B3M

B3M Host I/F Specifications

CONFIDENTIAL

Version v2 2017/6/19

Approved	2017/6/19	H.Watanabe
Judged	2017/6/19	K.Yamaguchi
Created	2017/6/19	Y.Tamura

History

Ver	Date	Software Ver.	Description	Decided	Created
v1	2015/08/28	0006	First creation	Eda	Watanabe
v2	2017/6/19	0007	"GX3" response specification was added to 4.2.3.2 "U?". The comment was added in 4.1.	Watanabe	Tamura

Before using this document

- **The content described in this document is subject to change without notice for the purpose of system improvement.**
- **It is prohibited to copy a part or all of the content described in this document without permission except for personal use. It is, also, strictly prohibited to reprint without prior notice.**
- **Please note that Olympus shall not be responsible for any damage or lost profit caused by using this document or any claim from third parties.**

1. INTRODUCTION

The firmware B3M can control both the industrial system microscope BX3M and the inverted metallurgical microscope GX3. This document describes command specifications against Host PC.

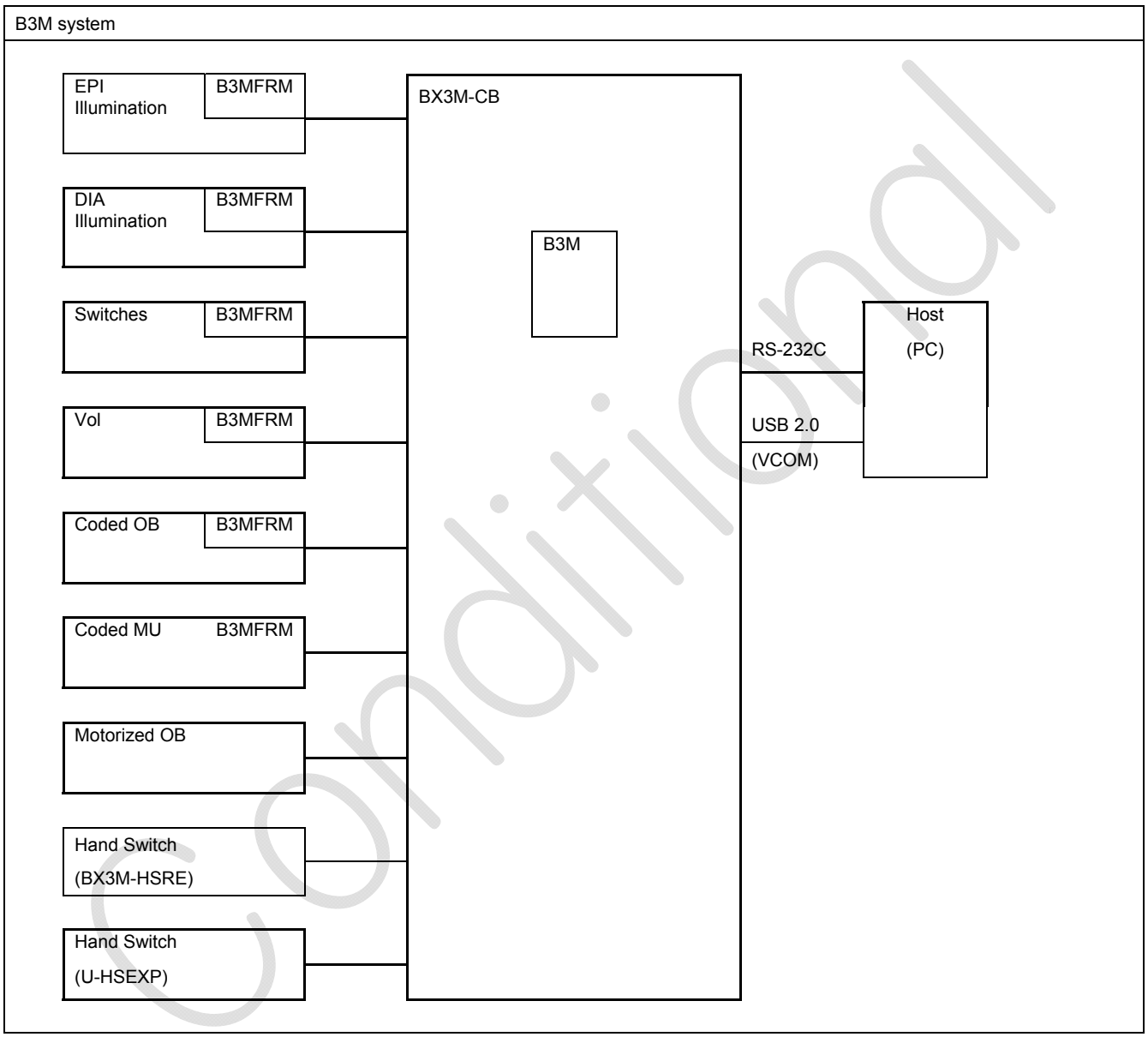


Fig 1 B3M system

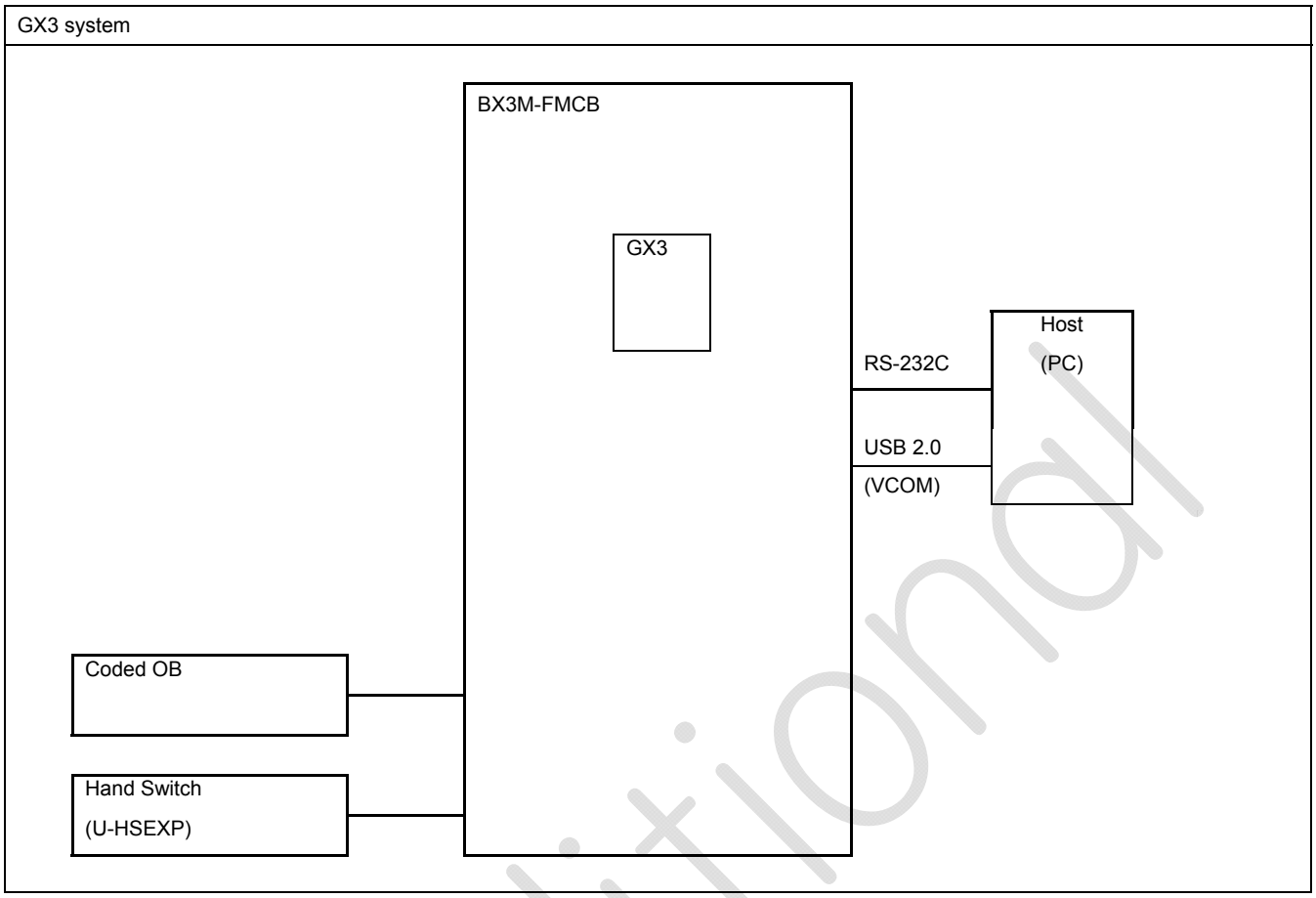


Fig 2 GX3 system

1.1. Rule of Notation

This document complies with the following notations.

Table 1 Rule of Notations

Notation	Example	Description
All text	**Commands cannot be received.**	Underline or **Block**, or both of **Underline and Block** are used to emphasize or to call attention to the meaning of the text.
All text	*number*	If representing the element in the special group, those terms are shown in *Italics.* *Number* represents the element in the numeral group. When the numeral group consists of 1, 2, 3, 4, 5, and 6, *number* describes one of those.
	command	*command* represents the element in Command group.
Area of variables	(0 - 1000)	The area between 0 to 1000. 0 <= x <= 1000
	(ON, OFF, STANDBY)	Any one of ON, OFF and STANDBY.
Radix of value	0x01, 0x55, 0xAA	Prefix 0x shows hexadecimal.
	0b01, 0b0101, 0b10101010	Prefix 0b shows binary.
Units	[0.1%]	Multiplying the set value by 0.1 indicates the actual percentage. Example on the left shows that the set value 2 equals to 0.2%.
	[um]	The unit of the set value is [um].
Command format	EBNF(***E****xtended* ***B****ackus-****N****aur* ***F****orm*)	
	α := β	α is defined as β.
	α | β	Select α or β
	[*α*]	α or nothing
	{ *α* }	Repeat α for 0 times or more.
	<< *α* >>	Repeat α once or more
	(*α*)	α
	α - β	A value which is no less than α and no more than β. Both.α and β must be integers. α <= x <= β
	Identifier := *Alphabet* { *Alphabet* | Numeral }	An identifier is defined as a string beginning with an alphabet, after which 0 or more alphabets and/or numeric characters follow.
	Repeated abbreviated notation … *Foo p1,…*	Repeats the last sorted data more than once. *Foo p1,p1* *Foo p1,p1,p1* *Foo p1,p1,p1,p1* are shown.

2. SUMMARY

2.1. Feature

B3M controls each motorized part using the commands from the host computer.

3. SYSTEM OVERVIEW

3.1. System Configuration

3.1.1. Configuration of the Motorized Part

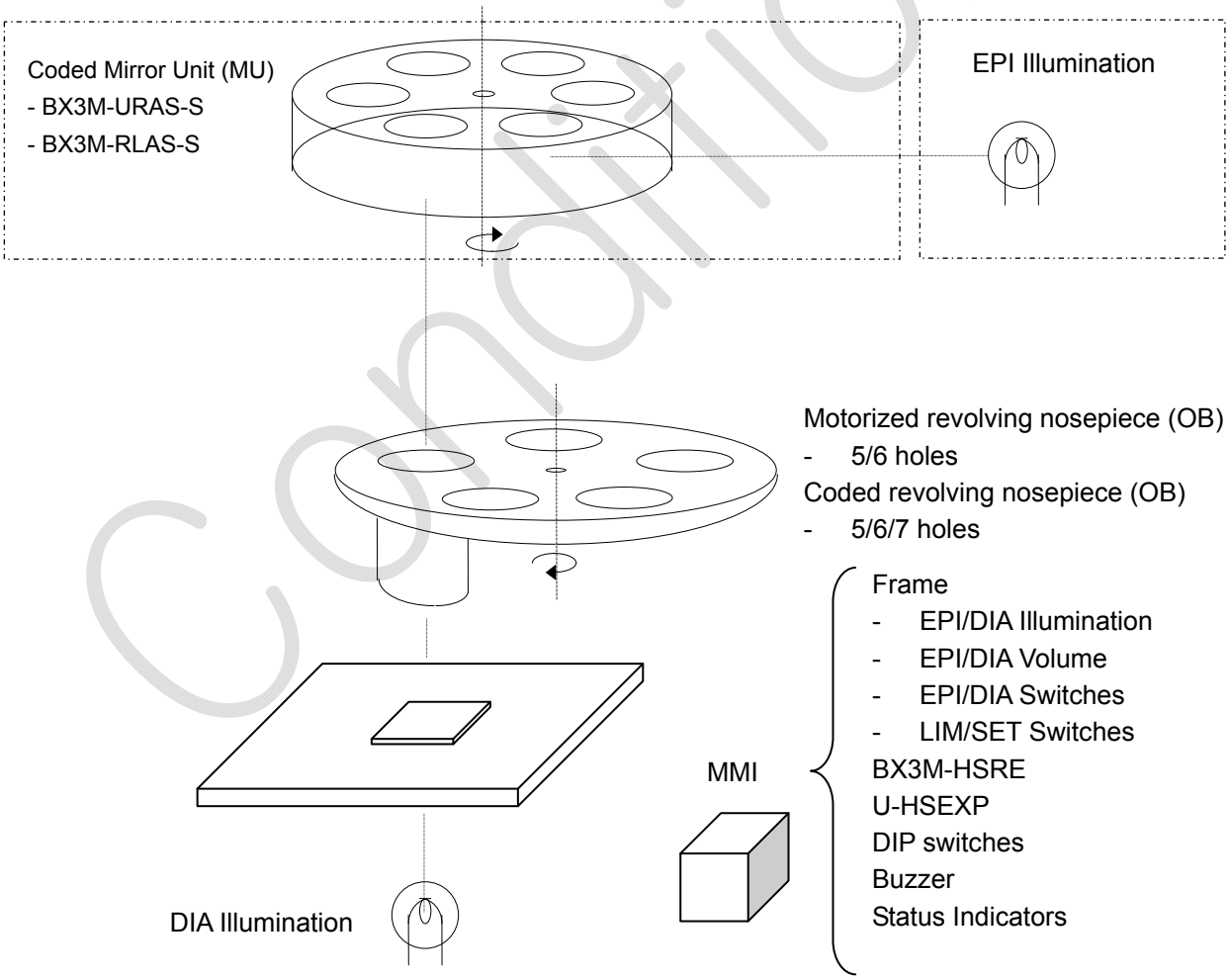


Fig 3 Configuration of the motorized/coded part and names in BX3M

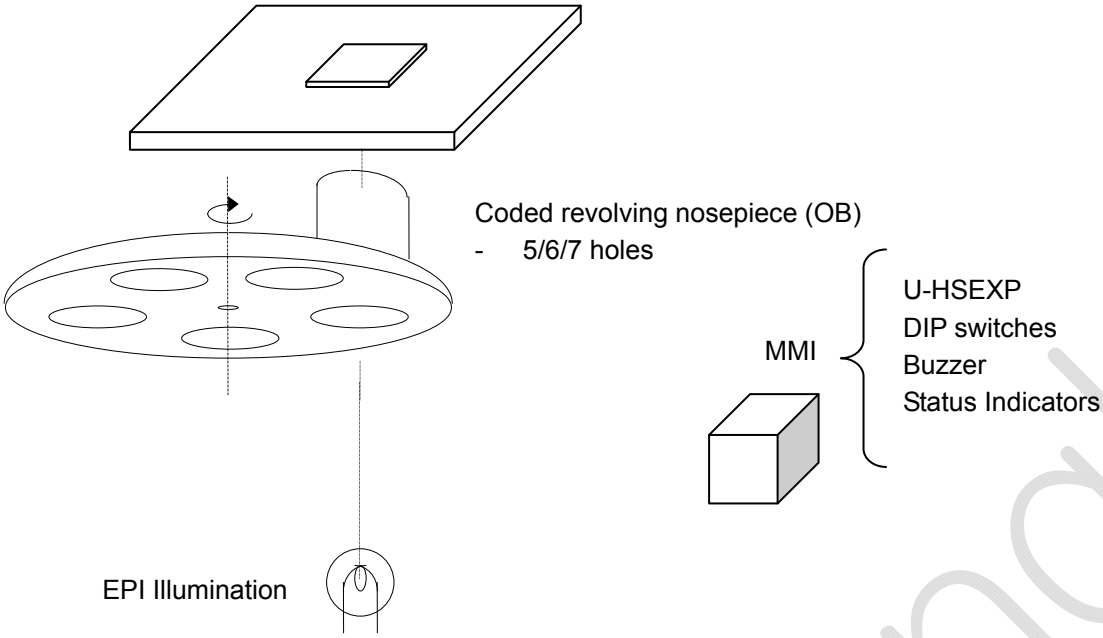


Fig 4 Configuration of the motorized/coded part and names in GX3

4. I/F

4.1. Dip Switch

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

Table 2 Dip Switch

Switch name	bit (on: 1, off: 0)				Function assignment	Settings
	3	2	1	0		
SW1				0	ON/OFF setting of Buzzer	ON (Default)
				1		OFF
			0		Motorized Nosepiece hole number setting	5 holes (Default)
			1			6 holes
		0			CW/CCW Assignment of BX3M-HSRE's Button1	CW rotating of OB (Default)
		1				CCW rotating of OB
	0				Target Frame	Upright frame BX3M
	1					Inverted frame GX3

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

4.2. Host I/F

The remote command of Host I/F controls B3M. Host I/F employs the serial UART communication using RS-232C and USB2.0 Virtual COM port.(VCOM).
It may be described as “command” representing the response of B3M and notification from B3Magainst commands from Host computer.

4.2.1. Basic Actions of Host I/F

4.2.1.1. Port Setting

Port setting is as follows (RS-232C, VCOM).

Table 3 Port Setting

Baud rate	19200[bps]
Data bit	8[bit]
Parity	even
Stop bit	2[bit]
Terminator	CR+LF
Flow control	Without

Restriction of VCOM is as follows.
Refuse permission for VCOM plug and play.

4.2.2. Command Format

The following table shows the command format. ASCII character code is employed as the character set of the command. 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.	B3M 1 (Fixed)
tag	Tag	String of uppercase alphabets and graphic characters. Application classification	Combination with variable length of 'A' to 'Z' and '?'. ex. 'L', 'OB', 'U?', 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' ～'9', 'A'～'Z', 'a'～'z'.
data-delimiter	Data delimiter	A graphical character Delimiter between ***data*** to ***data.***	',' Comma(0x2C)
terminator	Terminator	A control character Terminates ***command.***	CR+LF (0x0D 0x0A)

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.

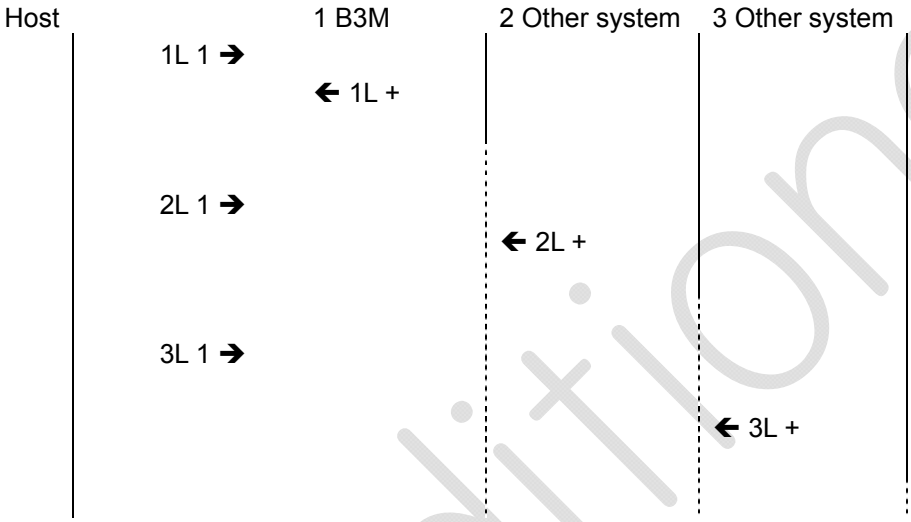
4.2.2.1. The Index and the Unit specified

The host computer needs to specify the system to which a command is sent by using the index. The index of B3M is defined as 1 fixed, but can be selected by the command described later. B3M ignores the command except the index 1.

Table 5 Index and Unit specified

Index	Unit Specified
1	B3M

ex.



4.2.2.2. Command Response

This section described the case that B3M ignores (discards) the command received. All the commands of FOO from the host computer below are ignored. However, this is limited to the case that *FOO* index specifies B3M. (B3M ignores the command of index different from the selected index.)

■Sequence

Host		B3M
s1. On initialization		Powers the unit Starts initialization
	FOO ➔	On initialization (The command cannot be received or the received command is nullified.)
		Terminates initialization (The command can be received)
s2. 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.

The index of *FOO* specifies B3M, but it sends the invalid response if not interpretable.

■Sequence

Host		B3M
s1. Undefined Command		
	FOO ➔	*FOO* is not described in the command dictionary (the command table) of the unit.
	← *n*x	Invalid (command) response is sent.
s2. Overlong command		
	FOO ➔	*FOO* exceeds the maximum command length.
	← *n*x	Invalid (command) response is sent.
s3.Local		
	FOO ➔	Local (The system is not logged in.) and during logging in. However, *FOO* excludes the command received locally, such as LOG, LOG?, *BAR*?, etc.
	← *n*x	Invalid (command) response is sent.

※ *n* represents the index.

4.2.2.3. Command Sequence

The commands sent by the host can be classified according to their purposes. The classified type determines whether handshake is used or not (whether the commands between the Host and B3M are synchronized or not).

Table 6 Handshake and Nest

Format*1	Type	Direction Host B3M	Description	Handshake
X parameters *X*	Control request <**R**>	→	Request of control(action/setup)	Used
X + *X parameters*	Positive acknowledgement <**PA**>	←	Normal completion of the control request	Used
X !,*error-code* *X* !,*error-code*,*parameters*	Negative acknowledgement <**NA**>	←	Abnormal completion of the control request	Used
X?	Query <**Q**>	→	Parameter/data query	Used
X parameters	Notification <**N**>	←	Parameter/data notification	Used
X parameters	Active notification <**AN**>	←	Parameter/data active notification	Not used
X error-code	Error notification <**EN**>	←	Error notification	Not used

*1 *X* represents a tag, *parameters* represents parameters and *error-code* represents the error code.

4.2.2.3.1. 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 from B3M., the host computer is notified that a processing (an action) is completed.

■Sequence

Host				B3M
s1. Control Request	<**R**>	➔		Starts request processing
				Processing the request
Positive acknowledgement		←	<**PA**>	Terminates request processing
s2. Control Request	<**R**>	➔		Starts request processing
				Processing the request
Negative acknowledgement		←	<**NA**>	Terminates request processing
s3. Query	<**Q**>	➔		Starts querying
				On querying
Notification		←	<**N**>	Terminates querying

4.2.2.3.2. Commands without Handshake

Handshake is not required with the active notification <**AN**> and error notification <**EN**>.

■ Sequence

Host				B3M
s4. Active notification	*ENABLE*<**R**>	➔		Active notification is enabled
Positive acknowledgement		←	*ENABLE* <**PA**>	Starts the active notification.
Active notification		←	<**AN**>	
Active notification		←	<**AN**>	
s5. Error notification		←	<**EN**>	Error occurs.

* *ENABLE* represents a command that enables active notification.

4.2.2.3.3. The Nest of Handshaking

The commands can be nested to a handshake command. The commands sent by Host computer are not received in the order they sent. An acknowledgement is sent to Host computer when a corresponding process is completed. However, some <**R**> commands cannot be nested.

■ Sequence

Host				B3M
s6. Control request	*FOO*<**R**>	➔		Starts the processing requested by *FOO*.
	BAR<**R**>	➔		Starts the processing requested by *BAR*
		←	*FOO*<**PA**>	Completes the processing requested by *FOO*.
		←	*BAR*<**PA**>	Completes the processing requested by *BAR*.
s7. Control request/Query	*FOO*<**R**>	➔		Starts the processing requested by *FOO*.
	BAR<**R**>	➔		Starts the processing requested by *BAR*.
	FOO2<**R**>	➔		Starts the processing requested by *FOO2*.
	BAR2<**R**>	➔		Starts the processing requested by *BAR2*.
	FOO<**Q**>	➔		Starts the query.
		←	*FOO*<**PA**>	Starts the processing requested by *FOO*.
		←	*FOO*<**N**>	Completes the query.
		←	*BAR2*<**PA**>	Completes the processing requested by *BAR2*.
		←	*FOO2*<**PA**>	Completes the processing requested by *FOO2*.
		←	*BAR*<**PA**>	Completes the processing requested by *BAR*.
s8. Control request (cannot be nest)	*FOO*<**R**>	➔		
	BAR<**R**>	➔		
		←	*BAR*<**NA**>	
		←	*FOO*<**PA**>	

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

4.2.3. Command Reference

Table 7 Command List

Command	Local	Remote
L	X	X
L?	X	X
U?	X	X
V	-	X
EIL	-	X
EIL?	X	X
DIL	-	X
DIL?	X	X
EILS	-	X
DILS	-	X
EILSW	-	X
EILSW?	X	X
DILSW	-	X
DILSW?	X	X
GLM	-	X
OB	-	X
OB?	X	X
NOB	-	X
MU?	X	X
NMU	-	X
SN1	-	X
SN1?	X	X
VL	-	X
VL?	X	X
SK1	-	X
SK1?	X	X
SK3	-	X
SK3?	X	X
ER?	X	X

X: Enable, -: Disable

4.2.3.1. Log In **L L?**

■Summary

1. Log in to the state of Remote or Log out to the state of Local.
2. Get the current state (Remote/Local).

■Comments

1. Parameters changed in Remote are volatilized when switching to Local, and all will be returned to each default value.

■Format

Command	Type	Direction	Description
L *p1*	**R**	Host ➔ B3M	Change the state among Remote/Local.
L +	**PA**	Host ← B3M	Successfully changed the state.
L !,*error-code*	**NA**	Host ← B3M	Failed to change the state.
L?	**Q**	Host ➔ B3M	Get the current state (Remote/Local).
L *p1*	**N**	Host ← B3M	Notify the state (Remote/Local).

■Parameters

p1	0	Local default
	2	Remote

■Sequence

Host				B3M
Logs in(to Remote mode)	L 2	→		
		←	L +	
Enable software key	SK1 1	→		
		←	SK1 +	
		←	SK1 0	Notify switch status (any buttons are pressed.)
Get Remote/Local status	L?	→		
		←	L 2	Remote mode.
		←	SK1 1	MMI Button is pressed. Any parts are NOT moved.
Enable Ob active notification	NOB 1	→		
		←	NOB +	
		←	NOB 1	Notify current OB position Move nosepiece to out position by hand.
		←	NOB X	Notify current Ob as click out. Move nosepiece to position2 by hand.
		←	NOB 2	Notify nosepiece to position2.
Logs out (to Local mode)	L 0	→		
		←	L +	
				MMI button is pressed. (No active notification)
Logs in via RS-232C	L 2	→		
		←	L +	
Logs out via USB(VCOM)	L 0	→		
		←	L !,E013F0130	Combination error
Logs out (to Local mode)	L 0	→		
Moves Motorized Nosepiece	OB 1	→		
		←	OB !,E013F0511	System error (Logging in busy.)
		←	L +	
				Moving nosepiece at Local
Logs in	L 2	→		
		←	L !,E013F0511	System error (Logging in busy.)

4.2.3.2. Unit U?

■Summary

1. Get the unit name.

■Comments

1. The number of parameters of <N> is a variable number of specified strings of characters to describe the units (motorized parts or local MMI).
2. RV.5 / RV.6 will be replied when both of Motorized and Coded nosepiece are connected.
   Motorized nosepiece has a priority over a coded nosepiece and coded nosepiece will be disregarded.

■Format

Command	Type	Direction	Description
U?	**Q**	Host ➔ B3M	Get the unit name.
U *p1*,...	**N**	Host ➔ B3M	Notify the unit name

■Parameters

	Character	Explanation
p1	B3M GX3	System ID B3M: DIPSW BIT3 is set OFF. GX3: DIPSW BIT3 is set ON.
	FRM	Microscope frame is connected.
	CRV	Coded nosepiece is connected (Not recognized number of holes)
	RV.5 RV.6	Motorized nosepiece is connected (5 or 6 holes).
	CILL	Coded Illuminator is connected (Not recognized number of holes)
	B3M-HSRE	Hand switch for motorized nosepiece (BX3M-HSRE)
	U-HSEXP	Hand switch for camera exposure (U-HSEXP)

■Sequence

Host			B3M
			DIPSW BIT3 is set OFF.
	U?	➔	
		← U B3M, FRM, CRV,CILL	B3M, Frame, coded nosepiece, coded illuminator
			When BIT3 is set ON.
	U?	➔	
		← U GX3,CRV	GX3, Coded nosepiece

4.2.3.3. **V**ersion **V**

■Summary

1. Get Firmware version.

■Comments

■Format

Command	Type	Direction	Description
V *p1*	**R**	Host ➔ B3M	Get Firmware version.
V *p2*	**PA**	Host ← B3M	Notify Firmware version.
V !,*error-code*	**NA**	Host ← B3M	Failed to get Firmware version.

■Parameters

p1	Strings	Part
	1	B3M
	2	BX3M Frame
p2	0001-9999	ROM Version 4[B] fixed length
	----	Undefined 4[B] fixed length

4.2.3.4. **E**pi **I**llumination Intensity **EIL EIL?**

■Summary

1. Set Epi illumination intensity.
2. Get Epi illumination intensity.

■Comments

1. Nest error is sent when EIL <R> command while EILS is operating.

■Format

Command	Type	Direction	Description
EIL *p1*	**R**	Host ➔ B3M	Set Epi illumination intensity.
EIL +	**PA**	Host ← B3M	Successfully set Epi illumination intensity.
EIL !,*error-code*	**NA**	Host ← B3M	Failed to set Epi illumination intensity.
EIL?	**Q**	Host ➔ B3M	Get Epi illumination intensity.
EIL *p1*	**N**	Host ← B3M	Notify Epi illumination intensity.

■Parameters

p1	(0 – 255)	Range of Epi illumination intensity.

4.2.3.5. **D**ia **Il**lumination Intensity **DIL DIL?**

■Summary
1. Set Dia illumination intensity.
2. Get Dia illumination intensity.

■Comments
1. Nest error is sent when DIL <R> command while DILS is operating.

■Format

Command	Type	Direction	Description
DIL *p1*	**R**	Host → B3M	Set Dia illumination intensity.
DIL +	**PA**	Host ← B3M	Successfully set Dia illumination intensity.
DIL !,*error-code*	**NA**	Host ← B3M	Failed to set Dia illumination intensity.
DIL?	**Q**	Host → B3M	Get Dia illumination intensity.
DIL *p1*	**N**	Host ← B3M	Notify Dia illumination intensity.

■Parameters

p1	(0 - 255)	Range of Dia illumination intensity.

4.2.3.6. **E**pi **I**llumination Intensity **S**low Adjustment **EILS**

■Summary

1. Set Epi illumination intensity by slow adjustment. (Slow adjustment: Light intensity is gradually increased.)

■Comments

1. Increasing time is Max 1[s].
2. Nest error is sent when EIL/EILS/EILSW<R> command while EILS is operating.
3. Slow adjustment is only for increasing the light intensity. In the case of decreasing the light intensity, command operation is same as EIL.
4. EILS <R> will be Combination Error during Epi is turning off (EILSW = 0).

■Format

Command	Type	Direction	Description
EILS *p1*	**R**	Host ➔ B3M	Set Epi illumination intensity.
EILS +	**PA**	Host ← B3M	Successfully set Epi illumination intensity.
EILS !,*error-code*	**NA**	Host ← B3M	Failed to set Epi illumination intensity.

■Parameters

p1	(0 - 255)	Range of Epi illumination intensity.

■Sequence

Host				B3M
Set light intensity(increase)	EILS 100	➔		
				Approx. 1[s]
		←	EILS +	
Set light intensity(increase)	EILS 10	➔		
		←	EILS +	
Set light intensity(increase)	EILS 100	➔		
Set light intensity	EIL 10	➔		
		←	EIL !,E013F0110	Nest error
Set light intensity	EILS 90	➔		
		←	EILS !,E013F0110	Nest error
				Approx. 1[s]
		←	EILS +	

4.2.3.7. **D**ia **Il**lumination Intensity **S**low Adjustment **DILS**

■Summary

1. Set Dia illumination intensity by slow adjustment. (Slow adjustment: Light intensity is gradually increased.)

■Comments

1. Increasing time is Max 1[s].
2. Nest error is sent when DIL/DILS/DILSW <R> command while DILS is operating.
3. Slow adjustment is only for increasing the light intensity. In the case of decreasing the light intensity, command operation is same as DIL.
4. DILS <R> will be Combination Error during Dia is turning off (DILSW = 0).

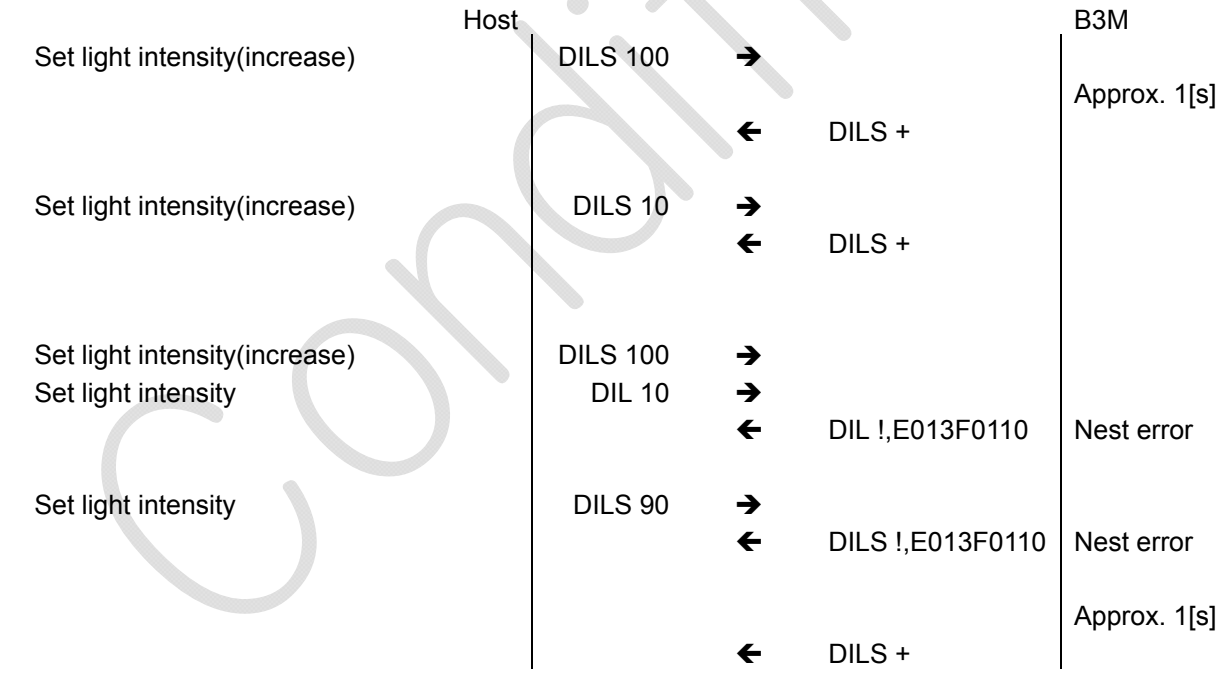
■Format

Command	Type	Direction	Description
DILS *p1*	**R**	Host ➔ B3M	Set Dia illumination intensity.
DILS +	**PA**	Host ← B3M	Successfully set Dia illumination intensity.
DILS !,*error-code*	**NA**	Host ← B3M	Failed to set Dia illumination intensity.

■Parameters

p1	(0 - 255)	Range of Dia illumination intensity.

■Sequence



4.2.3.8. **E**pi **Il**lumination ON/OFF **Sw**itch **EILSW EILSW?**

■Summary

1. Turn ON/OFF Epi Illumination.
2. Get Epi Illumination status (ON/OFF).

■Comments

1. EILSW <R> will be Nest error during EILS is operating.

■Format

Command	Type	Direction	Description
EILSW *p1*	**R**	Host → B3M	Turn ON/OFF Epi Illumination.
EILSW +	**PA**	Host ← B3M	Successfully turned ON/OFF Epi illumination.
EILSW !,*error-code*	**NA**	Host ← B3M	Failed to turn ON/OFF Epi illumination.
EILSW?	**Q**	Host → B3M	Get Epi illumination status.
EILSW *p2*	**N**	Host ← B3M	Notify Epi illumination status (ON/OFF).

■Parameters

p1	0	OFF
	1	ON
p2	0	OFF
	1	ON
	X	Undefined

4.2.3.9. **D**ia **Il**lumination ON/OFF **Sw**itch **DILSW DILSW?**

■Summary

1. Turn ON/OFF Dia Illumination.
2. Get Dia Illumination status (ON/OFF).

■Comments

1. DILSW <R> will be Nest error during DILS is operating.

■Format

Command	Type	Direction	Description
DILSW *p1*	**R**	Host ➔ B3M	Turn ON/OFF Dia Illumination.
DILSW +	**PA**	Host ← B3M	Successfully turned ON/OFF Dia illumination.
DILSW !,*error-code*	**NA**	Host ← B3M	Failed to turn ON/OFF Dia illumination.
DILSW?	**Q**	Host ➔ B3M	Get Dia illumination status.
DILSW *p2*	**N**	Host ← B3M	Notify Dia illumination status (ON/OFF).

■Parameters

p1	0	OFF
	1	ON
p2	0	OFF
	1	ON
	X	Undefined

4.2.3.10. **G**et **L**ight **M**anager Memorized Value **GLM**

■Summary

1. Get Light manager memorized value.

■Comments

1. Regarding Light maneger table, refer Fig 5.
2. In Remote mode, light maneger does't work.

■Format

Command	Type	Direction	Description
GLM *p1,p2*	**R**	Host ➔ B3M	Get Light manager memorized value.
GLM *p3,p4,p5,p6,p7,p8,p9*	**PA**	Host ← B3M	Successfully got Light manager memorized value.
GLM !,*error-code*	**NA**	Host ← B3M	Failed to get Light manager memorized value.

■Parameters

p1	1	MU 1
	2	MU 2
	3	MU 3
	4	MU 4
	5	DIA Observation
p2	1	1: EPI Illumination
	2	2: DIA Illumination
p3	0 - 255	Light intensity of nosepiece pos1 (0: OFF)
p4	0 - 255	Light intensity of nosepiece pos2 (0: OFF)
p5	0 - 255	Light intensity of nosepiece pos3 (0: OFF)
p6	0 - 255	Light intensity of nosepiece pos4 (0: OFF)
p7	0 - 255	Light intensity of nosepiece pos5 (0: OFF)
p8	0 - 255	Light intensity of nosepiece pos6 (0: OFF)
p9	0 - 255	Light intensity of nosepiece pos7 (0: OFF)

■Sequence

Host			B3M
Get Light manager value of MU1 & EPI Illumination.	GLM 1,1	➔	
		← GLM 10,20,30,50,100,140,255	Notify values of Light manager value of MU1 & EPI Illumination.
Get Light manager value of DIA observation & DIA Illumination.	GLM 5,2	➔	
		← GLM 100,110,130,150,200,240,255	Notify values of Light manager value of DIA observation & DIA Illumination.
Get Light manager value of DIA observation & EPI Illumination.	GLM 5,1	➔	
		← GLM 0,0,0,0,0,0,0	Notify values of Light manager value of DIA observation & EPI Illumination.

OB hole #		Light select Switch				
		EPI				DIA
		MU Hole#				
		1	2	3	4	
1	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.
2	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.
3	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.
4	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.
5	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.
6	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.
7	EPI	App.	App.	App.	App.	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	App.

Example)

Nosepiece hole #		Light select Switch				
		EPI				DIA
		CUBE Position				
		1	2	3	4	
1	EPI	10	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	100
2	EPI	20	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	110
3	EPI	30	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	130
4	EPI	50	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	150
5	EPI	100	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	200
6	EPI	140	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	240
7	EPI	255	255	255	255	0(Fixed)
	DIA	0(Fixed)	0(Fixed)	0(Fixed)	0(Fixed)	255

Fig 5 Light manager table

4.2.3.11. OB position OB OB?

■Summary

1. Set Objective Lenz (OB) position.
2. Get OB position.

■Comments

1. For position change from the “out”-position, the revolving nosepiece is set to the nearest “in” position in the direction from position 2 to 1 (CW direction) then set to the specified position by passing through the shortest path.

1. Format

Command	Type	Direction	Description
OB *p1*	**R**	Host ➔ B3M	Set OB position.
OB +	**PA**	Host ← B3M	Successfully set OB position.
OB !,*error-code*	**NA**	Host ← B3M	Failed to set OB position.
OB?	**Q**	Host ➔ B3M	Get OB position.
OB *p2*	**N**	Host ← B3M	Notify OB position.

■Parameters

p1	(1－n)	Motorized OB position "n" is depends on the number of holes of Motorized OB (5, 6).
p2	(1－n)	Motorized or Coded OB position "n" is depends on the number of holes of Motorized OB (5, 6) or Corded OB (5, 6, 7).
	X	Undefined

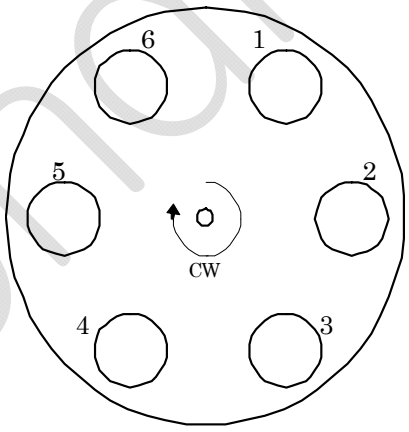


Fig 6 OB positions (View from the objective mounting side)

4.2.3.12. Active **N**otification of **OB position NOB**

■Summary

1. Enable/Disable Active Notification <AN> of OB position.

■Comments

1. <AN> of current OB position will be sent when NOB setting turn to 1 (<AN> is Enable). After that, <AN> of OB will be sent when OB position is changed.

■Format

Command	Type	Direction	Description
NOB *p1*	**R**	Host ➔ B3M	Enable/Disable <AN> of OB position.
NOB +	**PA**	Host ← B3M	Successfully enabled/disabled <AN> of OB position.
NOB !,*error-code*	**NA**	Host ← B3M	Failed to enable/disable <AN> of OB position.
NOB *p2*	**AN**	Host ← B3M	Notify OB position.

■Parameters

p1	0	Disable default
	1	Enable
p2	(1－n)	OB position "n" is depends on the number of holes of Motorized OB (5, 6) or Corded OB (5, 6, 7).
	X	Undefined

■Sequence

Host			B3M
1. In case of Motorized Nosepiece			
Disable active notification.	NOB 0	➔	
		← NOB +	
Switches nosepiece	OB 2	➔	
		← OB +	
Enable active notification.	NOB 1	➔	
		← NOB +	
		← NOB 2	Notify current OB position.(Hole2)
Switches nosepiece	OB 5	➔	
		← OB +	
		← NOB 5	Notify current OB position. .(Hole5)
1. In case of Coded Nosepiece			
Enable active notification.	NOB 1	➔	
		← NOB +	
		← NOB 2	Notify current OB position. .(Hole2)
			Move nosepiece to the out position by hand.
		← NOB X	Notify current Ob (Click out)
			Move nosepiece to position4 by hand.
		← NOB 4	Notify current OB position. .(Hole4)

4.2.3.13. **MU** Position **MU?**

■Summary

1. Get Mirror Unit (MU) position.

■Comments

1. Regarding relationship between MU position and Observation method, BX3M-URAS-S case is flexible; however BX3M-RLAS-Sis fixed.
2. B3M can recognize Coded MU's Connect/Disconnect, however can NOT recognize a type of unit.

■Format

Command	Type	Direction	Description
MU?	**Q**	Host ➔ B3M	Get MU position.
MU *p1*	**N**	Host ➔ B3M	Notify MU position.

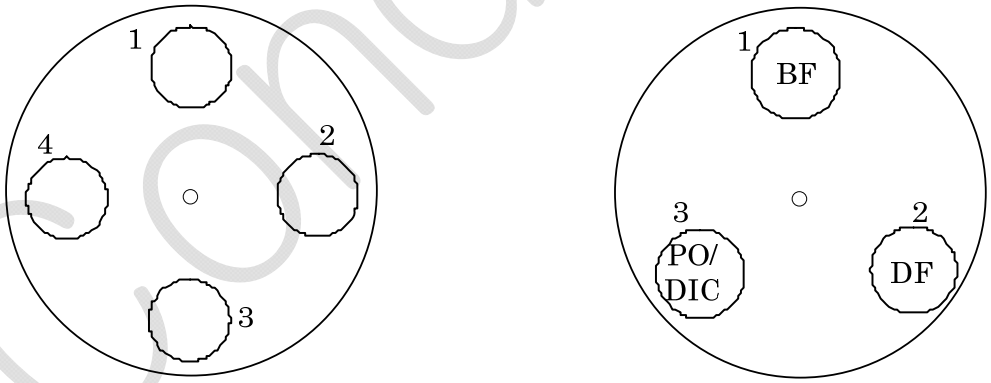
■Parameters

1. BX3M-URAS-S

p1	(1 – 4)	MU position
	X	Undefined

2. BX3M-RLAS-S

p1	(1 – 3)	MU position 1: BF (Fixed) 2: DF (Fixed) 3: DIC/PO (Fixed)
	X	Undefined



BX3M-URAS-S BX3M-RLAS-S

Fig 7 MU position (TOP View)

4.2.3.14. Active **N**otification of **MU** Position **NMU**

■Summary

1. Enable/Disable Active Notification <AN> of Mirror Unit (MU) position.

■Comments

1. <AN> of current MU position will be sent when NMU setting turn to 1 (<AN> is Enable). After that, <AN> of MU will be sent when MU position is changed.

■Format

Command	Type	Direction	Description
NMU *p1*	**R**	Host ➔ B3M	Enable/Disable <AN> of MU position.
NMU +	**PA**	Host ← B3M	Successfully enabled/disabled <AN> of MU position.
NMU !,*error-code*	**NA**	Host ← B3M	Failed to enable/disable <AN> of MU position.
NMU *p2*	**AN**	Host ← B3M	Notify MU position.

■Parameters

p1	0	Disable default
	1	Enable
p2	(1 – n)	MU position 1 - *n n* := (3, 4) **It depends on the flexibility of the Illumination equipped.**
	X	Undefined

■Sequence

Host			B3M
Enable <AN> of MU position	NMU 1	➔	
		NMU +	Enabled <AN> of MU
	←	NMU 1	Notify MU position
			Move a mirror unit to the out position by hand.
	←	NMU X	Notify MU position
			Move a mirror unit to the position2 by hand.
	←	NMU 2	Notify MU position
Disable <AN> of MU position	NMU 0	➔	
		NMU +	

4.2.3.15. **S**witch Active **N**otification **1** (U-HSEXP) **SN1 SN1?**

■Summary

1. Enable/Disable Active Notification <AN> of U-HSEXP status.
2. Get U-HSEXP status.

■Comments

■Format

Command	Type	Direction	Description
SN1 *p1*	**R**	Host ➔ B3M	Enable/Disable <**AN**> of U-HSEXP status.
SN1 +	**PA**	Host ➔ B3M	Successfully enabled/disabled <**AN**> of U-HSEXP status.
SN1 !,*error-code*	**NA**	Host ➔ B3M	Failed to enable/disable <**AN**> of U-HSEXP status.
SN1 *p2*	**AN**	Host ➔ B3M	Notify U-HSEXP status (ON/OFF).
SN1?	**Q**	Host ➔ B3M	Get U-HSEXP status.
SN1 *p2*	**N**	Host ➔ B3M	Notify U-HSEXP status (ON/OFF).

■Parameters

p1	0	Disable default
	1	Enable
p2	0	OFF
	1	ON
	X	Undefined (U-HSEXP is disconnected)

4.2.3.17. Volume Active Notification **VL VL?**

■Summary

1. Enable/Disable Active Notification <AN> of Volume position.
2. Get Volume position.

■Comments

■Format

Command	Type	Direction	Description
VL *p1*	**R**	Host ➔ B3M	Enable/Disable <**AN**> of Volume position.
VL +	**PA**	Host ← B3M	Successfully enabled/disabled <**AN**> of Volume position.
VL !,*error-code*	**NA**	Host ← B3M	Failed to enable/disable <**AN**> of Volume position.
VL *p2*	**AN**	Host ← B3M	Notify Volume position.
VL?	**Q**	Host ← B3M	Get Volume position.
VL *p2*	**N**	Host ← B3M	Notify Volume position.

■Parameters

p1	0	Disable default
	1	Enable
p2	0 – 255	Volume position
	X	Undefined

■Sequence

Host			B3M
Get Volume position.	VL?	➔	
		← VL 100	Notify Volume position.
Enable <AN> of Volume position.	VL 1	➔	
		← VL +	
		← VL 100	Notify Volume position.
			Volume is operated by User.
		← VL 130	Notify Volume position.
			Volume is operated by User.
		← VL 180	Notify Volume position.

4.2.3.18. **S**oft-**K**ey Active Notification **1** (BX3M Frame) **SK1 SK1?**

■Summary

1. Enable/Disable Active Notification <AN> of Switches on BX3M Frame status.
2. Get Switches on BX3M Frame status.

■Comments

■Format

Command	Type	Direction	Description
SK1 *p1*	**R**	Host ➔ B3M	Enable/Disable <**AN**> of Switches on BX3M Frame status.
SK1 +	**PA**	Host ➔ B3M	Successfully enabled/disabled <**AN**> of Switches on BX3M Frame status.
SK1 !,*error-code*	**NA**	Host ➔ B3M	Failed to enable/disable <**AN**> of Switches on BX3M Frame status.
SK1 *p2*	**AN**	Host ➔ B3M	Notify Switches on BX3M Frame status.
SK1?	**Q**	Host ➔ B3M	Get Switches on BX3M Frame status.
SK1 *p2*	**N**	Host ➔ B3M	Notify Switches on BX3M Frame status.

■Parameters

p1	0	Disable default
	1	Enable
p2	(0 – 7)	3 bit image 0x0 - 0x7 (hexadecimal) taking the switch status as on: 1 and off: 0.
	X	Undefined

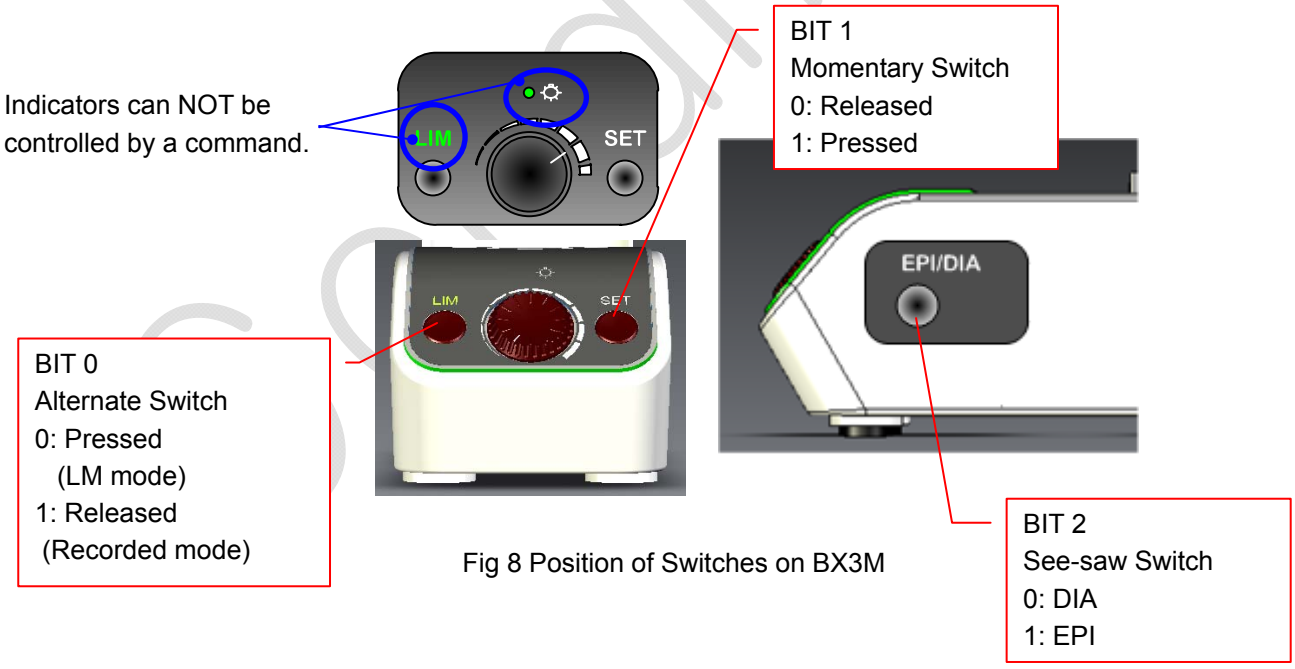


Fig 8 Position of Switches on BX3M

4.2.3.19. **S**oft-**K**ey Active Notification **3** (BX3M-HSRE) **SK3 SK3?**

■Summary

1. Enable/Disable Active Notification <AN> of BX3M-HSRE status.
2. Get BX3M-HSRE status.

■Comments

■Format

Command	Type	Direction	Description
SK3 *p1*	**R**	Host ➔ B3M	Enable/Disable <**AN**> of BX3M-HSRE status.
SK3 +	**PA**	Host ← B3M	Successfully enabled/disabled <**AN**> of BX3M-HSRE status.
SK3 !,*error-code*	**NA**	Host ← B3M	Failed to enable/disable <**AN**> of BX3M-HSRE status.
SK3 *p2*	**AN**	Host ← B3M	Notify BX3M-HSRE status.
SK3?	**Q**	Host ➔ B3M	Get BX3M-HSRE status.
SK3 *p2*	**N**	Host ← B3M	Notify BX3M-HSRE status.

■Parameters

p1	0	Disable default
	1	Enable
p2	(0 – 3)	2 bit image 0x0 - 0x3 (hexadecimal) taking the switch status as on: 1 and off: 0.
	X	Undefined (BX3M-HSRE is disconnected.)

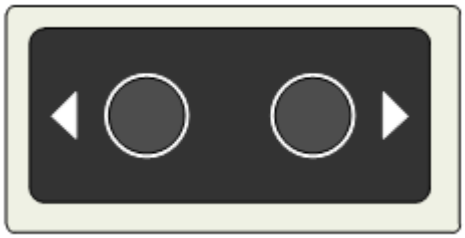


Fig 9 BX3M-HSRE

4.2.3.20. **Er**ror **ER**

■Summary

1. Error active Notification of Fatal error <EN>.
2. Get Fatal error code which occurred the last time.

■Comments

1. <EN> can't be disabled.

■Format

Command	Type	Direction	Description
ER *error-code*	**EN**	Host ← B3M	Notify of Fatal error code.
ER?	**Q**	Host → B3M	Get Fatal error code
ER *error-code*	**N**	Host ← B3M	Notify of Fatal error code

■Parameters

error-code	(E00000000 – EZZZZZZZZ)	9[B] fixed length (cf. Error code list)

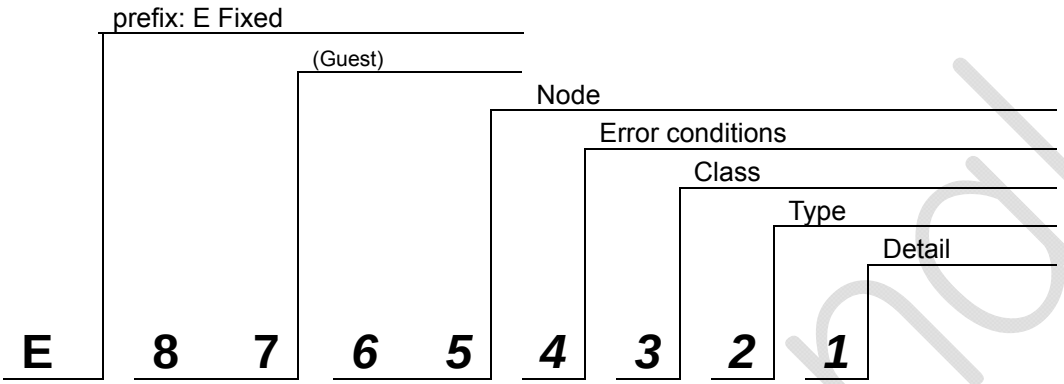
■Sequence

Host		B3M
Get Fatal error code.	ER? →	
	← ER E00000000	Notify Fatal error code (None)
	OB 1 →	
	← OB !,E01140200	OB timeout
Get Fatal error code.	ER? →	
	← ER E01140200	Notify Fatal error code.

4.3. Error Codes

Error codes are described as follows. The error codes are created based on the hierarchical structure, and the meaning of the lower digits differs depending on the upper digits.

error-code	E00000000 – EZZZZZZZZ	7[B] fixed length with decimal 6 digits following after prefix: E.



8th and 7th digits	code	Description	Notes
(guest)	00 - 99	Guest Number	The guest number of B3M is displayed in decimal.

8th and 7th digits	code	Description	Notes
(node)	01-3F	Node Number	The node number of parts is displayed in hexadecimal.

4th digit	code	Error details	Notes
	0	Warning or nonfatal error	When causes are removed, most of the cases can be restored.
(error conditions)	1	Fatal error	Unable to restore and the relevant part/unit will be locked.

■The Class differs depending on the function performed by Parts. (All parts do not necessarily have all Classes.)

3rd digit	code	Error Details
Class	1	Command
	2	Motorized (including the light source)
	3	AF control
	4	Limit
	5	System
	6	MMI (Man Machine I/F ex. Hs, Jog, Js, etc.)
	7	Non-volatile memory
	8 - 0	reserved

■Further Types (2nd digit) and Details (1st digit) indicate the different meaning by each Class.

4.3.1. B3M

Error codes of B3M are described as follows. However, prefix:E is omitted.

Part	Class	error-code*1	Type	Details
All	Command*2	xxyy0110	Nesting error	The command which cannot execute nesting was nested.
		xxyy0120	Parameter error	The parameter exceeds the area. Too many parameters or too few parameters.
		xxyy0130	Combination error	Unacceptable due to the combination with other status. No target part exists.

*1 xx indicates a certain guest to take 01 - 99. yy indicates a certain node to take 01 - 3F.

*2 **When the multiple errors are detected** in one transaction**, the minimum value class is selected as the error code**.
For example, when the parameter error and the combination error are detected, the parameter error is selected.

Part	Class	Type	error-code	Details
0x3F (B3M)	Command*2	Nesting error	013F0110	The command which cannot execute nesting was nested.
		Parameter error	013F0120	The parameter exceeds the area. Too many parameters or too few parameters.
		Combination error	013F0130	Unacceptable due to the combination with other status. No target part exists. After logging in one HOST I/F RS-232C (or USB), logs in another HOST I/F USB (or RS-232C).
		Internal I/F timeout	013F1150	Communication to BX3M Frame is timeout.
	Motorized	Motorized nosepiece	013F1213	Sensor detection is timeout.
			013F1214	Motor timeout error.
			013F1215	Overrun error (ClickOUT after finishing motor sequence)
			013F1216	Sensor error (Type sensor is mismatch).
			013F1219	Others
		Unit disconnected	013F1220	BX3M-HSRE is disconnected.
			013F1221	U-HSEXP is disconnected.
			013F1222	Motorized nosepiece is disconnected.
			013F1223	Coded nosepiece is disconnected.
			013F1224	Coded Illumination is disconnected.
	System	System error	013F0511	<R> command except L command is sent at local. L command is sent during transferring to Local. L command is sent during moving motorized parts (Busy).