

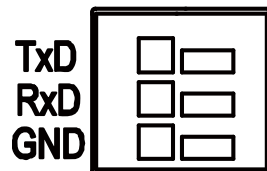
RS-232C communication specifications for IK-HR1D

1. Communication data specifications

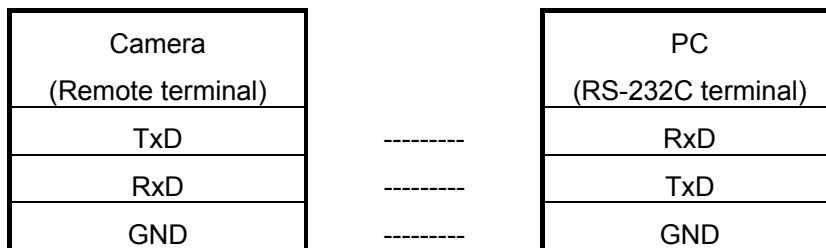
Synchronization system	Asynchronous
Baud rate	9600 bps / 19200 bps
Data length	8 bits
Parity	None
Start bit	1 bit
Stop bit	1 bit
Direction of transmission	LSB first
Handshake function	None

2. Remote terminal names (camera side)

Name		Contents	Direction of signal
1	TxD	Translating Data	Camera to PC
2	RxD	Receiving Data	PC to Camera
3	GND	GND	—



3. Method of connection



4. Communication procedure

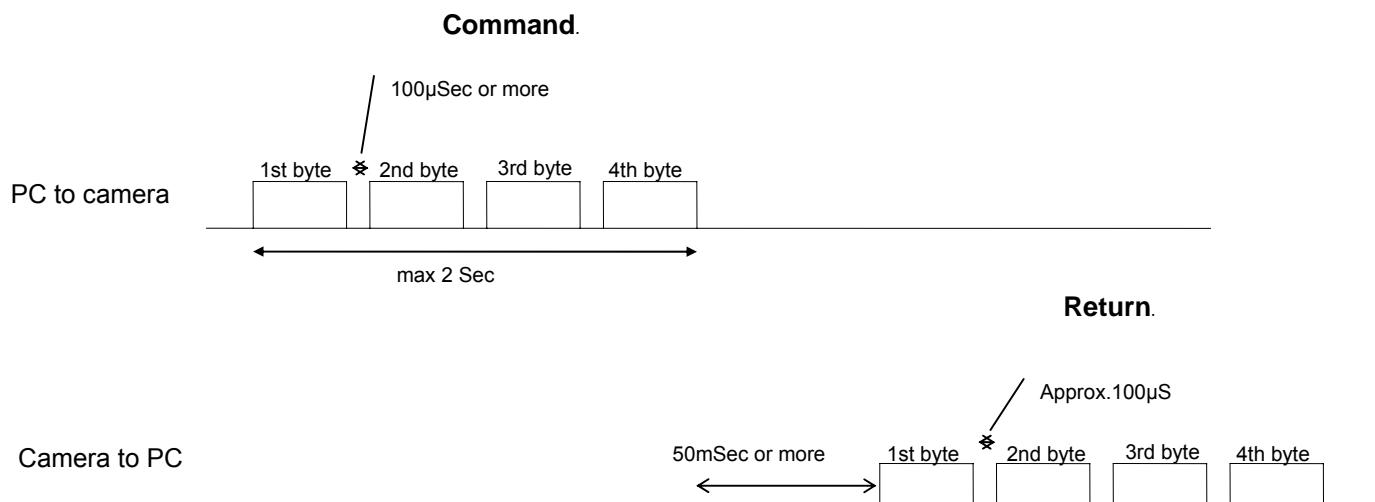
4-1. Camera communications consist of receiving a four-byte command code from the PC and then communicating a four (4)-byte return code from the camera.

* Transmitting any of the following commands before a return code is transmitted will cause that command to be ignored.

4-2. If the product fails to receive up to the 4th byte of data within about two seconds after receiving the 1st byte of command code from the PC, the product will judge the status as a communication error, about the reception, and transmit a return code (15 05 FF FF).

* The same is true in the case of an overrun error or framing error. About two seconds after such an error occurs, the product will transmit a return code (15 05 FF FF).

4-3. Do not transmit a next command from the time you transmit a command code to the camera until you finish receiving a return code. Allow for at least 50mS from the time you receive a return code until you transmit a next command.



5. Communication Command

5-1. Command code (PC to Camera)

Item	Transmitted data				Actions	
	1st byte	2nd byte	3rd Byte	4th byte		
Key button function	4BH	01H	FFH	FFH	DISP	Functions in the same way as the rear panel switches. Note 1: The same as when the DATA UP is pressed for one second. Note 2: Remote presetting does not change the baud rate setting. All other items function in the same way as the presetting actions made by pressing the MENU DOWN and DATA DOWN simultaneously. This returns the product to its initial settings.
	4BH	02H	FFH	FFH	PAGE	
	4BH	03H	FFH	FFH	MENU UP	
	4BH	04H	FFH	FFH	MENU DOWN	
	4BH	05H	FFH	FFH	DATA UP	
	4BH	06H	FFH	FFH	DATA DOWN	
	4BH	07H	FFH	FFH	AWB START(Note 1)	
	4BH	0AH	FFH	FFH	DATA PRESET(Note 2)	
Reading of user data	05H	ADDRESS	FFH	FFH	MEMORY DATA READ REQUEST For ADDRESS, see 5.3."ADDRESS&DATA (1st byte=05H, 53H)."	
Writing of user data	53H	ADDRESS	DATA(L)	DATA(H)	MEMORY DATA WRITE REQUEST For ADDRESS and DATA, see 5.3."ADDRESS&DATA (1st byte=05H, 53H)."	
Reading of status	FFH	ADDRESS	FFH	FFH	CAMERA STATUS READ REQUEST For ADDRESS, see 5.4."ADDRESS&DATA (1st byte=FFH)."	

- The tables in 10 and 11 (on page 7 and later) notate the data H first, then L. You should however transmit the data L first, then H.

5-1-1. Key button function

[DISP], [PAGE], [MENU UP], [MENU DOWN], [DATA UP] and [DATA DOWN] are in the same way as the rear panel switches.

Note 1: [AWB START] is same as when the [DATA UP] is pressed for one second. Please refer to the item in "6. AWB".

Note 2: [DATA PRESET] is same as "Return to factory setting" that is written in the instruction manual.

Remote presetting does not change the baud rate setting. All other items function in the same way as the presetting actions made by pressing the MENU DOWN and DATA DOWN simultaneously. This returns the product to its initial settings.

5-1-2. Reading of user data

MEMORY DATA READ REQUEST (05 ADDRESS FF FF)

- This function is used to read items that can be configured by OSD (two-byte data).
- For the contents of ADDRESS and DATA, see 11."ADDRESS&DATA (1 st byte=05H,53H)."
- This function reads the contents of the specified item.

5-1-3. Writing of user data

MEMORY DATA WRITE REQUEST (53 ADDRESS DATA(L) DATA(H))

- This function is used to rewrite the contents of items that can be configured by OSD (two-byte data).
- For the contents of ADDRESS and DATA, see 11."ADDRESS&DATA (1 st byte =05H,53H)."
- This function rewrites the contents of the specified item.
- During AWB (while the data in AUTO READ is 01H), the product will not accept the MEMORY DATA WRITE REQUEST command. (The product will return the return code due to the camera mode error. See 6."Return code.")

5-1-4. Reading of status

MEMORY DATA READ REQUEST (FF ADDRESS FF FF)

- This function is used to read the status data of the camera (two-byte data).
- For the contents of ADDRESS and DATA, see the contents of 12."ADDRESS & DATA (1st byte=FFH)."
- The following state can be confirmed.

Master Gain (GAIN)

The final result of AWB function (that is the result of processing [AWB START])

OSD PAGE (Displaying menu page)

The cursor position of "→" for the each MENU. (1st to 13th from the top.)

5.2. Return code (Camera to PC)

Item	Return code				Meaning
	1st byte	2nd byte	3rd byte	4th byte	
NORMAL	06H	Transmitted data 2nd byte	Transmitted data 3rd byte	Transmitted data 4th byte	Transmitted data, 1st byte ≠ 05H, ≠FFH
	06H	ADDRESS	DATA (L)	DATA (H)	Transmitted data, 1st byte = 05H
	FFH	ADDRESS	DATA (L)	FFH	Transmitted data 1st byte =FFH
ERROR	15H	01H	FFH	FFH	Invalid data (1st, 2nd byte)
	15H	02H	FFH	FFH	Invalid data (3rd, 4th byte)
	15H	03H	FFH	FFH	Camera mode error You have specified a command which cannot be executed in the current camera mode or which cannot produce anything significant.
	15H	05H	FFH	FFH	Time-out or communication error.

A camera mode error (15H 03H FFH FFH) can be caused by any of the following:

Command category	Command item	Camera status that causes a mode error
Operation switch system	DISP	- AWB being executed.
	PAGE	- AWB being executed.
	MENU UP	- Color bar screen on - Camera screen on - AWB being executed.
	MENU DOWN	ditto
	DATA UP	- Color bar screen on - Camera screen on - Index menu screen on - AWB being executed.
	DATA DOWN	ditto
	AWB START	- The WB mode is in a mode other than AWB. - Color bar screen on - Menu screen on - AWB being executed.
	DATA PRESET	- Color bar screen on - Menu screen on - AWB being executed.
	Other than above command at 1st byte = 4B	- AWB being executed.
MEMORY DATA WRITE	Other than SCENE FILE	- AWB being executed.
	SCENE FILE	- Color bar screen on - AWB being executed.

5.3. ADDRESS & DATA (1st byte=05H, 53H)

*: don't care

Item		Address	Data		Action	
			H	L		
SHUTTER	MODE	01H	* * H	00H	AUTO	Sets the SHUTTER MODE and EXT TRIG mode. AUTO: Auto shutter MANU: Manual mode SS: Synchronous scan mode
				01H	MANU	
				02H	SS	
	LEVEL	03H	* * H	9CH ↓ 00H ↓ 64H	-100 ↓ 00 ↓ 100	Adjusts the automatic shutter level. Level Low ↑ If the high level is selected, the value increases. ↓ If the low level is selected, the value decreases. Level High
	PEAK/AVE	04H	* * H	00H ↓ 0AH	00:10 ↓ 10:00	Adjusts the ratio between peak and average value in the automatic shutter mode. 00: Average only. 01 to 09: The bigger the value is, the higher the ratio is. 10: Peak only
	SPEED	05H	* * H	00H ↓ 13H	1 ↓ 20	Adjusts the automatic shutter response speed. The bigger the value is, the faster the response is.
	AREA	06H	* * H	00H 01H 02H 03H 04H	PRESET A PRESET B PRESET C PRESET D PRESET E	Selects the available picture area in the automatic shutter mode. PRESET A,B,C,D,E: Specified range
MANUAL	0DH	* * H	00H 01H 02H 03H 04H 05H 06H 07H 08H 09H 0AH	OFF 1/100S 1/125S 1/250S 1/500S 1/1000S 1/2000S 1/4000S 1/8000S 1/16000S 1/32000S	Sets a shutter speed in manual mode.	

Item		Address	Data		Action		
			H	L			
	SYNCHRO SCAN	0EH	0002H ↓ 0463H		002 / 1125H ↓ 1123 / 1125H	Sets a shutter time every time a synchronization scan is turned off or data setting. Turned off is meant the maximum value by 1123H. 2H / 1125H~1123 / 1125H: The shutter speed can be set by the 1H. (0002H(Hex)) (0463H(Hex))	
GAIN	MODE	20H	* * H	01H	MANUAL	Sets the master gain mode.	
				02H	OFF		
	MANU	22H	* * H	00H ↓ 0CH	00dB ↓ 12dB	Sets the gain when the master gain is manual.	
WHITE BALANCE	MODE	30H	* * H	00H	AWB	Sets the white balance mode.	
				01H	ATW		
				02H	MANUAL		
	C.TEMP	31H	* * H	* * H	00H	3200K	Sets a color temperature.
					01H	5600K	
	R PAINT	32H	* * H	* * H	F6H ↓ 00H ↓ 0AH	-10 ↓ 00 ↓ 10	Sets the RED setting in AWB mode.
	B PAINT	33H	* * H	* * H	F6H ↓ 00H ↓ 0AH	-10 ↓ 00 ↓ 10	Sets the BLUE setting in AWB mode.
AREA		34H	* * H	00H	PRESET A	Sets in AWB mode. PRESET A,B,C,D,E : in the specified range	
				01H	PRESET B		
				02H	PRESET C		
				03H	PRESET D		
				04H	PRESET E		

Item		Address	Data		Action	
			H	L		
WHITE BALANCE	R GAIN	39H	* * H	9CH ↓ 00H ↓ 64H	-100 ↓ 0 ↓ 100	Sets the RED gain in MANUAL mode.
	B GAIN	3AH	* * H	9CH ↓ 00H ↓ 64H	-100 ↓ 0 ↓ 100	Sets the BLUE gain in MANUAL mode.
	ATW R PAINT	3BH	* * H	F6H ↓ 00H ↓ 0AH	-10 ↓ 0 ↓ 10	Sets the RED setting in ATW mode.
	ATW B PAINT	3CH	* * H	F6H ↓ 00H ↓ 0AH	-10 ↓ 0 ↓ 10	Sets the BLUE setting in ATW mode.
	AWB R DATA READ	A0H	* * H	* * H	Data read 250~4000	Reads R data in Auto White Balance. Note) This item can only read 1st byte=05H. It can not be written 1st byte=53.
	AWB B DATA READ	A1H	* * H	* * H	Data read 250~4000	Reads B data in Auto White Balance. Note) This item can only read 1st byte=05H. It can not be written 1st byte=53H.

Item		Address	Data		Action	
			H	L		
PROCESS	GAMMA ON/OFF	40H	* * H	00H	ON	Gamma correction setting : ON/OFF
				01H	OFF	
	GAMMA	41H	* * H	F6H	-10	Gamma correction level setting
				↓ 00H	↓ 0	
				↓ 0AH	↓ 10	
	DTL GAIN	44H	* * H	F9H	-7	DTL gain setting
↓ 00H				↓ 0		
↓ 07H				↓ 7		
DTL.B. FRQ	45H	* * H	00H	LOW	Detail boost frequency setting	
			01H	NORMAL		
			02H	HIGH		
M. PED	46H	* * H	80H	-128	Master pedestal setting	
			↓ 00H	↓ 0		
			↓ 7FH	↓ 127		

Item		Address	Data		Action	
			H	L		
MATRIX	MATRIX ON/OFF	50H	* * H	00H	ON	Matrix color correction : ON/OFF
				01H	OFF	
	R HUE	51H	* * H	F1H ↓ 00H ↓ 0FH	-15 ↓ 0 ↓ 15	Red hue setting
	R GAIN	52H	* * H	F1H ↓ 00H ↓ 0FH	-15 ↓ 0 ↓ 15	Red gain setting
	G HUE	53H	* * H	F1H ↓ 00H ↓ 0FH	-15 ↓ 0 ↓ 15	Green hue setting
	G GAIN	54H	* * H	F1H ↓ 00H ↓ 0FH	-15 ↓ 0 ↓ 15	Green gain setting
	B HUE	55H	* * H	F1H ↓ 00H ↓ 0FH	-15 ↓ 0 ↓ 15	Blue hue setting
	B GAIN	56H	* * H	F1H ↓ 00H ↓ 0FH	-15 ↓ 0 ↓ 15	Blue gain setting

Item	Address	Data		Action		
		H	L			
MATRIX	Ye HUE	57H	* * H	F1H ↓ 00H ↓ 0FH ↓ 15	-15 ↓ 0 ↓ 15	Yellow hue setting
	Ye GAIN	58H	* * H	F1H ↓ 00H ↓ 0FH ↓ 15	-15 ↓ 0 ↓ 15	Yellow gain setting
	Cy HUE	59H	* * H	F1H ↓ 00H ↓ 0FH ↓ 15	-15 ↓ 0 ↓ 15	Cyan hue setting
	Cy GAIN	5AH	* * H	F1H ↓ 00H ↓ 0FH ↓ 15	-15 ↓ 0 ↓ 15	Cyan gain setting
	Mg HUE	5BH	* * H	F1H ↓ 00H ↓ 0FH ↓ 15	-15 ↓ 0 ↓ 15	Magenta hue setting
	Mg GAIN	5CH	* * H	F1H ↓ 00H ↓ 0FH ↓ 15	-15 ↓ 0 ↓ 15	Magenta gain setting

Item		Address	Data		Action		
			H	L			
OPTION	MONITOR	8AH	* * H	00H	PC	Changes monitor mode.	
				01H	TV		
	I/P MODE	8BH	* * H	00H	1080p		Sets I/P mode.
				01H	1080i		
	BAUD RATE	88H	* * H	00H	9600bps		Sets a baud rate for RS232C communications.
				01H	19200bps		

Item		Address	Data		Action	
			H	L		
SCENE FILE	90H	* * H	00H	FILE A	Selects a scene file.	
			01H	FILE B		
			02H	FILE C		
			03H	FILE D		
			04H	FILE E		

5.4. ADDRESS & DATA (1st byte=FFH)

Item	Address	Data		Action	
		H	L		
GAIN READ	01H	FFH	00H ↓ 0CH	00dB ↓ 12dB	Master gain
AUTO READ	03H	FFH	01H	AWB in progress.	
			02H	The final result of AWB is accepted.	
			03H	The final result of AWB is rejected. C. TEMP HIGH(R GAIN MAX)	
			04H	The final result of AWB is rejected. C. TEMP HIGH(B GAIN MIN)	
			05H	The final result of AWB is rejected. C. TEMP LOW(R GAIN MIN)	
			06H	The final result of AWB is rejected. C. TEMP LOW(B GAIN MAX)	
			07H	The final result of AWB is rejected. LEVEL HIGH	
			08H	The final result of AWB is rejected. LEVEL LOW	
			0AH	The final result of AWB is rejected.	

Item	Address	Data		Action	
		H	L		
OSD PAGE	04H	FFH	00H	OSD OFF(a live image)	
			01H	INDEX	
			02H	SHUTTER	
			03H	GAIN	
			04H	WHITE BALANCE	
			05H	PROCESS	
			06H	MATRIX	
			07H	OPTION	
			33H	AWB in progress	
			FFH	COLOR BAR	
" → "POINT	05H	FFH	00H ↓ 0CH	1st ITEM to 13th ITEM	The position of "→" for the each MENU. (1st to 13th from the top.)

6. AWB

1) To start AWB, take an image of a white subject and transmit an AWB SART command under the following conditions:

- The WB mode should be AWB.
- The camera screen (a live image) should be on. (The OSD PAGE data should be 00H.)

2) For the AWB status (whether in progress or complete) and the final result, read the contents of AUTO READ by using the MEMORY DATA READ REQUEST(FF 03 FF FF) command. For the causes of errors, refer to the following:

- NG : AWB will not be completed within a specified time.
- CTEMP HIGH : Color temperature is too high.
- CTEMP LOW : Color temperature is too low.
- LEVEL HIGH : The level of the image in the area is too high.
- LEVEL LOW : The level of the image in the area is too low.