L1280

Uncooled Thermal Imaging Module

Operating Commands User Manual

V1.0.0

Version History

Version	Date	Description
V1.0.0	2024-07	Initial version

Contents

1. Serial Port Settings

Table1 Serial Port Settings

Baud Rate	Trans-format			Parity Check
	Data bits	Start Bits	Stop Bits	
115200bps	8	1	1	none

***Note**: Start transmission from the Least Significant Bit (LSB) of each byte.*

2. Command and Message Format of the Thermal Imaging Core

2.1 Receive Command Format of the Thermal Imaging Core

Table2 Receive Command Format of the Thermal Imaging Core (Take Read FPA temperature as an example)

Command Head	Byte Count	CW0	CW1	OW	PRM1	PRM2	…	PRM N	Checksum	Command Tail	
		Command Body									
0xAA	0x04	0x01	0xC3	0x00	none	none	none	none	0x72	0xEB	0xAA

Note:

(1) All the format values described in Table 2 are hexadecimal bytes;

(2) The checksum is the sum of all bytes before the checksum byte of the command, modulo 256;

(3) The command and parameter information are described from Table5 to Table8;

(4) The command body byte count is the number of valid bytes from CW0 to Checksum;

(5) The command head is fixed to 0xAA, and the command tail is fixed to 0xEB and 0xAA;

2.2 Status Information Format of the Thermal Imaging Core

Table3 Status Information Format of the Thermal Imaging Core (Take Read FPA temperature as an example)

Command head	Byte count	CW1	OW	RV	RV	…	RV	Check sum	Command tail	
		Command body								
0x55	0x05	0xC3	0x33	0xCB	0x11	none	none	0x2C	0xEB	0xAA

Note:

(1) Status information reflects command execution result.

(2) Please refer to the command and status information table for the command codes and return values of the module. The lower byte of the return value comes first; for example, if 4725 corresponds to hexadecimal 0x11CB, then the return values are 0xCB and 0x11 respectively.

(3) The byte count is the total sum of the command, return value, and checksum byte counts.

(4) The operation code for the return information is fixed as 0x33.

(5) The command header for the return information is fixed as 0x55.

(6) The command footer for the return information is fixed as 0xEB, 0xAA.

When the user controls the module, if the two-byte command word returned by the module to the host computer software are all 0xFF, and only one byte has the return value as shown in Table 4, it indicates a communication protocol error. Users can refer to the table to find the cause of the error.

Table4 Error List of RV

Returned value	Cause of Error
0xFB	No CW
0xFD	The DRC checksum byte error

2.3 The Receiving Command and Status Information

Table5 Settings Menu

Settings						
CW0	**CW1**	**Meaning**	**OW**	**PRM Byte**	**PRM**	**RV Bytes Count**
0x01	0x00	Set shutter presence	0x01	1	00:with shutter;80:w/o shutter	1
0x01	0x02	NUC	0x02	2	Parameter 1: The low four bits represent the calibration type: 0 for background calibration; 1 for dual- state; 4 for single-state. The high four bits represent: 0 for both NUC and offset calibration; 4 for offset calibration only; 8 for NUC calibration only; C for neither NUC nor offset calibration. Parameter 2: 01 for shutter calibration maintaining shutter state; 02 for background calibration maintaining shutter state.	1
0x01	0x01	Auto NUC	0x01	1	0x00: off 0x01: on	1
0x01	0x03	Set time interval of auto NUC	0x01	1	0~255 minutes	1
0x01	0x04	Set temp interval of auto NUC	0x01	1	0.0~25.5 ℃ (0.1℃/cnt)	1

0x01	0xC3	Read FPA temp.	0x00	0	The return value is in little-endian mode. Dividing the return value by 100 gives the actual temperature value. If it is a negative number, the temperature is returned in two's complement form.	2
0x01	0x7C	Read core temp.	0x00	0	The return value is in little-endian mode. Dividing the return value by 100 gives the actual temperature value. If it is a negative number, the temperature is returned in two's complement form.	2
0x01	0x7F	Save settings	0x02	0	none	1
0x01	0x82	Restore default settings	0x02	0	00:restore public only; 01:restore all	1

Table6 Video Menu

Video						
CW0	**CW1**	**Meaning**	**OW**	**PRM Byte**	**PRM**	**RV Bytes Count**
0x01	0x44	Move reticle position	0x02	1	Bit7=0:the step size is small Bit7=1: the step size is big 0x06/0x86:move upwards 0x07/0x87: move downwards 0x08/0x88:move left 0x09/0x89:move right	1
				5	PRM1:0x05 represents directly setting the reticle coordinates. PRM2:the low byte of the X-axis coordinate. PRM3:the high byte of the X-axis coordinate. PRM4:the low byte of the Y-axis coordinate. PRM5:the high byte of the Y-axis coordinate.	1
		Read reticle position	0x00	0	None	4
0x01	0x43	Set reticle display	0x02	1	C1:defective pixel reticle on ; 40: defective pixel reticle off; 00:user reticle off; 80: style 1;81: style 2, the	1

					same applies in sequence.	
0x01	0x5D	Digital video selection	0x02	2	0x00 0x00:off 0x02 0x00: LVCOMS 0x03 0x00:LVDS 0x04 0x00:BT656 0x05 0x00:BT1120 0x05 0x80:CDS_2 0x0A 0x00:MIPI	1
0x01	0x5C	Digital video source selection	0x01	1	0x00:ORG 0x01:NUC 0x02:DRC 0x04:TEMP 0x05:DNS	1
0x01	0x4C	Image flip	0x01	1	0x01:no flip 0x02:flip horizontally 0x04:flip vertically 0x08:flip horizontally and vertically	1
0x01	0x40	Digital zoom	0x02	8	PRM1:Top-left X low PRM2:Top-left X high PRM3:Top-left Y low PRM4:Top-left Y high PRM5:Bottom-right X low PRM6:Bottom-right X high PRM7:Bottom-right Y low PRM8:Bottom-right Y high The detailed calculation method is described in the appendix.	1
0x01	0x3D	CVBS video on/off	0x02	1	0x00:off 0x01:on	1
0x01	0x3E	Video freeze	0x02	1	0x00:off 0x01: on	1
0x01	0x42	Color palettes	0x02	1	0x00:White-hot(default） 0x01:Black-hot 0x02:Rainbow 0x03:Rainbow HC 0x04:Iron 0x05:Lava 0x06:Sky 0x07:Medium gray 0x08:Grayish red 0x09:Purple orange 0x0A:Special 1 0x0B:Warning red 0x0c:Fire and ice	1

					0x0d:Cyan red 0x0E:Special 2 0x0F:Gradient red 0x10:Gradient green 0x11:Gradient yellow 0x12:Warning green 0x13:Warning blue	
0x01	0x4B	Warning color threshold setting	01	2	PRM1:Threshold value PRM2:0x00 warning red, 0x01warning green, 0x02warning blue	1
0x01	0x19	Image enhancement level setting	01	1	0x00:manual 0x01:Class0 0x02:Class1 0x03:Class2 0x04:Class3 0x05:Class4 0x06:Class5 0x07:Class6 0x08:Class7 0x09:Class8 0x0A:Class9	1
0x01	0x36	Brightness setting	01	1	0~100	1
0x01	0x37	Contrast setting	01	1	0~100	1
0x01	0x38	DDE settiing	01	1	0~100	1
0x01	0x39	Spatial filtering setting	01	1	0~100	1
0x01	0x3A	Temporal filtering setting	01	1	0~100	1

Table7 Advance settings

Advance settings						
CW0	**CW1**	**Meaning**	**OW**	**PRM Bytes**	**PRM**	**RV Byte Count**
0x01	0x77	Baud rate	0x02	1	0x01: auto baud rate 0x02: 9600 0x04: 19200 0x08: 38400 0x10: 115200 0x20: 921600 0x40: 57600	1

Table 8 Functional Menu of Temperature Measurement Parameters

L1280 Temperature Measurement Parameters						
CW0	**CW1**	**Meaning**	**OW**	**PRM Byte Count**	**PRM**	**RV Byte Count**
0x07	0x00	Temperature measurement function on/off	0x01	1	0x00:off 0x01:on	1
0x07	0x01	Select Temperature Measurement Range	0x01	1	0x00: high gain 0x01: low gain 0x03: auto	1
0x07	0x02	Temperature unit	0x01	1	0x00: Celsius 0x01:Kelvin 0x02:Fahrenheit	1
0x07	0x05	Read low-high gain threshold	0x00	1	0x00	2
		Set low-high gain threshold	0x01	2	Threshold=parameter/10, low bit in front	1
0x07	0x06	Read low-high gain percentage	0x00	1	0x00	3
		Set low-high gain percentage	0x01	1	Percentage=parameter/100	1
0x07	0x07	Read high-low gain threshold	0x00	1	0x00	2
		Set high-low gain threshold	0x01	2	Threshold=parameter/10, low bit in front	1
0x07	0x08	Read high-low gain percentage	0x00	1	0x00	3
		Set high-low gain percentage	0x01	3	Percentage=parameter/100	1
0x07	0x0f	Read reflected temperature	0x00	1	0x00	4
		Set reflected temperature	0x01	4	Temperature=parameter/10000 low bit in front	1
0x07	0x10	Read atmospheric temperature	0x00	1	0x00	4
		Set atmospheric temperature	0x01	4	Temperature=parameter/10000, Low bit in front	1
0x07	0x11	Read atmospheric transmissivity	0x00	1	0x00	4

		Set atmospheric transmissivity	0x01	4	Transmissivity=parameter/10000, low bit in front	1
0x07	0x12	Read emissivity	0x00	1	0x00	4
		Set emissivity	0x01	4	Emissivity=parameter/10000, low bit in front	1
0x07	0x13	Read distance	0x00	1	0x00	4
		Set distance	0x01	4	Distance=parameter/10000, Low bit in front	1
0x07	0x18	Environmental variable enable	0x01	1	0x00	1

Table 9 Menu of Full Frame Temperature Measurement

Full Frame Temperature Measurement						
CW0	**CW1**	**Meaning**	**OW**	**PRM Byte Count**	**PRM**	**Returned Byte Count**
0x07	0xf0	Temperature scale on/off	0x01	1	0x00: off 0x01: on	1
0x07	0x1d	Write low temperature threshold of temperature scale	0x01	4	Threshold=PRM/10000 low bit in front	1
		Read low temperature threshold of temperature scale	0x00	1	0x00	4
0x07	0x1e	Write high temperature threshold of temperature scale	0x01	4	Threshold=PRM/10000 low bit in front	1
		Write high temperature threshold of temperature scale	0x00	1	0x00	4

Table 10 Menu of Calibration Function

Calibration Function						
CW0	**CW1**	**Meaning**	**OW**	**PRM Bytes**	**PRM**	**Returned Value**
0x07	0x6E	Secondary Calibration (single point)	0x02	2	Temp=RPM	1
0x07	0x6F	Secondary Calibration (two points)	0x02	2	Temp=RPM	1
0x07	0x6A	Secondary Calibration enable and save	0x02	1	0x00	1
0x07	0x6B	Secondary Calibration Clear	0x02	1	0x00	1

Appendix 1 Commands List

Commands		The incoming message	Remark
NUC	Receive	For imaging type: AA 05 01 11 02 **00** C3 EB AA (background correction) AA 05 01 11 02 **01** C4 EB AA (shutter correction) For temperature measurement type: AA 05 01 11 02 **80** 43 EB AA (background correction) AA 05 01 11 02 **81** 44 EB AA (shutter correction)	No matter Auto NUC on or off, send background correction or shutter correction command to perform manual NUC.
	Return	55 04 11 33 01 9E EB AA	
Auto NUC	Receive	AA 05 01 01 01 **01** B3 EB AA (on) AA 05 01 01 01 **00** B2 EB AA (off)	
	Return	55 04 01 33 01 8E EB AA	
Read FPA Temp.	Receive	AA 04 01 C3 00 72 EB AA	For example: If the readout temp. is 47.55℃, the returned value is 47.55×100℃, that is 4755 in decimal, low byte returns first. If it is negative, the temperature is returned in two's complement form.
	Return	55 05 C3 33 **CB 11** 2C EB AA	
Read core temp.	Receive	AA 04 01 7C 00 2B EB AA	For example: If the readout temp. is 47.25℃, the returned value is 47.25×100℃, that is 4725 in decimal, low byte returns first. If it is negative, the temperature is returned in two's complement form.
	Return	55 05 7C 33 **75 12** 90 EB AA	
Save settings	Receive	AA 04 01 7F 02 30 EB AA	
	Return	55 04 7F 33 01 0C EB AA	
Restore to default settings	Receive	AA 05 01 82 02 00 34 EB AA	
	Return	55 04 82 33 01 0F EB AA	
Set time	Receive	AA 05 01 03 01 **0A** BE EB AA	When auto NUC is

Commands		The incoming message	Remark
interval of auto NUC	Return	55 04 03 33 01 90 EB AA	enabled, the shutter correction time interval can be set. For example, if the time interval is 10 min., then the transmitted parameter is 0x0A(the set accuracy is 1 minute).
Set temp interval of auto NUC	Receive	AA 05 01 04 01 **0F** C4 EB AA	When the Auto NUC is enabled, temperature interval of shutter correction can be set. For example: 0x0F =15 means the temp interval is 15/10 =1.5℃
	Return	55 04 04 33 01 91 EB AA	
	Return	55 1C 75 33 **4D 33 4C 5F 31 32 38 30 54 5F 56 30 5F 32 30 5F 44 32 30 32 33 31 32 32 37** 3F EB AA	
Digital zoom	Receive	1.0 ×: AA 0C 01 40 02 **00 00 00 00 7F 0 2 FF 01** 7A EB AA 2.0 ×: AA 0C 01 40 02 **A0 00 80 00 DF 01 7F 01** 79 EB AA 3.0 ×: AA 0C 01 40 02 **D5 00 AB 00 A9 01 54 01** 78 EB AA 4.0 ×: AA 0C 01 40 02 **F0 00 C0 00 8F 01 3F 01** 79 EB AA 5.0 × :AA 0C 01 40 02 **00 01 CD 00 7F 01 32 01** 7A EB AA 6.0 × :AA 0C 01 40 02 **0B 01 D5 00 74 01 29 01** 79 EB AA 7.0 × :AA 0C 01 40 02 **12 01 DB 00 6C 01 23 01** 78 EB AA 8.0 ×: AA 0C 01 40 02 **18 01 E0 00 67 01 1F 01** 7A EB AA	Let W be the width and H be the height of the detector array, and let m be the preset magnification factor (accurate to one decimal place). Then, X_top_left = W/2 - W / (2 * m) Y_top_left = H/2 - H / (2 * m) X_bottom_right = W /2+ (W - 1) / (2 * m) Y_bottom_right = H/2 + (H - 1) / (2 * m) For the left command, take 640x512 as an example. Similarly, decimal multiplication instructions are obtained.
	Return	55 04 40 33 01 CD EB AA	
Crosshair style	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	
Crosshair movement	Receive	(Move upwards) Small step size: AA 09 01 44 02 **06** 00	

Commands		The incoming message	Remark
		00 00 00 00 EB AA Big step size: AA 09 01 44 02 **86** 00 00 00 00 80 EB AA (Move downwards) Small step size: AA 09 01 44 02 **07** 00 00 00 00 01 EB AA Big step size: AA 09 01 44 02 **87** 00 00 00 00 81 EB AA (Move left) Small step size: AA 09 01 44 02 **08** 00 00 00 00 02 EB AA Big step size: AA 09 01 44 02 **88** 00 00 00 00 82 EB AA (Move right) Small step size: AA 09 01 44 02 **09** 00 00 00 00 03 EB AA Big step size: AA 09 01 44 02 **89** 00 00 00 00 83 EB AA (Move to the center) 640*512: AA 09 01 44 02 **05 40 01 00 01** 41 EB AA 720*576: AA 09 01 44 02 **05 68 01 F0 00** 58 EB AA	
	Return	55 04 44 33 01 D1 EB AA	
Crosshair position	Receive	AA 09 01 44 02 **05 64 00 64 00** C7 EB AA (Set position) AA 04 01 44 00 F3 EB AA(Read position)	5 bytes of parameters, where parameter 1 is fixed to 0x05. Parameters 2 to 3 represent the X-axis coordinate with the low byte first, while parameters 4 to 5 represent the Y-axis coordinate with the low byte first. In the example given, the set coordinate positions are: X-axis: 0x0064 = 100 Y-axis: 0x0064 = 100
	Return	55 04 44 33 01 D1 EB AA(Set position) 55 07 44 33 **68 01 20 01** 5D EB AA(Read position)	
Color Palettes	Receive	(WH) AA 05 01 42 02 **00** F4 EB AA (BH) AA 05 01 42 02 **01** F5 EB AA (Rainbow) AA 05 01 42 02 02 F6 EB AA (Rainbow HC) AA 05 01 42 02 **03** F7 EB AA (Iron) 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	

Commands		The incoming message	Remark
		EB AA (Gray-red) AA 05 01 42 02 **08** FC EB AA (Purple orange) AA 05 01 42 02 **09** FD ED AA (Special 1) AA 05 01 42 02 **0A** FE EB AA (Warning red) AA 05 01 42 02 **0B** FF EB AA (Ice 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	
Set the threshold of warning color	Receive	(Warning red, 0xF0 = 240) AA 06 01 4B 01 **F0 00** ED EB AA (Warning green, 0xF0 = 240) AA 06 01 4B 01 **F0 01** EE EB AA (Warning blue, 0x14 = 20) AA 06 01 4B 01 **14 02** 13 EB AA	0x00: warning red 0x01: warning green 0x02: warning blue
	Return	55 04 4B 33 01 D8 EB AA	
Select digital video source	Receive	(ORG) 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 (TEMP) AA 05 01 5C 01 **04** 11 EB AA (DNS) AA 05 01 5C 01 **05** 12 EB AA	
	Return	55 04 5C 33 01 E9 EB AA	
Set digital video interface	Receive	(LVDS)AA 06 01 5D 02 **03 00** 13 EB AA (LVCOMS)AA 06 01 5D 02 **02 00** 12 EB AA (BT.656) AA 06 01 5D 02 **04 00** 14 EB AA (BT.1120)AA 06 01 5D 02 **05 00** 15 EB	BT.656, BT.1120 and CDS-2 only supports DRC data source.

Commands		The incoming message	Remark
		AA (CDS_2)AA 06 01 5D 02 **05 80** 95 EB AA (Off)AA 06 01 5D 02 **00 00** 10 EB AA	
	Return	55 04 5D 33 01 EA EB AA	
Image flip	Receive	(Off)AA 05 01 4C 01 **01** FE EB AA (Left-right flip)AA 05 01 4C 01 **02** FF EB AA (Up-down flip)AA 05 01 4C 01 **04** 01 EB AA (Mirror flip)AA 05 01 4C 01 **08** 05 EB AA	
	Return	55 04 4C 33 01 D9 EB AA	
SN Query	Receive	AA 04 01 71 00 20 EB AA	
	Return	55 43 71 33 42 32 32 34 31 30 30 32 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 D9 EB AA(B2241002)	The returned PN code is in ASCII code. If the number of bits is insufficient, return 00.
CVBS video on/off	Receive	(On) AA 05 01 3D 02 **01** F0 EB AA (Off) AA 05 01 3D 02 **00** EF EB AA	
	Return	55 04 3D 33 01 CA EB AA	
Video freeze	Receive	(On) AA 05 01 3E 02 **01** F1 EB AA (Off) AA 05 01 3E 02 **00** F0 EB AA	
	Return	55 04 3E 33 01 CB EB AA	
Set Logo display	Receive	(On) AA 05 01 49 02 80 7B EB AA (Off) AA 05 01 49 02 00 FB EB AA	
	Return	55 04 49 33 01 D6 EB AA	
Set DDE class	Receive	AA 05 01 19 01 03 CD EB AA	For example: If the DDE class setting is 2, you need to send 2+1=0x03.
	Return	55 04 19 33 01 A6 EB AA	
Set DDE	Receive	AA 05 01 1E 02 47 17 EB AA	Example: 0x**47**=71
	Return	55 04 1E 33 01 AB EB AA	
Set spatial denosing	Receive	AA 05 01 1D 02 9E 6D EB AA	Example:0x**9E**=158
	Return	55 04 1D 33 01 AA EB AA	
Contrast	Receive	AA 06 01 24 01 12 00 E8 EB AA	Two-byte parameter, with

Commands		The incoming message	Remark
setting	Return	55 04 24 33 01 B1 EB AA	the low byte first. Example: 0x0012 = 18
Brightness setting	Receive	AA 05 01 26 01 7D 54 EB AA	Example: 0x7D = 125.
	Return	55 04 26 33 01 B3 EB AA	
Set temporal denoising	Receive	AA 05 01 05 01 82 38 EB AA	Example: 0x**82**=130
	Return	55 04 05 33 01 92 EB AA	
Set dynamic range	Receive	AA 05 01 21 01 41 13 EB AA	Example: 0x**41**=65
	Return	55 04 21 33 01 AE EB AA	
Baud rate setting	Receive	(9600bps) AA 06 01 77 02 **02 00** 2C EB AA (19200bps) AA 06 01 77 02 **04 00** 2E EB AA (38400bps) AA 06 01 77 02 **08 00** 32 EB AA (57600bps) AA 06 01 77 02 **40 00** 6A EB AA (115200bps) AA 06 01 77 02 **10 00** 3A EB AA	
	Return	55 04 77 33 01 04 EB AA	
The cursor of the defective pixels	Receive	Show: AA 05 01 43 02 **C1** B6 EB AA Hide: AA 05 01 43 02 **40** 35 EB AA	
	Return	55 04 43 33 01 D0 EB AA	
Move the defective pixel cursor	Receive	Up 1: AA 05 01 44 02 **01** F7 EB AA Down 1: AA 05 01 44 02 **02** F8 EB AA Left 1: AA 05 01 44 02 **03** F9 EB AA Right 1: AA 05 01 44 02 **04** FA EB AA Up 20: AA 05 01 44 02 **81** 77 EB AA Down 20: AA 05 01 44 02 **82** 78 EB AA Left 20: AA 05 01 44 02 **83** 79 EB AA Right 20: AA 05 01 44 02 **84** 7A EB AA	
	Return	55 04 44 33 01 D1 EB AA	
Scan defective pixels	Receive	AA 04 01 93 02 44 EB AA	
	Return	55 04 93 33 01 20 EB AA	
Defective pixels add/cancel	Receive	Add: AA 05 01 90 01 **01** 42 EB AA Cancel: AA 05 01 90 01 **02** 43 EB AA	

Commands		The incoming message	Remark
	Return	55 04 90 33 01 1D EB AA	
Save the defective pixel list	Receive	AA 05 01 90 01 **05** 46 EB AA	
	Return	55 04 90 33 01 1D EB AA	
Recover the defective pixel list	Receive	AA 05 01 90 01 **06** 47 EB AA	
	Return	55 04 90 33 01 1D EB AA	
Calibrate the K value of lens	Receive	Acquire low temperature data: AA 05 01 A0 01 **0A** 5B EB AA Acquire high temperature data: AA 05 01 A0 01 **0B** 5C EB AA Calculate: AA 05 01 A0 01 **0C** 5D EB AA Save: AA 05 01 A0 01 **0D** 5E EB AA Clear: AA 05 01 A0 01 **0E** 5F EB AA	
	Return	55 04 A0 33 01 2D EB AA	
Halo calibration	Receive	Clear: AA 05 01 A1 01 **02** 54 EB AA Acquire: 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	

Appendix2 Temperature Measurement Command List

Command Descriptions	Module Receiving Commands		Remark
Temperature measurement OSD on/off	Receive	AA 05 07 00 01 **00** B7 EB AA (off) AA 05 07 00 01 **01** B8 EB AA (on)	
	Return	55 05 07 00 33 01 95 EB AA	
Select temperature unit	Receive	AA 05 07 02 01 **00** B9 EB AA (Celsius) AA 05 07 02 01 **01** BA EB AA (Kelvin) AA 05 07 02 01 **02** BB EB AA (Fahrenheit)	
	Return	55 05 07 02 33 01 97 EB AA	
Read the threshold of low-high gain	Receive	AA 05 07 05 00 **00** BB EB AA	
	Return	55 06 07 05 33 **B0 04** 4E EB AA (The threshold is 120)	Return 2 bytes, with the low byte first. Temperatrure=return value/10, for example, 120.0 degrees: B0 04.
Set the threshold of low-high gain	Receive	AA 06 07 05 01 **B0 04** 71 EB AA (The threshold is 120)	Two-byte parameter, with the low byte first. Temperature = Parameter value / 10.
	Return	55 05 07 05 33 01 9A EB AA	
Read the percent of low-high gain	Receive	AA 05 07 06 00 **00** BC EB AA	
	Return	55 07 07 06 33 **5F 00 00** FB EB AA (The percentage here is 95%)	Return 3 bytes. Percentage = returned 0/100+returned 1-2(low byte first)/100000.
Set the percentage of low-high gain	Receive	AA 07 07 06 01 **5F 00 00** 1E EB AA (95%)	Three-byte parameter. Percentage = PRM0/100+PRM 1-2(low bit in front)/100000
	Return	55 05 07 06 33 01 98 EB AA	
Read the threshold of high-low gain	Receive	AA 05 07 07 00 **00** BD EB AA	
	Return	55 06 07 07 33 **78 05** 19 EB AA (The threshold here is 140.0)	Return 2 bytes, with the low byte first. Temp.=return value/10.
Set the threshold of high-low gain	Receive	AA 06 07 07 01 **2C 01** EC EB AA (The threshold here is 30.0)	Two-byte parameter, with the low byte first. Temperature=PRM/10.
	Return	55 05 07 07 33 01 9C EB AA	
Read the	Receive	AA 05 07 08 00 **00** BE EB AA	

percentage of high-low gain	Return	55 07 07 08 33 **0F 00 00** AD EB AA (The percentage here is 15%)	Return 3 bytes. Percentage = returned 0/100+returned 1-2(low bit first)/100000
Set the percentage of high-low gain	Receive	AA 07 07 08 01 **0F 00 00** D0 EB AA (set as 15%)	Return 3 bytes. Percentage = returned 0/100+returned 1-2(low bit first)/100000
	Return	55 05 07 08 33 01 9D EB AA	
Select temperature measurementr ange	Receive	AA 05 07 01 01 **00** B8 EB AA (high gain) AA 05 07 01 01 **01** B9 EB AA (low gain) AA 05 07 01 01 **03** BB EB AA (Auto)	Hight gain temp. measuring range -20~+150°C. Low gain temp. measuring range 0~+550°C. In Auto mode, the module will automatically select the temperature measurement range.
	Return	55 05 07 01 33 01 96 EB AA	
Read the reflected temperature	Receive	AA 05 07 0F 00 **00** C5 EB AA	
	Return	55 08 07 0F 33 **90 D0 03 00** 09 EB AA (The reflected temperature here is 25°C)	Return 4 bytes, with the low byte first. Temp.=returned value/10000.
Set the reflected temperature	Receive	AA 08 07 0F 01 **E0 93 04 00** 40 EB AA (The reflected temperature here is 30°C)	Four- byte parameter, with the low bytefirst. Temp.=parameter value/10000.
	Return	55 05 07 0F 33 01 A4 EB AA	
Read the ambient temperature	Receive	AA 05 07 10 00 **00** C6 EB AA	
	Return	55 08 07 10 33 **90 D0 03 00** 0A EB AA (The ambient temperature here is 25°C)	Return 4 bytes, with the low byte first. Temperature=returned value/10000.
Set the ambient temperature	Receive	AA 08 07 10 01 **90 D0 03 00** 2D EB AA (The ambient temp. is 25°C)	Four-byte parameter, with the low byte first. Temperature=returned value/10000.
	Return	55 05 07 10 33 01 A5 EB AA	
Read the ambient	Receive	AA 05 07 11 00 **00** C7 EB AA	

transmissivity	Return	55 08 07 11 33 **94 11 00 00** 4D EB AA (The transmissivity is 0.45)	Return 4 bytes, with the low byte first. Transmissivity = returned value/10000.
Set the ambient transmissivity	Receive	AA 08 07 11 01 **94 11 00 00** 70 EB AA(The transmissivity is 0.45)	PRM 4 Bytes, low Byte is in the front. Transmissivity = returned value/10000.
	Return	55 05 07 11 33 01 A6 EB AA	
Read the emissivity	Receive	AA 05 07 12 00 **00** C8 EB AA	
	Return	55 08 07 12 33 **48 26 00 00** 17 EB AA (emissivity: 0.98)	Return 4 bytes, with the low byte first. Emissivity = returned value/10000.
Set the emissivity	Receive	AA 08 07 12 01 **48 26 00 00** 3A EB AA	Four-byte parameter, with the low byte first. Emissivity = returned value/10000.
	Return	55 05 07 12 33 01 A7 EB AA	
Read the distance	Receive	AA 05 07 13 00 **00** C9 EB AA	
	Return	55 08 07 13 33 **60 EA 00 00** F4 EB AA (distance: 6.0)	Return 4 bytes, with the low byte first. Distance = returned value/10000.
Set the distance	Receive	AA 08 07 13 01 **60 EA 00 00** 17 EB AA	4-byte parameter, with the low byte first. Distance = returned value/10000.
	Return	55 05 07 13 33 01 A8 EB AA	
Enable environmental variables	Receive	AA 05 07 18 01 **00** CF EB AA	
	Return	55 05 07 18 33 01 AD EB AA	
Temperature scale ON/OFF	Receive	On: AA 05 07 F0 01 **01** A8 EB AA Off: AA 05 07 F0 01 **00** A7 EB AA	
	Return	55 05 07 F0 33 **01** 85 EB AA	Return 1 byte 0x01: Success 0x00: Fail
Write low temperature threshold of temperature scale	Receive	AA 08 07 1D 01 **40 0D 03 00** 27 EB AA (20.00℃)	Sending data = Actual data ×10000, with the low byte first
	Return	55 05 07 1D 33 01 B2 EB AA	
Read low temperature	Receive	AA 05 07 1D 00 **00** D3 EB AA	

threshold of temperature scale	Return	55 08 07 1D 33 **40 0D 03 00** 04 EB AA (20.00℃)	Actual data = Return data (With the low byte first)/10000
Write high temperature threshold of temperature scale	Receive	AA 08 07 1E 01 **80 1A 06 00** 78 EB AA(40.00℃)	Receive data = actual data × 10000, with the low byte first
	Return	55 05 07 1E 33 01 B3 EB AA	
Read high temperature threshold of temperature scale	Receive	AA 05 07 1E 00 **00** D4 EB AA	
	Return	55 08 07 1E 33 **80 1A 06 00** 55 EB AA(40.00℃)	Actual data = Return data /10000, with the low byte first
Secondary calibration (two points correction)	Receive	AA 06 07 6F 02 **19 00** 41 EB AA (25℃)	2-byte parameter, stands for the input blackbody temperature
	Return	55 05 07 6F 33 01 04 EB AA	
Secondary calibration (enable and save)	Receive	AA 05 07 6A 02 **00** 22 EB AA	Enable the parameters of secondary calibration, parameters of secondary calibration will be saved after power off
	Return	55 05 07 6A 33 01 FF EB AA	
Secondary calibration (Eliminate)	Receive	AA 05 07 6B 02 **00** 23 EB AA	Enable the original calibration parameter, the original calibration parameters will be saved after power off
	Return	55 05 07 6B 33 01 00 EB AA	