OLYMPUS

BX2A Development Document(N)

BX2A

BX2A Host I/F Specifications(N)

CONFIDENTIAL

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OLYMPUS CORPORATION
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Approved	2012/04/06	Katsu.Y.
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History

Version	Date	Person in Charge	Modification
01.01.01	2001/11/30	K. Yamaguchi, Dev. G3	The first edition Another version based on the sixth edition.
01.01.02	2001/12/04	K. Yamaguchi, Dev. G3	Misdescriptions were rectified.
01.02.01	2004/02/13	K. Yamaguchi, Dev. G4	The second edition (for BX2-MAIN-ROM AQ7816 V01.02.xx) Another version based on the seventh edition. The publication about Focus Unit Family was deleted from the error code list. The parameter of the unit presence command was modified. (The difference between V01.01.xx and V01.02.xx is explained.)

Version	Date	S/W Version	Modification	Approved	Created
01.02.02	2012/04/06	V02.01.01	The third edition. Another version based on the 8th edition(English edition Ver.01.02.02). Add disclaimer information.	Katsu.Y.	Katsu.Y.

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1.INTRODUCTION

BX2A, the top-quality system microscope, consists of multiple units (microcomputers and inclusion firmware units).
This document describes the firmware Host I/F specification of BX2 unit (referred to as BX2) **which controls the frame** among these units. (The command corresponding to the focus unit family is not mentioned. Refer to applicable specification.)

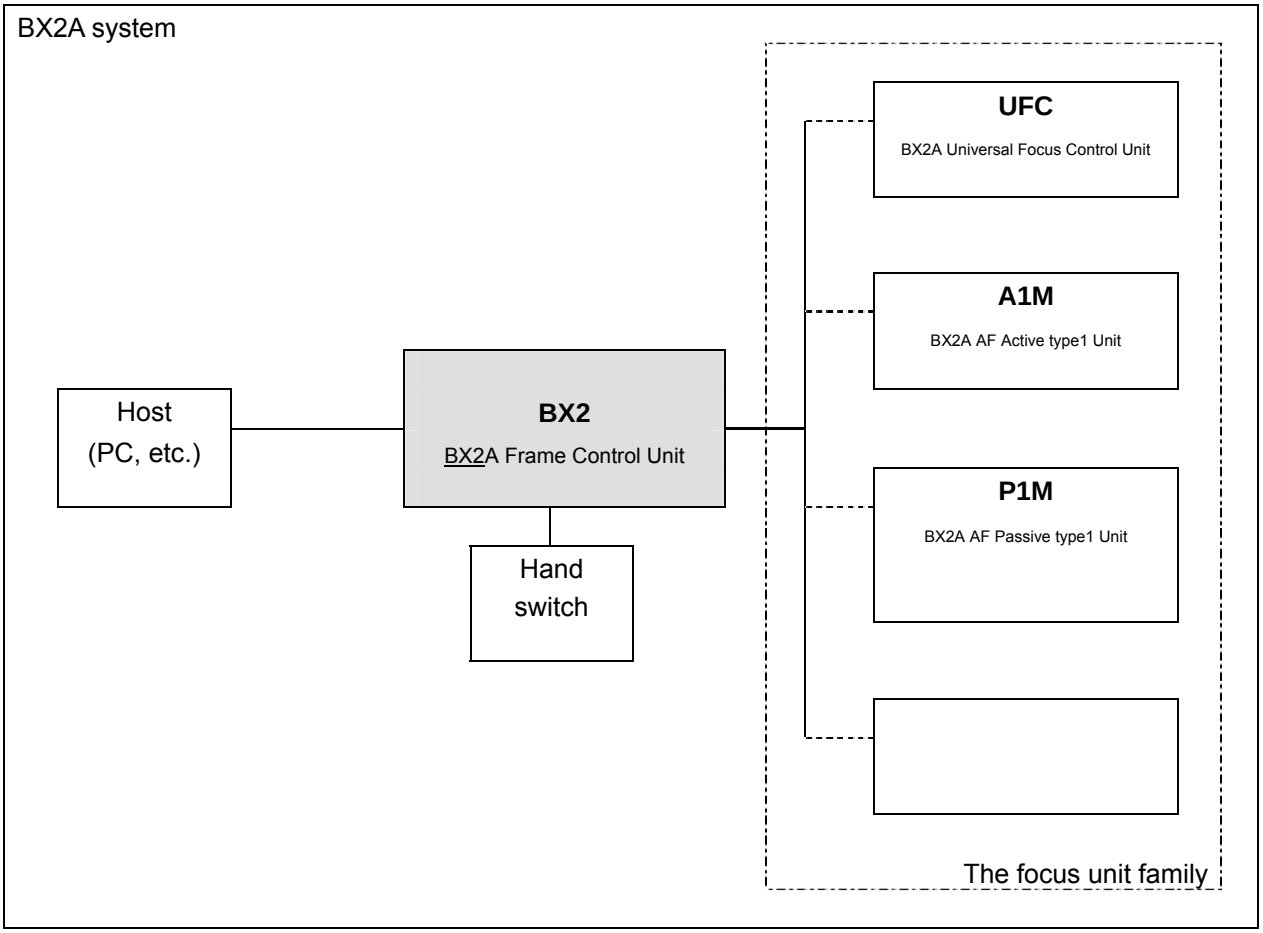


Fig 1 The BX2A system and the BX2 unit

1.1.Rule of Notation

This document complies with the following notations.

Table 1 Notations

Notation	Example	Description
Range of variables	(0 - 1000) (ON, OFF, STANDBY)	The range between 0 to 1000. 0 <= x <= 1000 Any one of ON, OFF and STANDBY.
Units	2[0.1%] [um]	Multiplying the set value by 0.1 indicates the actual percentage. Example shows that the set value 2 equals to 0.2%. The unit for the set value is [um].
Command format	EBNF (**E**xtended **B**ackus-**N**aur **F**orm) notation α:=β α|β [α] {α} <<α>> (α) α-β *Identifier* := *Alphabet* {*Alphabet* | *Numeral*}	 α is defined as β. Select α or β α or nothing Repeat α for 0 times or more. Repeat α once or more α A value which is no less than α and no more β. Both.α and β are integers. α <= x <= β An identifier is defined as a string beginning with an alphabet, after which 0 or more alphabets and/or numeric characters follow.

2. SUMMARY

2.1.Feature

BX2 controls each motorized part (except for the focus part) using the commands from the host computer and the buttons (switches) on the hand switch and the frame. Controls using the remote commands from the host computer and using the buttons on the hand switch and the frame are mutually exclusive. And the focus unit family controls the focus part.

3.SYSTEM OVERVIEW

3.1.System Configuration

3.1.1.Configuration of the Motorized Part

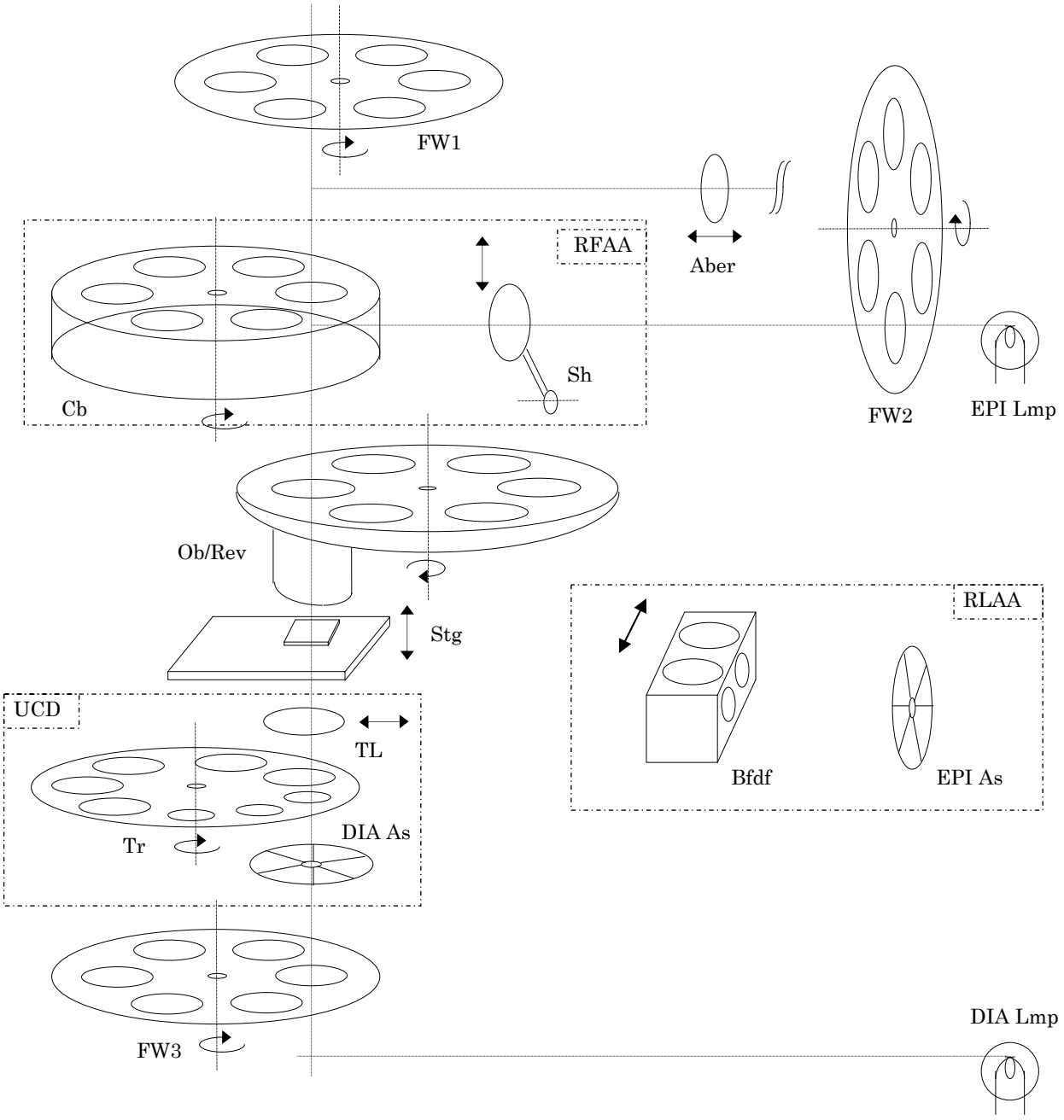


Fig 2 Configuration of the motorized part and names

4.Host I/F

4.1.DIP Switch

The following table shows assignment of the DIP switches. The unit detects the new setup only when BX-UCB is powered on, making those setups effective.

Table 2 DIP switches

Location / Board name (bits)	Bit position (on:1, off:0) 7	6	5	4	3	2	1	0	Feature	Detail
At the lower part of the CB front panel /AQ7794/S2(8)								0	Empty	Off
								1		On
							0		Baud rate	19200[bps]
							1			9600[bps]
						0			Data bit	8[bit]
						1				7[bit]
					0				Parity	Even
					1					Odd
				0					Parity bit	With
				1						Without
			0						Stop bit	2[bit]
			1							1[bit]
	0	0							Terminator	CR+LF
	0	1								CR
	1	0								LF
	1	1								CR+LF

Shaded cells indicate factory setups. (All set at off)

4.2.Host I/F

The remote command of Host I/F controls BX2. Host I/F employs the serial UART communication using RS-232C.

4.2.1.Basic Actions of the Commands

4.2.1.1.Setup of the Port

When BX-UCB is powered on, the DIP switches for setup the port is enabled to select each setup.

Table 3 Setup of the port

Baud rate	9600 / 19200[bps]
Data bit	7 / 8[bit]
Parity	even / odd / none
Stop bit	1 / 2[bit]
Terminator	CR / LF / CR+LF
Flow control	Without (CS control is enabled only when turning the power on.)

BX2 can not receive the command in between powering and an initialization completion. Monitoring CS (CTS) notifies the host computer of that the initialization is completed (and that it is prepared to receive the command).

Host		BX2
		Powers the unit
	← CS: OFF	Starts initialization
		On initialization (The command can not be received or the received command is nullified.)
		Terminates initialization (The command can be received.)
	← CS: ON	Fixes CS to ON hereafter.

After fixing CS to ON, BX2 does not set CS to OFF.
All the commands received when CS is OFF are nullified.

Command Format

The following table shows the command format. The ascii-code is employed as the character set. And the EBNF notation (***E****xtended* ***B****ackus-****N****aur* ***F****orm*) is applied. **The maximum length of the command is 64[B] including terminators.**

command* := *index tag* [*tag-delimiter data* { *data-delimiter data* }] *terminator

Table 4 The command components

Component	Name	Description	Code
index	Index	A numerical character The unit is specified.	'1' - '9'
tag	Tag	String of uppercase alphabets and graphic characters. Application classification	Combination with variable length of 'A' to 'Z' and '?'. E.g. 'LOG', 'OB', 'AFSTS?', etc.
tag-delimiter	Tag delimiter	A graphic character Delimiter between ***tag*** and ***data***.	' ' space (0x20)
data	Data	A graphic character, string of numeric characters or string of uppercase alphabets.	'+', '!', '-', ' Combination with variable length of '0' to '9', 'A' to 'Z' E.g. '+', '-', '1234', 'IN', 'OUT', 'UP', 'DOWN', etc.
data-delimiter	Data delimiter	A graphical character Delimiter between ***data*** and ***data***.	',' comma (0x2C)
terminator	Terminator	A control character Terminates a ***command***	CR, LF, or CR+LF can be selected using the DIP switches.

A command is a string terminated with a control character (CR, LF, or CR+LF). **Index and terminator are omitted in the description of the command in following sections.**

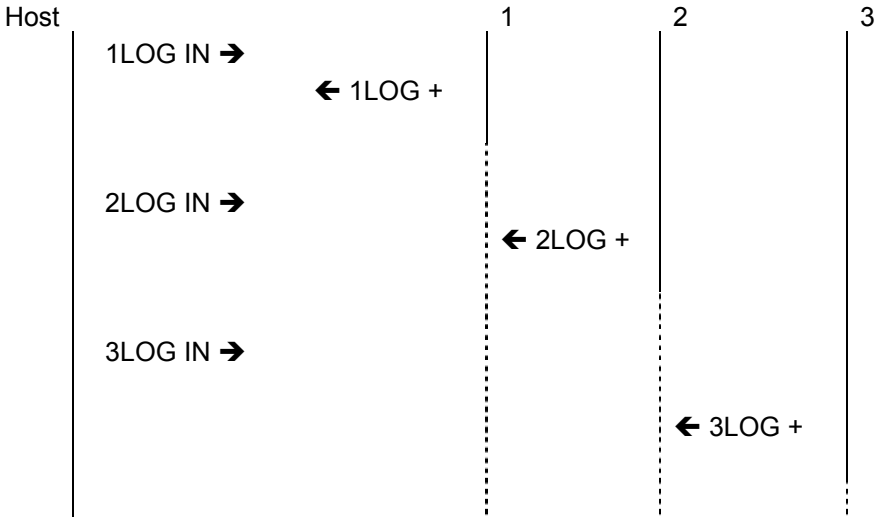
4.2.1.1.1. The Index and the Unit specified

Using the index, the host computer specifies the unit to which a command is sent.

Table 5 The index and the unit specified

Index	Unit specified	Note
'1'	Frame control unit	
'2'	Universal focus control unit Active AF type1 unit Passive AF type1 unit	They are selected alternatively and exclusively.
'3' – '9'	None	Reserved

E.g.



4.2.1.1.2. Command Response

Here is an example of ignoring (nullifying) the command received. All the commands of *FOO* from the host shown below are ignored.

Host		BX2/focus unit family
s1.On initialization		Powers the unit
	← CS: OFF	Starts initialization
	FOO →	On initialization (The command can not be received or the received command is nullified.)
		Terminates initialization (The command can be received)
	← CS: ON	Fixes CS to ON hereafter
s2.Local	*FOO* →	Local (The system is not logged in) *FOO* is except for LOG and LOG?.
s3.Undefined command	*FOO* →	*FOO* is not described in the command dictionary (the command table) of the unit.
s4.Overlong command	*FOO* →	*FOO* exceeds the maximum command length.
s5.Numerous commands	*FOO1* →	When sending a command unilaterally before receiving a handshake command, the unit accepts up to 32 commands and ignores subsequent commands.
	:	
	:	
	FOO32 →	The commands of *FOO1* to *FOO32* are processed.
	FOO33 →	The command of *FOO33* and later are ignored.

4.2.1.2.Command Sequence

The commands sent by the host computer can be classified into three category groups for their purpose. Whether handshake is used or not (whether the commands between the host computer and BX2 are synchronous or asynchronous) is determined according to these groups of commands.

Table 6 Handshake

Format □1	Type	Direction Host BX2	Description	Handshake □2
X parameters *X*	Control request <**R**>	→	Control request (action/setup)	○ ○
X + *X parameters*	Positive acknowledgement <**A**, **pA**>	←	Control/setup request Completed normally	○
X !,*error-code* *X* !,*error-code*,*parameters*	Negative acknowledgement <**A**, **nA**>	←	Control/setup request Completed abnormally	○
X?	Query <**Q**>	→	Parameter/data query	○
X parameters	Notification <**N**>	←	Parameter/data notification	○
X parameters	Active notification <**aN**>	←	Parameter/data active notification	×
X error-code	Error notification <**eN**>	←	Fatal error notification	×

□1 *X* represents a tag, *parameters* represents a parameter , and *error-code* represents an error code.

□2 ○; Used ×; Not used

4.2.1.2.1.The Command with Handshake

A control request <**R**> handshakes with a positive acknowledgement <**pA**>/negative acknowledgement <**nA**> while a query <**Q**> handshakes with a notification <**N**>. Receiving a handshake command, the host computer is notified that a processing (an action) is completed.

■Sequence

Host				BX2
s1.Request for control	<**R**>	➔		Starts the request
				On processing the request
Positive acknowledgement		←	<**pA**>	Terminates the request
s2.Request for control	<**R**>	➔		Starts the request
				On processing the request
Negative acknowledgement		←	<**nA**>	Terminates the request
s3.Query	<**Q**>	➔		Starts querying
				On querying
Notification		←	<**N**>	Terminates querying

4.2.1.2.2.The Command without Handshake

Handshaking is not required between an active notification <**aN**> and an error notification <**eN**>.

■Sequence

Host				BX2
s4. Active notification	*ENABLE*<**R**>	➔		Enables active notification
Positive acknowledgement		←	*ENABLE* <**pA**>	Starts notification
Active notification		←	<**aN**>	
Active notification		←	<**aN**>	
s5. Error notification		←	<**eN**>	An error occurs

- *ENABLE* represents an enabled active notification command.

4.2.1.2.3. The Nest of Handshaking

The commands can be nested to a handshake command. The commands sent by the host computer are not received in the order they sent. An acknowledgement is sent to the host computer when a corresponding process is completed.

■Sequence

Host				BX2
s6.Request for control	*FOO*<**R**>	➔		Starts the *FOO* request
	BAR<**R**>	➔		Starts the *BAR* request
		➔	*FOO*<**pA**>	Terminates the *FOO* request
		➔	*BAR*<**pA**>	Terminates the *BAR* request
s7. Request for control/query	*FOO*<**R**>	➔		Starts the *FOO* request
	BAR<**R**>	➔		Starts the *BAR* request
	FOO2<**R**>	➔		Starts the *FOO2* request
	BAR2<**R**>	➔		Starts the *BAR2* request
	FOO<**Q**>	➔		Starts querying
		➔	*FOO*<**pA**>	Terminates the *FOO* request
		➔	*FOO*<**N**>	Terminates querying
		➔	*BAR2*<**pA**>	Terminates the *BAR2* request
		➔	*FOO2*<**pA**>	Terminates the *FOO2* request
		➔	*BAR*<**pA**>	Terminates the *BAR* request

- *FOOn,* and *BARn* represent tags and *error-code* represents an error code.

4.2.2.Command Reference

Table 7 The command feature type

Type	Feature	Note
Normal	The standard feature	• Only the query <**Q**> command and the notification <**N**> command for it can be accepted locally. • Other commands are acceptable after the remote mode is initiated by command: LOG IN. • Command: LOG OUT returns the mode to the local mode.

4.2.2.1.Normal Commands

4.2.2.1.1.Login LOG LOG?

■Summary
1. Switches between remote and local operations.
2. Checks whether the current status is remote or local.

■Comments
1. In local mode, all remote commands except for this command are ignored.
2. In local mode, <**R**> is enabled during operating any button (during moving any motorized part).
3. Using <**R**> to switch to remote mode disables all the buttons and jogs (cf. the jog enable/disable command). And all the frame and HS LEDs are extinguished.
4. Using <**R**> to switch to local mode enables all the buttons and jogs. And the frame, HS, and control box LEDs return to regular local control. The objective active notification control is disabled.
5. Using <**R**> to switch to remote mode sets the stage escape status to the stage return status. However, actual returning operation is not accompanied at this time.

■Examples

Command	Type	Direction	Description
LOG *p1*	**R**	Host → BX2	Switches to remote/local.
LOG +	**pA**	Host ← BX2	Remote and local has been switched over.
LOG !,*error-code*	**nA**	Host ← BX2	Remote/local has not been switched.
LOG?	**Q**	Host → BX2	Queries about the remote/local status.
LOG *p1*	**N**	Host ← BX2	Notifies of the remote/query status.

■Parameters

p1	'IN'	Remote
	'OUT'	Local

4.2.2.1.2.Objective Switching OB OB?

■Summary

1. Engages the objective in the specified revolving nosepiece position into the light axis.
2. Gets the status of the revolving nosepiece position and objective.

■Comments

■Examples

Command	Type	Direction	Description
OB *p1*	**R**	Host ➔ BX2	Engages the specified revolving nosepiece position into the light axis.
OB +	**pA**	Host ← BX2	The specified revolving nosepiece position has been engaged into the light axis.
OB !,*error-code*	**nA**	Host ← BX2	The specified revolving nosepiece position has not been engaged into the light axis.
OB?	**Q**	Host ➔ BX2	Queries about the revolving nosepiece position and objective engaged into the light path.
OB *p2*	**N**	Host ← BX2	Notifies of the revolving nosepiece position and objective engaged into the light path.

■Parameters

p1	('1' - '*n*')	The Rev position; 1 - *n* *n* := (5, 6, 7) **It depends on the flexibility of the revolving nosepiece equipped.**
p2	('1' - '*n*')	The Rev position; 1 - *n* *n* := (5, 6, 7) **It depends on the flexibility of the revolving nosepiece equipped.**
	'X'	Undefined

4.2.2.1.3.Objective Active Notification Control SNDOB

■Summary
1. Controls the objective active notification command.

■Comments
1. This command enable/disable the objective active notification when the revolving nosepiece is operated manually. **Cf. The objective active notification command**
2. This command is set to OFF when the mode is switched from remote to local.

■Examples

Command	Type	Direction	Description
SNDOB *p1*	**R**	Host ➔ BX2	Enables/disables the objective active notification.
SNDOB +	**pA**	Host ← BX2	The objective active notification has been enabled/disabled.
SNDOB !,*error-code*	**nA**	Host ← BX2	The objective active notification has not been enabled/disabled.

■Parameters

p1	'ON'	Enables the objective active notification
	'OFF'	Disables the objective active notification. The default.

4.2.2.1.4.Objective Active Notification OBM

■Summary
1. Notifies of the in-position of the revolving nosepiece.

■Comments
1. The active notification is delivered when the revolving nosepiece comes to the specific position (in-position) manually.

■Examples

Command	Type	Direction	Description
OBM *p1*	**aN**	Host ← BX2	The objective comes to the specific position.

■Parameters

p1	('1' - '*n*')	The Rev position; 1 - *n* *n* := (5, 6, 7) **It depends on the flexibility of the revolving nosepiece equipped.**

4.2.2.1.5.Lamp Control LMPSW LMPSW?

■Summary

1. Switches the lamp to on/off.
2. Gets the lamp status.

■Comments

■Examples

Command	Type	Direction	Description
LMPSW *p1*	**R**	Host ➔ BX2	Controls the lamp.
LMPSW +	**pA**	Host ← BX2	The lamp has been controlled.
LMPSW !,*error-code*	**nA**	Host ← BX2	The lamp has not been controlled.
LMPSW?	**Q**	Host ➔ BX2	Queries about the lamp status.
LMPSW *p1*	**N**	Host ← BX2	Notifies of the lamp status.

■Parameters

p1	'ON'	Switches the lamp to on.
	'OFF'	Switches the lamp to off.

4.2.2.1.6.Lamp Selection LMPSEL LMPSEL?

■Summary

1. Selects the lamps for reflected light/transmitted light (for EPI/DIA).
2. Gets the lamp in use.

■Comments

■Examples

Command	Type	Direction	Description
LMPSEL *p1*	**R**	Host ➔ BX2	Selects the lamps for EPI/DIA.
LMPSEL +	**pA**	Host ← BX2	The lamps for EPI/DIA have been switched.
LMPSEL !,*error-code*	**nA**	Host ← BX2	The lamps for EPI/DIA have not been selected.
LMPSEL?	**Q**	Host ➔ BX2	Queries about the lamp in use.
LMPSEL *p1*	**N**	Host ← BX2	Notifies of the lamp in use.

■Parameters

p1	'DIA'	The lamp for transmitted light.
	'EPI'	The lamp for reflected light.

4.2.2.1.7.Light Brightness LMP LMP?

■Summary
1. Sets the voltage of the lamp for transmitted light/reflected light.
2. Gets the voltage of the lamp for transmitted light/reflected light.

■Comments
1. Switching the lamps specifies the lamp for adjustment.
2. The voltages of the lamp for transmitted light and the lamp for reflected light are stored respectively.

■Examples

Command	Type	Direction	Description
LMP *p1*	**R**	Host ➔ BX2	Sets the light intensity to the specified voltage.
LMP +	**pA**	Host ← BX2	The light intensity has been set to the specified voltage.
LMP !	**nA**	Host ← BX2	The light intensity has not been set to the specified voltage.
LMP?	**Q**	Host ➔ BX2	Queries about the light intensity.
LMP *p1*	**N**	Host ← BX2	Notifies of the light intensity.

■Parameters

p1	(‘0’ - ‘120’)	Light intensity [0.1V]

4.2.2.1.8.Lamp Status LMPSTS?

■Summary
1. Gets the lamp status.

■Comments
1. Switching the lamps specifies the target lamp.
2. When the light intensity is below 2V, the lamp status can not be queried (it is always becomes ‘X’ indicating unknown).
3. When the lamp is switched to off, the lamp status can not be queried (it is always becomes ‘X’ indicating unknown).

■Examples

Command	Type	Direction	Description
LMPSTS?	**Q**	Host ➔ BX2	Queries about the lamp status.
LMPSTS *p1*	**N**	Host ← BX2	Notifies of the lamp status.

■Parameters

p1	‘OK’	The lamp is working normally.
	‘X’	The status is unknown.

4.2.2.1.9.Cube Switching CUBE CUBE?

■Summary

1. Engages the cube specified (RFAA/RLAA) into the light axis.
2. Gets the cube status.

■Comments

1.

■Examples

Command	Type	Direction	Description
CUBE *p1*	**R**	Host ➔ BX2	Engages the cube specified into the light axis.
CUBE +	**pA**	Host ← BX2	The cube specified has been engaged into the light axis.
CUBE !,*error-code*	**nA**	Host ← BX2	The cube specified has not been engaged into the light path.
CUBE?	**Q**	Host ➔ BX2	Queries about the cube being engaged into the light path.
CUBE *p2*	**N**	Host ← BX2	Notifies of the cube being engaged into the light path.

■Parameters

p1	('1' - '*n*')	The Rev position; 1 - *n* *n* := (2, 6, 8) It depends on the flexibility of the cube equipped. **In use of RLAA, '1' is fixed to BF and '2' to DF.**
p2	('1' - '*n*')	The Rev position; 1 - *n* *n* := (2, 6, 8) It depends on the flexibility of the cube equipped. **In use of RLAA, '1' is fixed to BF and '2' to DF.**
	'X'	Undefined

4.2.2.1.10.DIA Aperture Stop (AS) Switching DAS DAS?

■Summary

1. Specifies the diameter of DIA AS (UCD).
2. Gets the diameter of DIA AS.

■Comments

■Examples

Command	Type	Direction	Description
DAS *p1*	**R**	Host → BX2	Specifies the diameter of DIA AS.
DAS +	**pA**	Host ← BX2	The diameter of DIA AS has been specified.
DAS !,*error-code*	**nA**	Host ← BX2	The diameter of DIA AS has not been specified.
DAS?	**Q**	Host → BX2	Queries about the diameter of DIA AS.
DAS *p2*	**N**	Host ← BX2	Notifies of the diameter of DIA AS.

■Parameters

p1	(‘0’ - ‘482’)	The driving address of DIA AS.
p2	(‘0’ - ‘482’)	The driving address of DIA AS.
	‘X’	Undefined

4.2.2.1.11.EPI Aperture Stop (AS) Switching EAS EAS?

■Summary

1. Specifies the diameter of EPI AS (RLAA).
2. Gets the diameter of EPI AS.

■Comments

■Examples

Command	Type	Direction	Description
EAS *p1*	**R**	Host → BX2	Specifies the diameter of EPI AS.
EAS +	**pA**	Host ← BX2	The diameter of EPI AS has been specified.
EAS !,*error-code*	**nA**	Host ← BX2	The diameter of EPI AS has not been specified.
EAS?	**Q**	Host → BX2	Queries about the diameter of EPI AS.
EAS *p2*	**N**	Host ← BX2	Notifies of the diameter of EPI AS.

■Parameters

p1	(‘0’ - ‘3113’)	The driving address of EPI AS.
p2	(‘0’ - ‘3113’)	The driving address of EPI AS.
	‘X’	Undefined

4.2.2.1.12.Shutter Control SHUTTER SHUTTER?

■Summary

1. Controls the shutter (RFAA).
2. Gets the shutter status.

■Comments

■Examples

Command	Type	Direction	Description
SHUTTER *p1*	**R**	Host ➔ BX2	Controls the shutter.
SHUTTER +	**pA**	Host ← BX2	The shutter has been controlled.
SHUTTER !,*error-code*	**nA**	Host ← BX2	The shutter has not been controlled.
SHUTTER?	**Q**	Host ➔ BX2	Queries about the shutter status.
SHUTTER *p2*	**N**	Host ← BX2	Notifies of the shutter status.

■Parameters

p1	'IN'	The shutter is closed.
	'OUT'	The shutter is opened.
p2	'IN'	The shutter is closed.
	'OUT'	The shutter is opened.
	'X'	Undefined.

4.2.2.1.13.Condenser Top Lens Switching CDTOP CDTOP?

■Summary

1. Engages/disengages the condenser top lens (UCD) into/from the light axis.
2. Gets the status of the condenser top lens.

■Comments

■Examples

Command	Type	Direction	Description
CDTOP *p1*	**R**	Host ➔ BX2	Engages/disengages the condenser top lens into/from the light axis.
CDTOP +	**pA**	Host ← BX2	The condenser top lens has been engaged/disengaged into/from the light axis.
CDTOP !,*error-code*	**nA**	Host ← BX2	The condenser top lens has not been engaged/disengaged into/from the light axis.
CDTOP?	**Q**	Host ➔ BX2	Queries about the status of the condenser top lens.
CDTOP *p2*	**N**	Host ← BX2	Notifies of the status of the condenser top lens.

■Parameters

p1	'IN'	The condenser top lens is engaged into the light axis.
	'OUT'	The condenser top lens is disengaged from the light axis.
p2	'IN'	The condenser top lens is engaged into the light axis.
	'OUT'	The condenser top lens is disengaged from the light axis.
	'X'	Undefined

4.2.2.1.14.Turret Switching TURRET TURRET?

■Summary

1. Engages the optical element turret (UCD) specified into the light axis.
2. Gets the status of the optical element turret.

■Comments

■Examples

Command	Type	Direction	Description
TURRET *p1*	**R**	Host ➔ BX2	Engages the turret position specified into the light axis.
TURRET +	**pA**	Host ← BX2	The turret position specified has been engaged into the light path.
TURRET !,*error-code*	**nA**	Host ← BX2	The turret position specified has not been engaged into the light path.
TURRET?	**Q**	Host ➔ BX2	Queries about the turret position engaged into the light path.
TURRET *p2*	**N**	Host ← BX2	Notifies of the turret position engaged into the light path.

■Parameters

p1	(‘1’ - ‘8’)	The turret position; 1 - 8
p2	(‘1’ - ‘8’)	The turret position; 1 - 8
	‘X’	Undefined

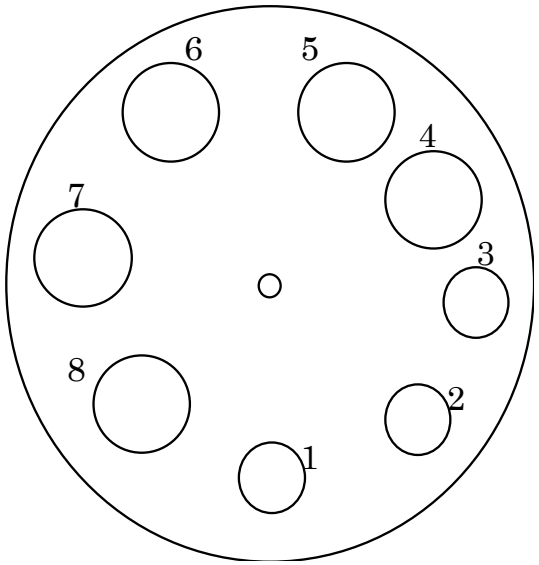


Fig 3 The turret positions (The condenser top lens side view)

4.2.2.1.15.Filter Wheel 1 Switching FW1 FW1?

■Summary

1. Engages the filter wheel position specified into the light axis.
2. Gets the status of the filter wheel.

■Comments

■Examples

Command	Type	Direction	Description
FW1 *p1*	**R**	Host ➔ BX2	Engages the filter wheel position specified into the light axis.
FW1 +	**pA**	Host ← BX2	The filter wheel position specified has been engaged into the light axis.
FW1 !,*error-code*	**nA**	Host ← BX2	The filter wheel position specified could not engaged into the light axis.
FW1?	**Q**	Host ➔ BX2	Queries about the filter wheel position engaged into the light axis.
FW1 *p2*	**N**	Host ← BX2	Notifies of the filter wheel position engaged into the light axis.

■Parameters

p1	('1' - '*n*')	The filter wheel position; 1 - *n* *n* := (6, 8) It depends on the flexibility of the filter wheel equipped.
p2	('1' - '*n*')	The filter wheel position; 1 - *n* *n* := (6, 8) It depends on the flexibility of the filter wheel equipped.
	'X'	Undefined

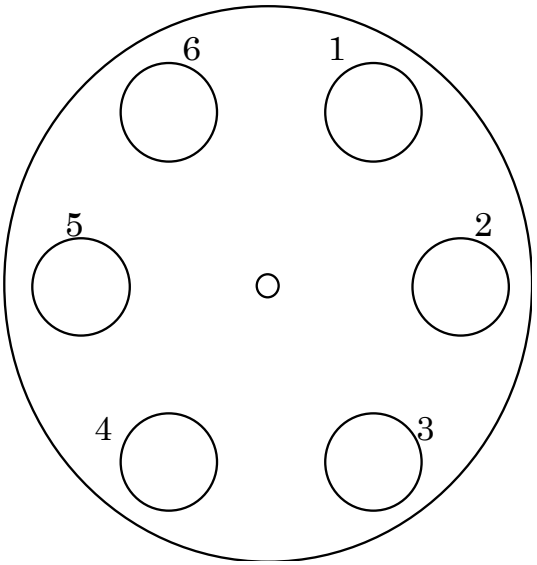


Fig 4 The filter wheel position (The filter side view)

4.2.2.1.16.Filter Wheel 2 Switching FW2 FW2?

■Summary

1. Refer to “Filter Wheel 1 Switching”. This is defined on the same format as the filter wheel 1 except for the index number (No.1 to 3).

4.2.2.1.17.Filter Wheel 3 Switching FW3 FW3?

■Summary

1. Refer to “Filter Wheel 1 Switching”. This is defined on the same format as the filter wheel 1 except for the index number (No.1 to 3).

4.2.2.1.18.Jog Dial Selection JOGSEL JOGSEL?

■Summary

1. Selects the jog.
2. Gets the status of the jog selected.

■Comments

1. Switches the frame jog/the focus handle jog in IFFH connection.

■Examples

Command	Type	Direction	Description
JOGSEL *p1*	**R**	Host → BX2	Selects the jog.
JOGSEL +	**pA**	Host ← BX2	The jog has been selected.
JOGSEL !,*error-code*	**nA**	Host ← BX2	The jog could not select the jog.
JOGSEL?	**Q**	Host → BX2	Queries about the status of the jog selected.
JOGSEL *p1*	**N**	Host ← BX2	Notifies of the status of the jog selected.

■Parameters

p1	‘FH’	The focus handle jog (FH). The default.
	‘FRM’	The frame jog

4.2.2.1.19.Unit Presence UNIT?

■Summary

1. Checks whether the unit is present or not.

■Comments

1. The number of the parameters in **<N>** is the variable number of the strings that have been specified to represent the respective unit.

■Examples

Command	Type	Direction	Description
UNIT?	**Q**	Host ➔ BX2	Queries whether the unit is present or not.
UNIT *p1*	**N**	Host ➔ BX2	Notifies whether the unit is present or not.
UNIT *p1*,...	**N**	Host ➔ BX2	Notifies whether the unit is present or not.

■Parameters

p1	The default string representing the unit			
	‘BX2’	System ID: Permanently present. □1		
	‘FRM’	With the frame		
	(‘RV0’ - ‘RV7’)	With any one of Rev type0 - type7.	type0	U-D5BDREM
			type1	U-D6REM
			type2	U-D5BDREMC/U-P5REMC
			type3	U-D6REMC
			type4	Empty
			type5	Empty
			type6	Empty
			type7	Empty
	‘FO’	With the focus (Z/AF).		
	(‘RFA’, ‘RLA’, ‘PMT’)	With RFAA or RLAA or FV5-PMTWI. □2		
	‘UCD’	With UCD.		
	‘FW1.*n*’	With the filter wheel 1. *n* represents the flexibility of the filter wheel. *n* := (6-8 | X)		
	‘FW2.*n*’	With the filter wheel 2. *n* represents the flexibility of the filter wheel. *n* := (6-8 | X)		
	‘FW3.*n*’	With the filter wheel 3. *n* represents the flexibility of the filter wheel. *n* := (6-8 | X)		
	‘HS’	With the hand switch.		
	‘CB.*n*’	With the cube/RFAA. *n* represents the flexibility of the cube. *n* := (6-8 | X)		
	‘NONE’	None of the above is present. □3		

□1 This is supported by V01.02.xx or later. In V01.01.xx, the system ID is not returned from BX-UCB.

□2 In V01.01.xx, FV5-PMTWI is not detected. So, the strings ‘PMT’ is not returned form BX-UCB.

□3 In V01.02.xx or later, The strings ‘NONE’ is not returned from BX-UCB.

■Sequence

HOST			BX2
UNIT?	→		
	←	UNIT FRM,RV1,FO,RFA,FW3.6,HS,CB.6	With Frame, U-D6REM、Focus (Z/AF), RFAA、FW3 (sextuple).the hand switch, and CB (sextuple) (In V01.01.xx)
UNIT?	→		
	←	UNIT BX2,FRM,RV1,FO,RFA,FW3.6,HS,CB.6	With Frame, U-D6REM、Focus (Z/AF), RFAA、FW3 (sextuple).the hand switch, and CB (sextuple) (In V01.02.xx or later)
UNIT?	→		
	←	UNIT FRM,RV2,FO,RLA,FW2.6	With Frame, U-D5BDREMC/ U-P5REMC, Focus (Z/AF), RLAA, FW2 (sextuple) (In V01.01.xx)
UNIT?	→		
	←	UNIT BX2,FRM,RV2,FO,RLA,FW2.6	With Frame, U-D5BDREMC/ U-P5REMC, Focus (Z/AF), RLAA, FW2 (sextuple) (In V01.02.xx or later)
UNIT?	→		
	←	UNIT NONE	Nothing is equipped. (In V01.01.xx)
UNIT?	→		
	←	UNIT BX2	Nothing is equipped. (In V01.02.xx or later)

4.2.2.1.20.Buzzer Control BUZ BUZ?

■Summary

1. Controls the buzzer.
2. Gets the buzzer status.

■Comments

■Examples

Command	Type	Direction	Description
BUZ *p1*	**R**	Host ➔ BX2	Controls the buzzer.
BUZ *p2*,*p3*,*p4*	**R**	Host ➔ BX2	Controls the buzzer at the pattern specified.
BUZ +	**pA**	Host ← BX2	The buzzer control has been started.
BUZ !,*error-code*	**nA**	Host ← BX2	The buzzer control has not been started.
BUZ?	**Q**	Host ➔ BX2	Queries about the buzzer status.
BUZ *p1*	**N**	Host ← BX2	Notifies of the buzzer status.

■Parameters

p1	‘ON’	The buzzer control ON.
	‘OFF’	The buzzer control OFF.
p2	(‘1’ - ‘100’)	The times that the buzzer sounds.
p3	(‘1’ - ‘20’)	The length that the buzzer sounds. [50ms]
p4	(‘1’ - ‘20’)	The length that the buzzer does not sound. [50ms]

4.2.2.1.21.Switch (button) SW SW?

■Summary

1. Controls the active notification <**aN**> of the status of the button on the hand switch.
2. Gets the button status.

■Comments

1. <**aN**> is sent whenever the button status changes. **<u>However, the minimum interval of sending is specified to 100[ms].</u>**

■Examples

Command	Type	Direction	Description
SW *p1*	**R**	Host ➔ BX2	Enables/disables the active notification <**aN**> of the button status.
SW +	**pA**	Host ← BX2	<**aN**> of the button status has been enabled/disabled.
SW !,*error-code*	**nA**	Host ← BX2	<**aN**> of the button status has not been enabled/disabled.
SW *p2*	**aN**	Host ← BX2	Notifies of the button status.
SW?	**Q**	Host ➔ BX2	Queries about the button status.
SW *p2*	**N**	Host ← BX2	Notifies of the button status.

■Parameters

p1	'ON'	Enables the active notification <**aN**>.
	'OFF'	Disables the active notification <**aN**>.
p2	('0' - 'FFFFFFFF')	The 32-bit image of 0x0 - 0xFFFFFFFF (hexadecimal) taking '1' as the switch-on status and '0' as the switch-off status. The variable-length array, A to F are always in capitals.

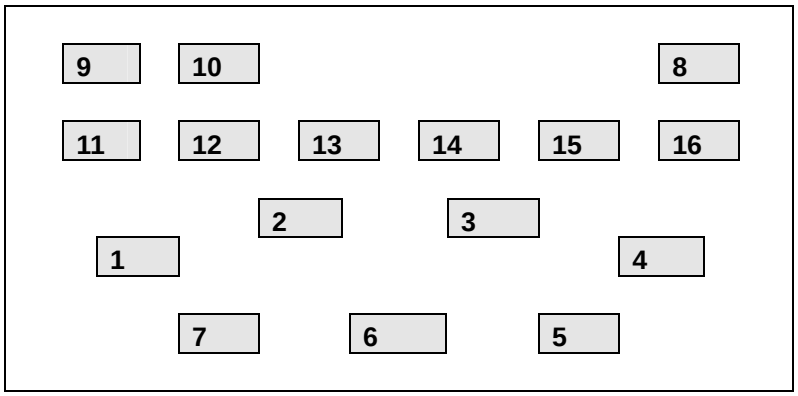


Fig 5 The hand switch and buttons/the numbers of the LEDs

Table 8 Assignment of the buttons and the parameters

Status MSB FF	FF	FF	LSB FF	Bit position	Assignment
				0	Transmitted/reflected light switch
				1	Light Preset switch
				2	Lamp ON-OFF switch
				3	Brightness adjustment button (Up)
				4	Brightness adjustment button (Down)
				5 - 7	Empty, all fixed at off
				8	Stage DOWN button
				9	F/C button
				10	Stage UP button
				11	Stage escape button
				12 - 15	Empty, all fixed at off
				16	The button 1 on the hand switch
				17	The button 2 on the hand switch
				18	The button 3 on the hand switch
				19	The button 4 on the hand switch
				20	The button 5 on the hand switch
				21	The button 6 on the hand switch
				22	The button 7 on the hand switch
				23	The button 8 on the hand switch
				24	The button 9 on the hand switch
				25	The button 10 on the hand switch
				26	The button 11 on the hand switch
				27	The button 12 on the hand switch
				28	The button 13 on the hand switch
				29	The button 14 on the hand switch
				30	The button 15 on the hand switch
				31	The button 16 on the hand switch

4.2.2.1.22.LED Control LED

■Summary

1. Controls the LEDs of the frame and hand switch.

■Comments

1. When switched to remote mode, the entire LEDs of the frame and hand switch are extinguished.
2. When switched to local mode, the LEDs of the frame and hand switch return to regular local control.

■Examples

Command	Type	Direction	Description
LED *p1*	**R**	Host ➔ BX2	Controls the LEDs of the frame and hand switch.
LED +	**pA**	Host ← BX2	The LEDs of the frame and hand switch have been controlled.
LED !,*error-code*	**nA**	Host ← BX2	The LEDs of the frame and hand switch have not been controlled.

■Parameters

p1	('0' - 'FFFFFF')	The 24-bit image of 0x0 - 0xFFFFFFFF (hexadecimal) taking '1' as the LED-on status and '0' as the LED-off status. The variable-length array, A to F are always in capitals.

Control MSB			LSB	Bit position	LED
	FF	FF	FF		
				0	DIA
				1	EPI
				2	Empty
				3	Preset
				4 - 7	Empty
				8	The hand switchLED.1
				9	The hand switchLED.2
				10	The hand switchLED.3
				11	The hand switchLED.4
				12	The hand switchLED.5
				13	The hand switchLED.6
				14	The hand switchLED.7
				15	The hand switchLED.8
				16	The hand switchLED.9
				17	The hand switchLED.10
				18	The hand switchLED.11
				19	The hand switchLED.12
				20	The hand switchLED.13
				21	The hand switchLED.14
				22	The hand switchLED.15
				23	The hand switchLED.16

4.2.2.1.23.Error ERR

■Summary

1. Notifies of an error.

■Comments

1. When an error occurs, the active notification <**aN**> is sent. This <**aN**> can not be disabled and controlled.

■Examples

Command	Type	Direction	Description
ERR *error-code*	**aN**	Host ← BX2	Notifies of an error.

■Parameters

error-code	('E00000' - 'E99999')	The 6[B] fixed-length array. (Cf. The error code list)

5.Parameter List

5.1.Error Codes

error-code	('E00000' - 'E99999')	The array length is fixed to 6 [B] and each code on the 1 to 5th degits of alphanumeric characters has its own meaning. The prefix is '54321', fixed to 'E'. '54321' 1st digit: Error details (classified according to Type/Part) 2nd digit: Type/Part (classified according to Error line and Index) 3rd digit: Error line 4th digit: Index (value for every unit) 5th digit: Error variation, NonFatalError/FatalError

	Code	Error details	Note
The 5th digit Error variation	'0'	NonFatalError	
	'1'	FatalError	

	Code	Error details	Note
The 4th digit Index (value for every unit)	'1'	BX2	
	'2'	Focus unit family	

■The codes on the 3rd to the 1st digits differ according to the 4th digit Index.

	Code	Error details
The 3rd digit Error line	'1'	Command
	'2'	Motorized part
	'3'	AF control
	'4'	Limit
	'5'	System
	'6'	Jog suspension

■The error codes per unit are described in later section.

5.1.1.BX2

Error line	Error-code	Error details	Note
Command	01120	Parameter error	
	01130	Combination error	The target has been combined with another system or does not exist.
	01140	Buffering error	Buffering is disabled since each control buffer of the target parts is full.

■When two or more errors are detected simultaneously, the error having minor value is given priority.

E.g. When a parameter error and a combination error are detected simultaneously, it is considered as a parameter error.

Error line	Error-code	Part	Error details
Motorized part	11211	Ob	Initialization error
	11212		Out-of-step
	11213		Click-escape error
	11214		Time-out error
	11215		Over run
	11216		Sensor error
	11217		Irregular operation
	11218		Reserved
	11219		Others
	01229	DIA lamp	Change of the lamp status (run-down or normal).
	01239	EPI lamp	Change of the lamp status (run-down or normal).
	11241 - 11249	Cb(RFAA)	The 1st digit is the same as Ob.
	11247		Irregular operation (Plug-and-play of the vertical illuminator cable)
	11251 - 11259	Sh(RFAA)	The 1st digit is the same as Ob.
	11261 - 11269	Bfdf(RLAA)	The 1st digit is the same as Ob.
	11267		Irregular operation (Plug-and-play of the vertical illuminator cable)
	11271 - 11279	EPI AS(RLAA)	The 1st digit is the same as Ob.
	11281 - 11289	DIA AS(UCD)	The 1st digit is the same as Ob.
	11291 - 11299	TL(UCD)	The 1st digit is the same as Ob.
	112A1 - 112A9	Tr(UCD)	The 1st digit is the same as Ob.
	112A7		Irregular operation (Plug-and-play of the UCD cable)
	112B1 - 112B9	FW1	The 1st digit is the same as Ob.
	112B7		Irregular operation (Plug-and-play of the FW1 cable)
	112C1 - 112C9	FW2	The 1st digit is the same as Ob.
	112C7		Irregular operation (Plug-and-play of the FW2 cable)
	112D1 - 112D9	FW3	The 1st digit is the same as Ob.
	112D7		Irregular operation (Plug-and-play of the FW3 cable)
	112E7	Frame (FRM)	Irregular operation (Plug-and-play of the frame cable)

Error line	Error-code	Error details
System	01511	LOG <**R**> is disabled during operation (while motorized parts work).