See the possibilities

Command List

SW-8000M-PMCL
SW-4000M-PMCL

Monochrome Line Scan Camera

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Communication Protocol for SW-4000M/8000M-PMCL <Rev02>

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All configuration of the camera is done via the RS-232C port. The camera can be set up from a PC running terminal emulator software.
Below is the description of the ASCII based short command protocol.

1. Model name

SW-4000M-PMCL 4K pixels CMOS Monochrome Line scan
SW-8000M-PMCL 8K pixels CMOS Monochrome Line scan

2. Communication setting

Baud Rate	9600
Data Length	8bit
Start Bit	1bit
Stop Bit	1bit
Parity	Non
Xon/Xoff Control	Non

3. Protocol(Short ASCII Command)

3.1. Transmit the setting command to camera

NN is any kind of the commands.
NN=[Param.]<CR><LF>
e.g.
Send to camera: GA=0 <CR><LF>
Camera response: COMPLETE<CR><LF>

When camera receives the valid command, camera will return 'COMPLETE'.
If camera receives the command, camera will return following:
e.g.
Send to camera: GAX=0 <CR><LF>
Camera response: 01 Unknown Command!!<CR><LF>
e.g.
Send to camera: GA=1000 <CR><LF>
Camera response: 02 Bad Parameters!!<CR><LF>

3.2. Transmit the request command to camera

The status of camera's settings can be queried by transmitting NN?<CR><LF>, where NN is any one of the commands.
The camera will return the current setting data.
e.g.
Send to camera: GA? <CR><LF>
Camera response: GA=0<CR><LF>

3.3. Switching baud rate between PC and camera

Camera always starts up with 9600bps. This can be switched to higher baud rates after a communication has been established. When switching to other baud rate the procedure is as follows.

e.g. Change baud rate to 115200bps

1. Confirm baud rates camera supported
   Send to camera: SBDRT? <CR><LF>
   Camera response: SBDRT=31(0x1F)<CR><LF>

2. Request new baud rate
   Send to camera: CBDRT=16(0x10) <CR><LF>
   Camera response: COMPLETE<CR><LF>

   (Change baud rate to 115200bps)

3. Rewrite new baud rate again with new baud rate (Confirmation command)
   Send to camera: CBDRT=16(0x10) <CR><LF>
   Camera response: COMPLETE<CR><LF>

   In case the camera does not receive the confirming command with new baud rate within 250ms after sending the acknowledge it falls back to the original baud rate (9600bps).

4. Command List(Short ASCII Command)

4.1. GenCP Bootstrap Register

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
DeviceVendorName	I String	R/O	DVN	"JAI Ltd., Japan"	—	—	—	**DVN?<CR><LF>**
DeviceModelName	I String	R/O	MD	"SW-4000M-PMCL" "SW-8000M-PMCL"	—	—	—	**MD?<CR><LF>**
DeviceVersion	I String	R/O	DV	Indicate device version (e.g. "0.1.0.0")	—	—	—	**DV?<CR><LF>**
DeviceID	I String	R/O	ID	Serial Number	—	—	—	**ID?<CR><LF>**
DeviceUserID	I String	R/W	UD	User can save and load free text. (12 or less characters)				**UD=[Param.]<CR><LF>** **UD?<CR><LF>**

4.2. Technology Specific Bootstrap Register

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
SupportedBaudrates	I Integer	R/O	SBDRT	Indicate Support/Non-support status for each baud rate bit0: 9600bps bit1: 19200bps bit2: 38400bps bit3: 57600bps bit4: 115200bps	0x01	0xFF	0x1F	**SBDRT?<CR><LF>** **This camera supports 9600bps, 19200bps, 38400bps, 57600bps, and 115200bps.**
CurrentBaudrate	I Integer	R/W	CBDRT	READ: Indicate current baud rate WRITE: Set any bit of baud rate bit0: 9600bps bit1: 19200bps bit2: 38400bps bit3: 57600bps bit4: 115200bps	0x01	0x80	1 (9600bps)	**CBDRT=[Param.]<CR><LF>** **CBDRT?<CR><LF>** **In case of WRITE execution (change baud rate), it needs to control in the proper sequence between Host and Camera. (Refer to the section 3.3)**

4.3. Device Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
DeviceFirmware Version	I String	R/O	VN	Firm Ver. No.	—	—	—	**VN?<CR><LF>**
DeviceFPGE Version	I String	R/O	PV	FPGA Ver. No.	—	—	—	**PV?<CR><LF>**
DeviceReset	I Command	W/O	CRS00	1	—	—	—	**CRS00=1<CR><LF>**
Temperature source selector	I Enumeration	R/W	TMPS0	0: Sensor 1: Sensor Board Bottom 2: Interface Board Bottom 3: FPGA	0	3	0	**TMPS0=[Param.]<CR><LF>** **TMPS0?<CR><LF>**
Temperature	I Integer	R/O	TMP0	Value	—	—	—	**TMP0?<CR><LF>** **(Value÷128) = Temperature[℃]**

4.4. Image Format Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
BinningVertical	I Integer	R/W	BI	1: Binning Off 2: Binning 2 mode	1	2	1	**BI=[Param.]<CR><LF>** **BI?<CR><LF>**
BinningHorizontal	I Integer	R/W	HB	1: Binning Off 2: Binning 2 mode	1	2	1	**HB=[Param.]<CR><LF>** **HB?<CR><LF>**
BinningHorizontalMode	I Enumeration	R/W	HBM	0: Average 1: Sum	0	1	1	**HBM=[Param.]<CR><LF>** **HBM?<CR><LF>**
Bit allocation	I Enumeration	R/W	BA	0: Mono8 1: Mono10	0	1	0	**BA=[Param.]<CR><LF>** **BA?<CR><LF>**
CL Clock	I Enumeration	R/W	CLC	0: 85 MHz 1: 63.75 MHz 2: 42.5 MHz 3: 31.875 MHz	0	3	0	**CLC=[Param.]<CR><LF>** **CLC?<CR><LF>**
Test Pattern	I Enumeration	R/W	TS	0: Off 1: Monochrome: Black-White 2: Gray Pattern 3: White	0	Mono:3 Color:6	0	**TS=[Param.]<CR><LF>** **TS?<CR><LF>**

4.5. Acquisition Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
Trigger Origin	I Enumeration	R/W	TG	0: Internal 1: External	0	1	0	**TG=[Param.]<CR><LF> TG?<CR><LF>**
Trigger Input	I Enumeration	R/W	TI	0: Camera-Link 1: Hirose12pin	0	1	0	**TI=[Param.]<CR><LF> TI?<CR><LF>**
Trigger Activation	I Enumeration	R/W	TA	0: RisingEdge 1: FallingEdge 2: LevelHigh 3: LevelLow	0	3	0	**TA=[Param.]<CR><LF> TA?<CR><LF>**
Auto Reset Mode	I Enumeration	R/W	ARST	0: Off 1: On	0	1	0	**ARST=[Param.]<CR><LF> ARST?<CR><LF>**
ExposureMode	I Enumeration	R/W	EM	0: Off 1: Timed 2: TriggerWidth	0	2	1	**EM=[Param.]<CR><LF> EM?<CR><LF>**
ExposureTimeRaw	I Integer	R/W	PE	Min～Max[us]				**PE=[Param.]<CR><LF> PE?<CR><LF>**
Exposure min limit	I Integer	R/O	PEMIN	Min～Max				**PEMIN?<CR><LF>**
Exposure max limit	I Integer	R/O	PEMAX	Min～Max				**PEMAX?<CR><LF>**
Line Rate	I Enumeration	R/W	LR	Min to Max clocks 10 ns/Step	500 *1	1515152	0	**LR=[Param.]<CR><LF> LR?<CR><LF> Available when TG=0**
Linerate min limit	I Integer	R/O	ARMIN	Min～Max				**ARMIN?<CR><LF>**
One-push auto line rate set	I Command	W/O	AR	0: Activate one-push auto line rate set	0	2	1	**AR=[Param.]<CR><LF>**
Auto line rate reference level	I Integer	R/W	AL	0 to 1023				**AL=[Param.]<CR><LF> AL?<CR><LF>**

4.6. Digital I/O Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
LineSource_Line1	I Enumeration	R/W	LS0	0: Low 1: High 2: Not supported 3: Not supported 4: ExposureActive (XEEN) 5: LVAL 6: TTL_In (HIROSE Trigger In) 7: CL_CC1_In (CL Trigger In)	0	7	0	**LS0=[Param.]<CR><LF>** **LS0?<CR><LF>**

4.7. Analog Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
Gain Level	I Integer	R/W	GA	min～0～max	100	SW-8000M 6400 SW-4000M 1600	100	**GA=[Param.]<CR><LF> GA?<CR><LF>**
AnalogBaseGain	I Enumeration	R/W	ABG	0: 0dB 1: +6dB 2: +9.54dB 3: +12dB	0	3	0	**ABG=[Param.]<CR><LF> ABG?<CR><LF>**
Black Level	I Integer	R/W	BL	min～0～max	-133	255	0	**BL=[Param.]<CR><LF> BL?<CR><LF>**

4.8. LUT Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
LUT On/Off	I Enumeration	R/W	LUN	0: Off 1: LUT 2: Gamma	0	2	0	**LUN=[Param.]<CR><LF> LUN?<CR><LF>**
LUT Index	I Integer	R/W	LUTI	0 to 255	0	255	0	**LUTI=[Param.]<CR><LF> LUTI?<CR><LF>**
LUT Data	I Integer	R/W	LUTD	0 to 4095	0	4095	0	**LUTD=[Param.]<CR><LF> LUTD<CR><LF>**
GammaSelector	I Enumeration	R/W	GMA	0(γ=1)～8(γ=0.45)	0	8	8	**GMA=[Param.]<CR><LF> GMA?<CR><LF>**

4.9. Transport Layer Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
DeviceTapGeometry	I Enumeration	R/W	TAGM	0: Geometry_1X2_1Y 1: Geometry_1X3_1Y 2: Geometry_1X4_1Y 3: Geometry_1X8_1Y 4: Geometry_1X10_1Y	0	4	2	**TAGM=[Param.]<CR><LF> TAGM?<CR><LF>**

4.10. User Set Control

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
UserSetLoad	I Command	W/O	LD	0: Default 1: UserSet1 2: UserSet2 3: UserSet3	0	3	0	**LD=[Param.]<CR><LF>**
UserSetSave	I Command	W/O	SA	1: UserSet1 2: UserSet2 3: UserSet3	1	3	1	**SA=[Param.]<CR><LF>**
EEPROM Current Area No. Request.	I Command	R/O	EA	0: Default 1: UserSet1 2: UserSet2 3: UserSet3	1	3		**EA?<CR><LF>**

4.11. JAI-Custom

Name	Interface	Access	Short ASCII	Values	MIN	MAX	DEFAULT	Description
Sensor Select	I Enumeration	R/W	SS	0: 4K-A Type 1: 4K-B Type	0	1	0	**SS=[Param.]<CR><LF> SS?<CR><LF> SW-4000M-PMCL only**
Select shading correction mode	I Enumeration	R/W	SDC	0: OFF 1: Factory area 2: User area	0	2	0	**SDC=[Param.]<CR><LF> SDC?<CR><LF>**
Run shading correction, store to user area	I Command	W/O	SDR	0=Run shading correction, store to user area	0	0	-	**SDR=0<CR><LF>**
Inquire the status after shading correction	I Enumeration	R/O	SDS	0=Shading correction has not been funished yet. 1=Succeeded 2=Error1 – image was too bright >95%* 3=Error2 – image was too dark <30%* 4=Error3 – Timeout-error occurred.	0	4	-	**SDS?<CR><LF> *100%:Full**
Select pixel gain correction mode	I Enumeration	R/W	PGC	1: Factory area 2: User area	1	2	1	**PGC=[Param.]<CR><LF> PGC?<CR><LF>**
Run pixel gain correction, store to user area	I Command	W/O	PGR	0=Run PRNU correction, store to user area	0	0	-	**PGR=0<CR><LF>**
Inquire the status after pixel gain correction	I Enumeration	R/O	PGS	0=Pixel gain correction has not been finished yet. 1=Succeeded 2=Error1 – image was too bright >95%* 3=Error2 – image was too dark <30%* 4=Error3 – Timeout-error occurred.	0	4	-	**PGS?<CR><LF> *100%:Full**

Select pixel black correction mode	I Enumeration	R/W	PBC	1: Factory area 2: User area	1	2	1	**PBC=[Param.]<CR><LF>** **PBC?<CR><LF>**
Run pixel black correction, store to user area	I Command	W/O	PBR	0=Run pixel black correction, store to user area	0	0	-	**PBR=0<CR><LF>**
Inquire the status after pixel black correction	I Enumeration	R/O	PBS	0=Pixel black correction has not been finished yet. 1=Succeeded 2=Error1 – image was too bright >10%* 3=Not supported. 4=Error3 – Timeout-error occurred.	0	4	-	**PBS?<CR><LF>** ***100%:Full**
Median filter	I Enumeration	R/W	MF	0: Off 1: On	0	1	0	**MF=[Param.]<CR><LF>** **MF?<CR><LF>**

***1 : Line Rate : Different by Tap Geometry and Binning Mode**

SW-4000M-PMCL

Non Binning Mode / Vertical Binning Mode		
TapGeometry	CL Clock	LR Min
1X2	31.7	6494
	42.41	4878
	63.39	3247
	84.82	2439
1X3	31.7	4329
	42.41	3247
	63.39	2165
	84.82	1623
1X4	31.7	3247
	42.41	2439
	63.39	1626
	84.82	1220
1X8	31.7	1626
	42.41	1220
	63.39	814
	84.82	611
1X10	31.7	1300
	42.41	975
	63.39	650
	84.82	501

SW-4000M-PMCL

Horzontal Binning Mode		
TapGeometry	CL Clock	LR Min
1X2	31.7	3247
	42.41	2433
	63.39	1623
	84.82	1218
1X3	31.7	2155
	42.41	1618
	63.39	1079
	84.82	809
1X4	31.7	1623
	42.41	1218
	63.39	813
	84.82	610
1X8	31.7	813
	42.41	610
	63.39	500
	84.82	500
1X10	31.7	648
	42.41	500
	63.39	500
	84.82	500

SW-8000M-PMCL

Non Binning Mode / Vertical Binning Mode		
TapGeometry	CL Clock	LR Min
1X2	31.7	12987
	42.41	9804
	63.39	6494
	84.82	4878
1X3	31.7	8696
	42.41	6494
	63.39	4329
	84.82	3247
1X4	31.7	6494
	42.41	4878
	63.39	3247
	84.82	2439
1X8	31.7	3247
	42.41	2439
	63.39	1626
	84.82	1218
1X10	31.7	2597
	42.41	1949
	63.39	1299
	84.82	1001