Enable Edge Highlight	Receive	AA 06 01 2F 01 00 01 E2 EB AA	
	Return	55 04 2F 33 01 BC EB AA	
Disable Edge Highlight	Receive	AA 06 01 2F 01 00 00 E1 EB AA	
	Return	55 04 2F 33 01 BC EB AA	
Query Edge Highlight	Receive	AA 05 01 2F 00 00 DF EB AA	
	Return	55 04 2F 33 01 BC EB AA (enabled) 55 04 2F 33 00 BB EB AA (disabled)	
Image Flip	Receive	AA 05 01 4C 01 01 FE EB AA (no flip)	
	Receive	AA 05 01 4C 01 02 FF EB AA (horizontal flip)	
	Receive	AA 05 01 4C 01 04 01 EB AA (vertical flip)	
	Receive	AA 05 01 4C 01 08 05 EB AA (diagonal flip)	
	Return	55 04 4C 33 01 D9 EB AA	
Digital Zoom	Receive	<p>1 × : AA 0C 01 40 02 00 00 00 00 7F 02 FF 01 7A EB AA</p> <p>2 × : AA 0C 01 40 02 A0 00 80 00 DF 01 7F 01 79 EB AA</p> <p>3 × : AA 0C 01 40 02 D5 00 AB 00 A9 01 54 01 78 EB AA</p> <p>4 × : AA 0C 01 40 02 F0 00 C0 00 8F 01 3F 01 79 EB AA</p> <p>5 × : AA 0C 01 40 02 00 01 CD 00 7F 01 32 01 7A EB AA</p> <p>6 × : AA 0C 01 40 02 0B 01 D5 00 74 01 29 01 79 EB AA</p> <p>7 × : AA 0C 01 40 02 12 01 DB 00 6C 01 23 01 78 EB AA</p> <p>8 × : AA 0C 01 40 02 18 01 E0 00 67 01 1F 01 7A EB AA</p>	<p>Note: The command parameters are the coordinates of the upper left corner and coordinates of the lower right corner. Note that the coordinate system starts from (0,0), first x and then y, that is, the number of columns first and then the number of rows. Parameter 0: col low byte upper left corner coordinate, parameter 1: col high byte, parameter 2: row low byte, parameter 3: row high byte, parameter 4: col low byte lower right corner coordinate, parameter 5: col high byte, parameter 6: row low byte, and parameter 7: row high byte.</p> <p>In the example, when the digital zoom is magnified 3 times, it is equivalent to following the setting values 00D5, 00AB, 01A9, and 0154. Within the actual magnified area, the coordinate of the upper left corner is (213,171) and the coordinate of the lower right corner is (425,340).</p> <p>The coordinate algorithm assumes</p>

Instruction Description		Module Instruction Reception	Remarks
			<p>that the width of the detector array is W, the height is H, and the preset zoom factor is m (accurate to 1 decimal place), then:</p> <p>Upper left corner</p> $X = \frac{W}{2} - \frac{W}{2 \cdot m}$ $Y = \frac{H}{2} - \frac{H}{2 \cdot m}$ <p>Lower right corner</p> $X = \frac{W}{2} + \frac{W - 1}{2 \cdot m}$ $Y = \frac{H}{2} + \frac{H - 1}{2 \cdot m}$
	Return	55 04 40 33 01 CD EB AA	
Cross Cursor	Receive	Hide: AA 05 01 43 02 00 F5 EB AA Display: AA 05 01 43 02 80 75 EB AA	
	Return	55 04 43 33 01 D0 EB AA	
Cross Cursor Position	Receive	Set position: AA 09 01 44 02 05 X1 X2 X3 X4 X5 EB AA Move up: AA 09 01 44 02 06 00 00 00 00 00 EB AA Move down: AA 09 01 44 02 07 00 00 00 00 01 EB AA Move left: AA 09 01 44 02 08 00 00 00 00 02 EB AA Move right: AA 09 01 44 02 09 00 00 00 00 03 EB AA	<p>X1 is the low bit of the row coordinate, X2 is the high bit of the row coordinate, X3 is the low bit of the column coordinate, X4 is the high bit of the column coordinate, and X5 is the checksum.</p>
	Return	55 04 44 33 01 D1 EB AA	
Palettes	Receive	White-hot: AA 05 01 42 02 00 F4 EB AA Black-hot: AA 05 01 42 02 01 F5 EB AA Rainbow: AA 05 01 42 02 02 F6 EB AA High-contrast rainbow: AA 05 01 42 02 03 F7 EB AA Iron red: AA 05 01 42 02 04 F8 EB AA Lava: AA 05 01 42 02 05 F9 EB AA Sky: AA 05 01 42 02 06 FA EB AA Medium gray: AA 05 01 42 02 07 FB EB AA Gray red: AA 05 01 42 02 08 FC EB AA Purple orange: AA 05 01 42 02 09 FD EB AA Special 1: AA 05 01 42 02 0A FE EB AA Warning red: AA 05 01 42 02 0B FF EB AA Ice and fire: AA 05 01 42 02 0C 00 EB AA Cyan red: AA 05 01 42 02 0D 01 EB AA Special 2: AA 05 01 42 02 0E 02 EB AA Gradient red: AA 05 01 42 02 0F 03 EB AA Gradient green: AA 05 01 42 02 10 04 EB AA Gradient blue: AA 05 01 42 02 11 05 EB AA Warning green: AA 05 01 42 02 12 06 EB AA Warning blue: AA 05 01 42 02 13 07 EB AA	
	Return	55 04 42 33 01 CF EB AA	

Instruction Description		Module Instruction Reception	Remarks
Read Runtime	Receive	AA 04 01 79 00 28 EB AA	Unit: ms
	Return	55 07 79 33 88 54 00 00 E4 EB AA	