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iX Link Protocol 1.0

Programming Guide

Revision 1.1

03-Dec-14

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1 Introduction

This document describes the iX Link protocol used for transportation of iX Link data messages between a host controller and a Phase One Industrial camera. It enables users to control the camera and capture images.

This revision of iX Link Protocol is designed to function with standard RS232 serial communication.

2 Messages and Flow Control

There are two types of iX Link data messages:

- Request message with a command to perform
- Reply message with command's completion code and results

The host/controller always initiates a communication with a camera by sending a request message. When the request message is sent, the host waits until the camera sends reply message.

The camera executes most commands almost instantly. Usually, the timeout for receiving a reply message is 500ms. However, there are commands that require additional time for execution (e.g. capture command). For these commands, there is an option to specify in the request message when the camera should send the reply message:

- Async reply mode — right after receiving a command
- Sync reply mode — after completing a command

For capture command in sync reply mode, the timeout is 5000ms + (exposure time)*2.

2.1 Request Message

Byte	Field	Value
0	iX Link protocol prefix	88
1	Message size	The message size starts from the 2nd byte (Protocol version) and does not include Checksum field
2	Protocol version	1
3	Command ID	The Command ID (CMD_ID enumeration)
4-	Command data	0-253 bytes of command data
4+ (command data length)	Checksum	The Checksum of the message (XOR starting from 2nd byte (Protocol version)

2.2 Reply Message

Byte	Field	Value
0	iX Link protocol prefix	88
1	Message size	The message size starts from 2nd byte (Protocol version) and does not include Checksum field
2	Protocol version	1
3	Command completion code	The Command completion code (COMPLETION_CODE enumeration)
4	Command ID	The Command ID (CMD_ID enumeration)
5-	Command data	0-253 bytes of command data
5+ (command data length)	Checksum	The Checksum of the message (XOR starting from 2nd byte (Protocol version)

3 Protocol Type Enumerations

3.1 Command ID

CMD_ID	Field Name	Description
10	SET_APERTURE	Set aperture value
11	GET_APERTURE	Get aperture value
12	GET_APERTURE_RANGE	Get aperture range
13	INCREMENT_APERTURE	Increment aperture
14	SET_ISO	Set ISO value
15	GET_ISO	Get ISO value
16	GET_ISO_RANGE	Get ISO range
17	INCREMENT_ISO	Increment ISO
18	SET_SHUTTER_SPEED	Set shutter speed value
19	GET_ SHUTTER_SPEED	Get shutter speed value
20	GET_ SHUTTER_SPEED_RANGE	Get shutter speed range
21	INCREMENT_ SHUTTER_SPEED	Increment shutter speed
25	SET_ BLACK_CALIB_MODE	Set black calibration mode

110	CAPTURE	Capture an image
111	GET_SYSTEM_STATUS	Get system status
114	START_LIVE_VIEW	Start live view mode
115	STOP_LIVE_VIEW	Stop live view mode
116	SET_REGION_OF_INTEREST	Set region of interest (ROI) for HDMI LV only
255	UNDEFINED_ID	Undefined command ID – may be used when no ID available (in reply message)

3.2 Command Completion Code

COMPLETION_CODE	Field Name	Description
0	NO_ERROR	Command finished successfully
-1	ERR_GENERAL	General error message
-2	ERR_NOT_SUPPORTED	Command not supported
-3	ERR_CANNOT_EXECUTE	Cannot execute command
-4	ERR_MSG_SIZE	Message size is invalid
-5	ERR_PROTOCOL_VERSION	Protocol version is invalid
-6	ERR_INPUT_OUT_OF_RANGE	Input values exceed limits

3.3 Black Calibration Mode

BLACK_CALIB_MODE	Field Name	Description
0	FORCED	Black calibration is always performed
1	SUPPRESSED	Black calibration is never performed

3.4 System Status

SYS_STATUS	Field Name	Description
0	STATUS_ERROR	System is in error state (general error)
1	STATUS_READY	System is ready to capture
2	STATUS_BUSY	System is not ready to capture

3.5 Reply Mode

REPLY_MODE	Field Name	Description
0	ASYNC_REPLY_MODE	Reply message is sent to the host right after receiving the request message and before completing the requested command
1	SYNC_REPLY_MODE	Reply message is sent to the host after completing the requested command

4 Command Data

4.1 Request Message Command Data

The request messages below have one byte command ID and command data. Request messages without command data are not detailed here since they only consist of one byte of command ID.

4.1.1 SET_APERTURE (#10)

Field Name	Type	Description
Aperture_value_num	Int8	Numerator of an apex value
Aperture_value_denom	Uint8	Denominator of an apex value

4.1.2 INCREMENT_APERTURE (#13)

Field Name	Type	Description
Aperture_inc_step_num	Int8	Numerator of an apex value
Aperture_inc_step_denom	Uint8	Denominator of an apex value

4.1.3 SET_ISO (#14)

Field Name	Type	Description
ISO_value_num	Int8	Numerator of an apex value
ISO_value_denom	Uint8	Denominator of an apex value

4.1.4 INCREMENT_ISO (#17)

Field Name	Type	Description
ISO_inc_step_num	Int8	Numerator of an apex value
ISO_inc_step_denom	Uint8	Denominator of an apex value

4.1.5 SET_SHUTTER_SPEED (#18)

Field Name	Type	Description
Shutter_speed_value_num	Int8	Numerator of an apex value
Shutter_speed_value_denom	Uint8	Denominator of an apex value

4.1.6 INCREMENT_ SHUTTER_SPEED (#21)

Field Name	Type	Description
Shutter_speed_Inc_step_num	Int8	Numerator of an apex value
Shutter_speed_Inc_step_denom	Uint8	Denominator of an apex value

4.1.7 SET_ BLACK_CALIB_MODE (#25)

Field Name	Type	Description
Black_calib_mode	Uint8	Black calibration mode (BLACK_CALIB_MODE enumeration)

4.1.8 CAPTURE (#110)

Field Name	Type	Description
Reply_mode	Uint8	The reply mode (REPLY_MODE enumeration)

4.1.9 STOP_LIVE_VIEW (#115)

Field Name	Type	Description
Reply_mode	Uint8	The reply mode (REPLY_MODE enumeration)

4.1.10 SET_REGION_OF_INTEREST (#116)

Field Name	Type	Description
ROI_center_point_x	Uint8	Center point horizontal position, while 1 is left end and 255 right end
ROI_center_point_y	Uint8	Center point vertical position, while 1 is bottom end and 255 top end
ROI_scale_percentage	Uint8	Region scaling in percentage

4.2 Reply Message Command Data

The reply messages below are sent from the camera to the host in reply to the request messages. Reply messages without data are not detailed here since they only consist of command completion code (COMPLETION_CODE) and command ID.

In case of an error (negative status byte value) no additional data is sent by the camera.

4.2.1 GET_APERTURE (#11)

Field Name	Type	Description
Aperture_value_num	Int8	Numerator of an apex value
Aperture_value_denom	Uint8	Denominator of an apex value

4.2.2 GET_APERTURE_RANGE (#12)

Field Name	Type	Description
Aperture_value_min_num	Int8	Numerator of an apex value

Aperture_value_max_num	Int8	Numerator of an apex value
Aperture_step_num	Uint8	Numerator of an apex value
Aperture_value_denom	Uint8	Denominator of an apex value

4.2.3 GET_ISO (#15)

Field Name	Type	Description
ISO_value_num	Int8	Numerator of an apex value
ISO_value_denom	Uint8	Denominator of an apex

4.2.4 GET_ISO_RANGE (#16)

Field Name	Type	Description
ISO_value_min_num	Int8	Numerator of an apex value
ISO_value_max_num	Int8	Numerator of an apex value
ISO_step_num	Uint8	Numerator of an apex value
ISO_value_denom	Uint8	Denominator of an apex value

4.2.5 GET_ SHUTTER_SPEED (#19)

Field Name	Type	Description
Shutter_speed _value_num	Int8	Numerator of an apex value
Shutter_speed _value_denom	Uint8	Denominator of an apex value

4.2.6 GET_ SHUTTER_SPEED_RANGE (#20)

Field Name	Type	Description
Shutter_speed_value_min_num	Int8	Numerator of an apex value
Shutter_speed_value_max_num	Int8	Numerator of an apex value
Shutter_speed_step_num	Uint8	Numerator of an apex value
Shutter_speed _value_denom	Uint8	Denominator of an apex value

4.2.7 GET_SYSTEM_STATUS (#111)

Field Name	Type	Description
System_status	Uint8	System status (SYS_STATUS enumeration)

4.3 Examples

Request message with command ID 11 (GET_APERTURE): 88 2 1 11 10

Reply message for command ID 11 (GET_APERTURE): 88 5 1 0 11 18 3 27 (no error)

Reply message for command ID 11 (GET_APERTURE): 88 3 1 255(-1) 11 245 (error)