RS-232C communication specifications for IK-HR1S

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

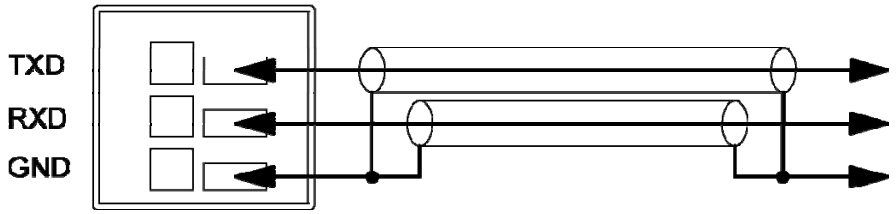
2. Remote terminal names (camera side)

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

Camera (Remote terminal)		PC (RS-232C terminal)
TxD	---------	RxD
RxD	---------	TxD
GND	---------	GND

Connection example



4. Communication procedure

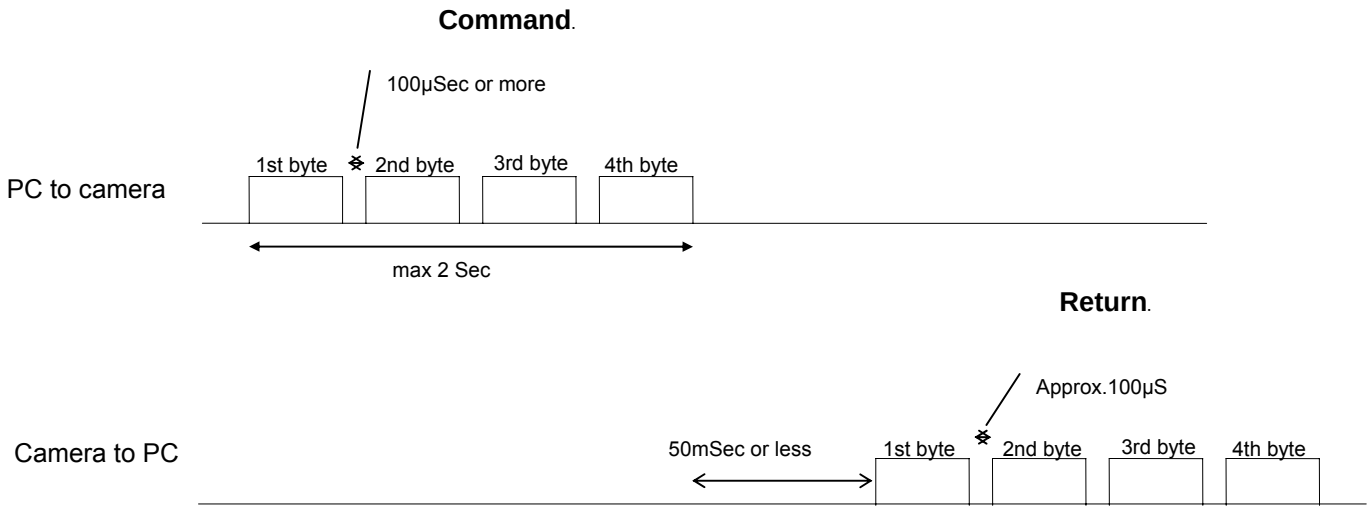
4-1. Camera communications consist of receiving a four-byte command code from the PC and then communicating a four (4)-byte return code from the camera.

***** 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) showed the data H first then L. However it should transmitted 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 5.3."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(Lo) DATA(Hi))

- 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 5.3."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.")

Note: Even if data is changed, and camera is in time even by an item not effective, it is possible to memorize it in the mode of the camera. Afterwards, when the camera becomes a mode that the stored data becomes effective, the data is reflected in the camera.

Example) When the SHUTTER MODE is under AUTO mode, if the MANUAL SHUTTER is changed to 1/1000S, it will become 1/1000S at next MANUAL mode.

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 5.4."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）

Return code				Meaning
t byte	2nd byte	3rd byte	4th byte	
	ADDRESS	DATA (Lo)	DATA (Hi)	Transmitted data, 1st byte = 06H (Read command of user setting)
	ADDRESS	DATA (Lo)	FFH	Transmitted data 1st byte =FFH (Read command of status)

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

ADDRESS (2nd byte) and DATA (3rd and 4th byte) of reading / Writing commands by user setting are given below table. ＊: don't care

Item		Address	Data		Action	
			Hi	Lo		
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	PRESET A	Selects the available picture area in the automatic shutter mode. PRESET A,B,C,D,E: Specified range
				01H	PRESET B	
				02H	PRESET C	
				03H	PRESET D	
				04H	PRESET E	
	MANUAL	0DH	＊＊H	00H	OFF	Sets a shutter speed in manual mode. If current mode of camera is 1080i, it is impossible to set the shutter speed of 720p mode. Same as if current mode of camera is 720p, it is impossible to set the shutter speed of 1080i mode.
				01H	1/100S	
				02H	1/125S	
				03H	1/250S	
				04H	1/500S	
				05H	1/1000S	
				06H	1/2000S	
				07H	1/4000S	

Item		Address	Data		Action	
			Hi	Lo		
SHUTTER (Continued)	SYNCHRO SCAN (In 1080i mode)	0EH	000FH ↓ 0463H		0015 / 1125H ↓ 1123 / 1125H (Above H meant horizontal lines)	Set a shutter time every time a synchronization scan is turned off or data setting. (In 1080i mode) Turned off is meant the maximum value by 1123H. 15H / 1125H～1123 / 1125H: The shutter speed can be set by the 1H. (0015H) (1123H) (Above H meant horizontal lines)
	SYNCHRO SCAN (In 720p mode)	0EH	000AH ↓ 02ECH		0010 / 1125H ↓ 0748 / 1125H (Above H meant horizontal lines)	Set a shutter time every time a synchronization scan is turned off or data setting. (In 720p mode) Turned off is meant the maximum value by 748H. 10H / 750H～748 / 750H: The shutter speed can be set by the 1H. (0010H) (0748H) (Above H meant horizontal lines)
GAIN	MODE	20H	＊＊H	01H	MANUAL	Sets the master gain mode.
				02H	OFF	
	MANU	22H	＊＊H	00H ↓ 12H	00dB ↓ 18dB	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	00H	3200K	Sets a color temperature.
				01H	5600K	
	R PAINT	32H	＊＊H	F6H ↓ 00H ↓ 0AH	-10 ↓ 00 ↓ 10	Sets the RED setting in AWB mode.
	B PAINT	33H	＊＊H	F6H ↓ 00H ↓ 0AH	-10 ↓ 00 ↓ 10	Sets the BLUE setting in AWB mode.

Item		Address	Data		Action	
			Hi	Lo		
WHITE BALANCE (Continued)	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	
	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=53H.
	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	
			Hi	Lo		
PROCESS	GAMMA ON/OFF	40H	＊＊H	00H	ON	Gamma correction setting : ON/OFF
				01H	OFF	
	GAMMA	41H	＊＊H	F6H ↓ 00H ↓ 0AH	-10 ↓ 0 ↓ 10	Gamma correction level setting
	DTL GAIN	44H	＊＊H	F9H ↓ 00H ↓ 07H	-7 ↓ 0 ↓ 7	DTL gain setting
	DTL B. FREQ	45H	＊＊H	00H	LOW	Detail boost frequency setting
				01H	NORMAL	
				02H	HIGH	
	M. PED	46H	＊＊H	80H ↓ 00H ↓ 7FH	-128 ↓ 0 ↓ 127	Master pedestal setting

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

Item		Address	Data		Action	
			Hi	Lo		
OPTION	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)

ADDRESS (2nd byte) of status reading commands by user setting is given below table. ＊: don't care

Item	Address	Data		Action	
		Hi	Lo		
GAIN READ	01H	FFH	00H ↓ 12H	00dB ↓ 18dB	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.	

<table>
<tr><th rowspan="2">Item</th><th rowspan="2">Address</th><th colspan="2">Data</th><th colspan="2" rowspan="2">Action</th></tr>
<tr><th>Hi</th><th>Lo</th></tr>
<tr><td>OSD PAGE</td><td>04H</td><td>FFH</td><td>00H</td><td>OSD OFF(a live image)</td><td rowspan="10"></td></tr>
<tr><td></td><td></td><td></td><td>01H</td><td>INDEX</td></tr>
<tr><td></td><td></td><td></td><td>02H</td><td>SHUTTER</td></tr>
<tr><td></td><td></td><td></td><td>03H</td><td>GAIN</td></tr>
<tr><td></td><td></td><td></td><td>04H</td><td>WHITE BALANCE</td></tr>
<tr><td></td><td></td><td></td><td>05H</td><td>PROCESS</td></tr>
<tr><td></td><td></td><td></td><td>06H</td><td>MATRIX</td></tr>
<tr><td></td><td></td><td></td><td>07H</td><td>OPTION</td></tr>
<tr><td></td><td></td><td></td><td>33H</td><td>AWB in progress</td></tr>
<tr><td></td><td></td><td></td><td>FFH</td><td>COLOR BAR</td></tr>
<tr><td>“ → ”POINT</td><td>05H</td><td>FFH</td><td>00H
↓
0CH</td><td>1st ITEM to 13th ITEM</td><td>The position of ”→” for the each MENU.
(1st to 13th from the top.)

The order numbers in MATRIX menu is given by below table.
-- 5 MATRIX --
(1st) MATRIX ON
(2nd) R HUE (8th) Ye HUE
(3rd) R GAIN (9th) Ye GAIN
(4th) G HUE (10th) Cy HUE
(5th) G GAIN (11th) Cy GAIN
(6th) B HUE (12th) Mg HUE
(7th) B GAIN (13th) Mg GAIN</td></tr>
</table>

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.)
- It should not be under AWB. (It is meant the result of AWB executive is not 01H.)

2) For the AWB status (whether in progress or complete) and the final result, use the status reading command of AWB confirmation.

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

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.