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FUJINON DIGI POWER Series TV Lens
RS-232C External Control Specifications

Specifications subject to change without notice, and FUJINON will not be responsible for printing errors.

1. Serial data format

Communications standard:	RS-232C
Bit rate:	38.4 kbps
Parity check:	None
Stop bit:	1 bit

2. Connector on the lens side

Box-type lens:	DE-9PF-N (JAE)
Handy lens:	HR10G-10R-10S (HIROSE)

DE-9PF-N Pin assignment

Pin	Designation	
1	DCD	(CD)
2	RxD	(RD)
3	TxD	(SD)
4	DTR	(ER)
5	GND	(SG)
6	DSR	(DR)
7	RTS	(RS)
8	CTS	(CS)
9	RI	(CI)

HR10G-10R-10S Pin assignment

Pin	Designation	
1	OPEN	
2	RxD	(RD)
3	TxD	(SD)
4	DTR	(ER)
5	GND	(SG)
6	DSR	(DR)
7	RTS	(RS)
8	CTS	(CS)
9	OPEN	
10	OPEN	

3. Construction of data sent and received

Command block data construction

Data length	Function code	Function data (Variable length)	Check sum
1 byte	1 byte	0 ~ 15 byte	1 byte

Data length

D7	D6	D5	D4	D3	D2	D1	D0

D7 ~ D4: 0000

D3 ~ D0: Function data length (0 ~ 15)

Function code

Refer to Item 6. Function code List.

Function data

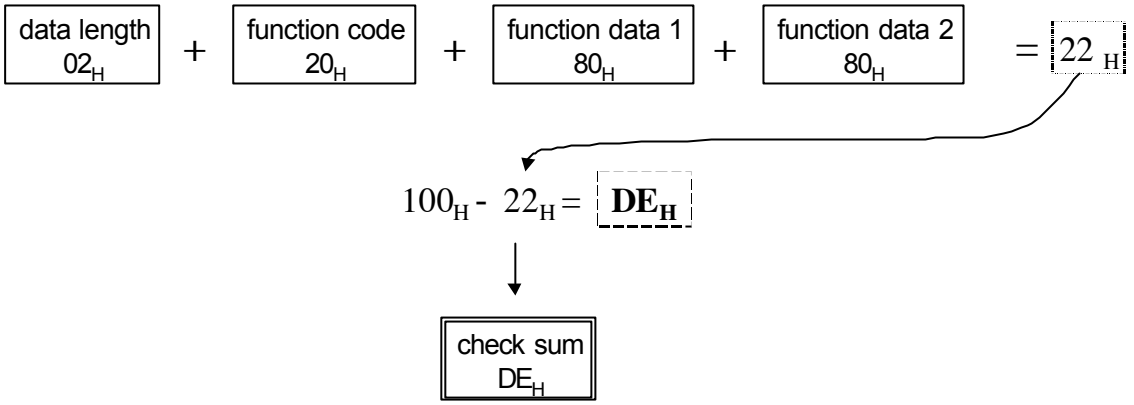
For the function data made up of 2 bytes or more, the top several bytes are sent in order.

Check sum

A value where the sum of the data length, the function code, the function data, and the check sum amount

becomes 0.

Please refer to the following example.



4. Specifications for communications-related operation

1) A host computer for external control (hereinafter called "host") leads communications. The lens responds to a command received from the host. No commands can be sent from the lens first.

2) After the power is turned ON, the lens confirms that DSR is ON and readies for communications. DSR must be continuously ON while connecting to the lens. DTR loops back DSR and RTS loops back CTS. Even when CTS is OFF the lens responds to a command from the host, if any.

3) After the power is turned ON and a receiving error and/or other communications errors occur for the lens, the host sends a connecting request command having no data to the lens. The host then confirms that the lens has responded to the command and communicates with the lens in the normal manner. Data from the command block in which errors occurred for both host and lens is not used.

4) On receiving the first connecting request command from the host after the power is turned ON, the lens is reset to cover the external control. During resetting, the lens returns a resetting response command having one piece of data (Data contents: 0) to the host computer. While the lens is in a resetting operation, the host sends a connecting request command to the lens repeatedly. The host confirms that the lens has been reset when the lens responds to the host computer by means of the command having no data. The host can force the lens to be reset by sending a reset request command having one piece of data (Data contents: 0) to the lens even during normal operations. However the lens without reset function responds by sending a command having data (data length: 0) when receiving a command having data (data length: 1).

5) The host cannot send the next command to the lens until the lens responds to the host except if there is no response from the lens in 10 msec or more.

6) The function code of the command the host sends to the lens is the same as that of the command the lens sends back to the host. On receiving a command from the host during resetting, the lens sends back a connecting response command having one piece of data to the host.

7) When receiving an undefined command or a non-corresponding command from the host, the lens sends back ACKNOWLEDGE (same function code, data length: 0) to the host. In some cases the lens responds to a command not indicated in the Specifications.

8) Both lens and host judge that there is an error if the data contains an error such as an overrun, framing or check sum or if the length of the command block differs from the data length designated in data length bytes + 3.

9) The host judges that there is an error if the lens does not respond to the host within 10 msec after the host sends a command to the lens.

10) For both lens and host, the byte intervals in the same command block must not be 1 msec or more. Both lens and host judge that there is an error if the byte intervals in the receiving command block are 1 msec or more.

11) If there is no command from the host in 5 seconds or more, the lens judges that the control from the host has finished and switches individual controls to local or camera. By the time the lens detects a change in local control signal or control signal from the camera, the position before switching is maintained.

12) If the lens or DSR is turned OFF, however, individual controls are switched to local or camera in spite of the settings made at that point. The position before switching is not maintained.

5. Details of function data

01_H connect

By sending a command having data (data length: 0) to the lens, the host makes a request for connection, and the lens responds to the host. By sending a command having data (data length: 1) to the lens, the host makes a forcible resetting of the lens and the lens tells the host that the lens is being reset. Contents of all the data are 0_H. However, the lens without reset function responds by sending a command having data (data length: 0) when receiving a command having data (data length: 1). Please contact us, Fujinon to ask if your lens has a reset function.

11_H, 12_H lens name

The name of a lens may be sent at up to 80 ASCII characters. The host also makes a request for 12_H if the 11_H response data is 15 bytes long.

13_H, iris (FNo.) data format

10000_H is regarded as F1.0 with 1000_H per iris

$FNo. = 2^{(8*(1-Data/10000_H))}$

$Data = 10000_H * (1-\log_2(FNo.)/8)$

Data can be used up to $FFFF_H$.

14_H, 15_H, 16_H distance data format

The 16-bit data is divided into two parts: One is the exponent part b, made up of the upper 4 bits and the other is the mantissa part a, made up of the lower 12 bits.

b15 ~ b12	b11 ~ b0
B	A

"a" represents 0 to 4095 without symbols, and "b" represents -8 to 7 with symbols. The exponent part and the mantissa part combined shall represent the value (distance) a ? 10 ^b [m].

In this method, there are multiple expressions to indicate one distance. The one with which the mantissa part becomes maximumis used.

(Example)

There are two equal expressions of 5.2 mm and 0.0052 m as follows:

52 ? 10^{-4} [m]

520 ? 10^{-5} [m]

However, the second method is used since the mantissa part is larger.

Value 5.2 mm is represented as $B208_H$ because $520 = 208_H$ and $-5 = B_H$.

20_H iris control

The variable range is represented as 0000_H through $FFFF_H$. 0000_H is the close end and $FFFF_H$ the open end.

30_H iris position

The variable range is represented as 0000_H through $FFFF_H$. 0000_H is the close end and $FFFF_H$ the open end.

21_H zoom control

The variable range is represented as 0000_H through $FFFF_H$. 0000_H is the wide end and $FFFF_H$ the tele-end.

31_H zoom position

The variable range is represented as 0000_H through $FFFF_H$. 0000_H is the wide end and $FFFF_H$ the tele-end.

22_H focus control

The variable range is represented as 0000_H through $FFFF_H$. 0000_H is the MOD and $FFFF_H$ the infinite distance

32_H focus position

The variable range is represented as 0000_H through $FFFF_H$. 0000_H is the MOD and $FFFF_H$ the infinite distance

42_H Switch 2 control

bit7	Undefined	1
bit6	Undefined	1
bit5	Forced iris servo	0:OFF 1:ON
bit4	IRIS auto/remote	0:auto 1:remote
bit3	Undefined	1
bit2	Undefined	1
bit1	Undefined	1
bit0	Undefined	1

52_H Switch 2 position

bit7	Undefined	1
bit6	Undefined	1
bit5	Forced iris servo	0:OFF 1:ON
bit4	IRIS auto/remote	0:auto 1:remote
bit3	Undefined	1
bit2	Undefined	1
bit1	Undefined	1
bit0	Undefined	1

The default position of Switch 2 is the value set before communication is established.

43_H Switch 3 control

bit7	Projector	0:ON 1:OFF
bit6	Undefined	1
bit5	Undefined	1
bit4	4:3 mode	0:ON 1:OFF
bit3	Extender magnification	Refer to the extender magnification table
bit2	Extender magnification	
bit1	Extender magnification	
bit0	Extender magnification	

53_H Switch 3 position

bit7	Projector	0:ON 1:OFF
bit6	Undefined	1
bit5	Undefined	1
bit4	4:3 mode	0:ON 1:OFF

bit3	Extender magnification	Refer to the extender magnification table
bit2	Extender magnification	
bit1	Extender magnification	
bit0	Extender magnification	

? Bit 4 to bit 7 cannot be controlled by means of function code 43_H.

? If bit 7 is 0 in function code 53_H, bit 0 through bit 3 shall be invalid.

? In the 4:3 mode, the 16:9 image is shown in the shape of the 4:3 image. If the original in the camera is the 4:3 image or if the lens is not provided with a ratio converter (? 0.8), the 4:3 mode shall be turned OFF.

? If the lens is designated with a non-provided magnification to the camera or extender is operated by hand the control shall be invalid.

? The extender can be controlled from the host at all times after communication is established. If the extender is set to a value except for ? 1.0 by the operating part of the extender and the camera, the host cannot set the extender to ? 1.0.

? The default position of Switch 3 is the value set before communication is established.

Extender magnification table

bit0 ~ 3	Function code 43_H		Function code 53_H	
	4:3 mode OFF	4:3 mode ON	4:3 mode OFF	4:3 mode ON
F_H	? 1.0	? 1.0	? 1.0	? 1.0
E_H	? 2.0	? 2.4	? 2.0	? 2.4
D_H	Reserved	Reserved	Reserved	Reserved
C_H	Reserved	Reserved	Reserved	Reserved
B_H ~ 2_H	Undefined	Undefined	Undefined	Undefined
1_H	Undefined	Undefined	? 0.8 (Note 1)	Undefined
0_H	Undefined	? 1.2 (Note 2)	Undefined	? 1.2 (Note 2)

Note 1: When the ratio converter (? 0.8) is turned ON manually with the 4.3 mode OFF. This state cannot be controlled by means of function code 43_H.

Note 2: When the 4:3 mode is ON, ? 1.0 is substantially used as ? 1.2 with the ratio converter (? 0.8) OFF.

44_H Switch 4 control

bit7	Undefined	1
bit6	Undefined	1
bit5	Undefined	1
bit4	Undefined	1
bit3	Undefined	1
bit2	Iris host/camera	0:host 1:camera
bit1	Zoom host/local	0:host 1:local
bit0	Focus host/local	0:host 1:local

54_H Switch 4 position

bit7	Undefined	1
bit6	Undefined	1
bit5	Undefined	1
bit4	Undefined	1
bit3	Undefined	1
bit2	Iris host/camera	0:host 1:camera
bit1	Zoom host/local	0:host 1:local
bit0	Focus host/local	0:host 1:local

? The lens switches the controlling destination according to bit 0 through bit 2. However, the lens maintains the position until the lens detects a change in the control signal for the controlling destination (until the lens receives a control signal from the host.)

? The default for Switch 4 position bit 0 through bit 2 is 1(local and camera).

60_H multiple data request and respond / 70_H multiple setting

- By using the 70_H multiple data setting, the host can preset the designated function code among position data for iris, zoom, focus, and extender and arrangement.
- When recovering from an error after setting by means of a connecting request command, the host sets multiple data again.
- If receiving the 70_H function code, the lens excludes a non-corresponding function code from the function code arrangement and returns a compatible function code to the arrangement.
- When receiving 60_H function code, the lens sends back the position data arrangement for the function code set by multiple data setting function code.

(Example)

The host sets the order of the designated position data (iris 30_H, zoom 31_H, focus 32_H, and extender 53_H).

$04_H, 70_H, 30_H, 31_H, 32_H, 53_H$, sum

The lens that does not support the extender position responds to this.

$03_H, 70_H, 30_H, 31_H, 32_H$, sum

The host makes a request for multiple data.

$00_H, 60_H$, sum

The lens responds to this (Example of the positions: 1234_H for iris, 5678_H for zoom, and $9ABC_H$ for focus)

$06_H, 60_H, 12_H, 34_H, 56_H, 78_H, 9A_H, BC_H$, sum

6. Function code table

Function code	Function code name	HOST ? LENS		LENS ? HOST	
		Data length	Function description	Data length	Function description
01_H	Connect	0	Connection request	0	Connection response
		1	Lens reset request	1	Response at the time of resetting
11_H	Lens name 1	0	Request for the first half of the lens name	0~ 15	Response to the first half of the lens name
12_H	Lens name 2	0	Request for the second half of the lens name	0~ 15	Response to the second half of the lens name
13_H	Open F No.	0	Request for open-F No.	2	Response to open-F No.
14_H	Tele-end focal length	0	Request for tele-end focal length	2	Response to tele-end focal length
15_H	Wide-end focal length	0	Request for wide-end focal length	2	Response to wide-end focal length
16_H	MOD	0	Request for MOD	2	Response to MOD
20_H	Iris control	2	Iris control	0	ACKNOWLEDGE
21_H	Zoom control	2	Zoom control	0	ACKNOWLEDGE
22_H	Focus control	2	Focus control	0	ACKNOWLEDGE
30_H	Iris position	0	Request for iris position	2	Response to iris position
31_H	Zoom position	0	Request for zoom position	2	Response to zoom position
32_H	Focus position	0	Request for focus position	2	Response to focus position
42_H	Switch 2 control	1	Switch 2 control	0	ACKNOWLEDGE
43_H	Switch 3 control	1	Switch 3 control	0	ACKNOWLEDGE
44_H	Switch 4 control	1	Switch 4 control	0	ACKNOWLEDGE
52_H	Switch 2 position	0	Request for switch 2 position	1	Response to switch 2 position
53_H	Switch 3 position	0	Request for switch 3 position	1	Response to switch 3 position
54_H	Switch 4 position	0	Request for switch 4 position	1	Response to switch 4 position
60_H	Multiple data	0	Request for multiple data	1~ 7	Response to multiple data
70_H	Multiple data setting	1~ 4	Request for setting of multiple data	1~ 4	Response to setting of multiple data