

INSTRUCTION MANUAL

EDX-10A/B

COMPACT RECORDING SYSTEM

(FOR CONTROL COMMAND)

Thank you for purchasing KYOWA's product EDX-10A/B Compact Recording System.

Read this Instruction Manual carefully in order to make full use of the high performance capabilities of the product.

Do not use the product in methods other than described in this Manual.

This Manual only describes Control Command of the EDX-10A/B.

For hardware, refer to the "EDX-10A COMPACT RECORDING SYSTEM (FOR HARDWARE)" and "EDX-10B COMPACT RECORDING SYSTEM (FOR HARDWARE)"

For software, refer to the "DCS-100A DYNAMIC DATA RECORDING SOFTWARE (FOR EDX-10A/B OPERATION)."

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Kyowa Electronic Instruments Co., Ltd. assumes no liability for any damage resulting from the use of the control command.

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NOTATIONS USED IN THE INSTRUCTION MANUAL

This Instruction Manual is written based on the assumption that customers fully understand basic knowledge of softwares including PCs and programming languages.
For details of programming, refer to commercially available textbooks, etc.

QUOTATIONS

- Related and reference items are enclosed with bracket quotation marks “ “.In addition, header No. and header character string may be adopted. (“EDX-10B COMPACT RECORDING SYSTEM (FOR HARDWARE),” “6 CONTROL COMMANDS” etc.)

- Personal Computer is denoted as the PC.
- EDX-10A/B is denoted as the EDX.
- Measuring units may be described with Model names.

Strain measuring unit:	EDX-11A
Voltage measuring unit:	EDX-12A
Thermocouple measuring unit:	EDX-13A
Low power strain measuring unit:	EDX-14A
Low power strain / voltage measuring unit::	EDX-15A

- Measuring units may be simply denoted as the "Unit."
- Input CH of the unit may be denoted as the "CH."
- CH numbers of the unit is denoted as the "CH1, CH2, , CH16."
- Low pass filter may be simply denoted as the "LPF."
- Unless otherwise specified, prefix that is expressing the size is described as follows.
"K" (Kilo) = 1024 and "M" (Mega) = 1048576.
(1K byte = 1024 byte, 1M byte = 1048576 byte)

Precautions

Certain notations are used as necessary to attract your attention to information that requires special care when handling the EDX, and to information provided for reference purposes.

Examples of Notations

NOTE

Essential precautions required when handling the EDX-10A/B.

MEMO

Reference items required when handling the EDX-10A/B.

1 OUTLINE

This Instruction Manual is to define Communication Command through USB interface between the EDX and the PC. The EDX and the PC is connected via USB, thereby enabling the PC to control the EDX with the Communication Command. This Instruction Manual is written based on the assumption that customers fully understand basic knowledge of the USB. For details, refer to commercially available textbooks, etc. In addition, for how to connect the EDX and the PC and for details of units, see the “EDX-10A/B COMPACT RECORDING SYSTEM (FOR HARDWARE)” when required.

NOTE

The USB interface is applicable only on Windows OS.

When control command data (hereinafter referred to as the command packet) is sent to the EDX from the PC, the EDX executes the specified operation and processing and then, returns the response data (hereinafter referred to as the response packet) to the PC.

The PC communicates with the EDX through the specified device driver that controls the EDX. The PC sends the command packet to the EDX using data transfer function of the socket and receives the response packet from the EDX using data receiving function.

2 TYPES OF VARIABLES

This chapter is to define various types of variables used in command packet and response packet. Assignment of variables with more than 2 bytes is in little endian format.

MEMO

Notation “0x****” on and after then denotes a hexadecimal value.

Types of Variables	The Number of Bytes	Notation	Supplement
signed char	1	char	8-bit variable with sign
unsigned char	1	BYTE	8-bit variable without sign
signed short	2	short	16-bit variable with sign
unsigned short	2	WORD	16-bit variable without sign
signed long	4	long	32-bit variable with sign
unsigned long	4	DWORD	32-bit variable without sign
signed int64	8	INT64	64-bit variable with sign
unsigned int64	8	UINT64	64-bit variable without sign
Float	4	float	Single precision floating decimal point variable
Double	8	double	Double precision floating decimal point variable

3 COMMUNICATION VIA USB INTERFACE

When controlling the EDX through the USB interface, the application program makes a demand to the EDX for control command send/receive request through KYOWA's USB communication API library (EDX10.DLL) function dedicated for the EDX.

NOTE

- The USB interface is applicable only on Windows OS.
- When connecting the EDX to the PC with USB interface, installing a device driver may be required. At this time, install the device driver according to instructions in the "EDX-10A/B COMPACT RECORDING SYSTEM (FOR HARDWARE)"

3-1 ESSENTIAL FILES

The following files are essential for creating and executing an application program.

- | | |
|---------------|--|
| (1) EDX10.H | API defined file (Required when creating the program)
Should be included in the API using source file. |
| (2) EDX10.LIB | API import library (Required when creating the program)
Should be linked to the library when creating the program. |
| (3) EDX10.DLL | API library main body (Required when executing the program)
Should be copied to the same folder with the application program. |

3-2 API FUNCTION

3-2-1 List of API Functions

Function	Function Name
USB library start processing	EDX10_UsbOpen()
USB library end processing	EDX10_UsbClose()
Receive timeout	EDX10_UsbSetTimeOut()
Connection check	EDX10_UsbConnectCheck()
Send Command	EDX10_UsbSendCmd()
Response Command	EDX10_UsbReceiveCmd()
Target reset	EDX10_UsbTargetReset()

3-2-2 List of Return Value of API Functions

Return value of the API function is described in the following table.

Return value	Results
0	Normally ended
Numeric value more than 1	The number of received bytes (only EDX10_UsbReceiveCmd())
-2	Argument is faulty
-100	No device of the argument specified ID No. exists.
-101	Communication error or timeout error
-102	Internal DLL error

3-2-3 Details of API functions

(1) EDX10_UsbOpen

Function	Initialization process of USB library
Definition	int EDX10_UsbOpen(void)
Return value	See the list of return values.
Memo	Do not forget to execute initialization process when starting the application program. By activating this function, initialization process of the DLL and EDX contact monitoring process are executed inside the PC.

(2) EDX10_UsbClose

Function	End process of the USB library
Definition	int EDX10_UsbClose(void)
Return value	See the list of return values.
Memo	Do not forget to execute end process when ending the application program. By activating this function, DLL using resource is released.

(3) EDX10_UsbTimeOut

Function	Set receive timeout time
Definition	int EDX10_UsbTimeOut (WORD wTimeOut)
Argument	wTimeOut Timeout time (0 to 60[sec], Default: 15)
Return value	See the list of return values.

(4) EDX10_UsbConnectCheck

Function	Returns status of the connected EDX
Definition	int EDX10_UsbConnectCheck(WORD *pwConnect)
Argument	pwConnect Folder destination of the EDX connected status (when connected: 1, when not connected: 0)
Return value	See the list of return values.

(5) EDX10_UsbSendCmd

Function	Sends command packet
Definition	int EDX10_UsbSendCmd(int nIdNo, DWORD dwSendByte, void *pSendCmd)
Argument	nIdNo ID No. (be sure to set 0) dwSendByte Size of the sending command packet (byte). pSendCmd Folder for storing the sending command packet
Return value	See the list of return values.
Memo	To be error when the send destination EDX is not connected. Before using this command, check whether the send destination EDX is connected with the EDX10_UsbConnectCheck() function.

(6) EDX10_UsbReceiveCmd

Function	Receives command response packet
Definition	int EDX10_UsbReceiveCmd(int nIdNo, void *pReceiveCmd, DWORD dwReceiveSize)
Argument	nIdNo ID No. (be sure to set 0) pReceiveCmd Folder for storing the received command response packet. dwReceiveSize Size of the folder destination for storing the command response packet (byte).
Return value	See the list of return values.
Memo	To be error when the receive destination EDX is not connected. Before using this command, check whether the receive destination EDX is connected with the EDX10_UsbConnectCheck() function. Size of the folder destination for storing the command response packet varies with the command. Prepare a folder with a size that can sufficiently save the response data of the commands.

(7) EDX10_UsbTargetReset

Function	After disconnecting the USB wiring of the EDX, reconnect the USB.
Definition	int EDX10_UsbTargetReset (int nIdNo)
Argument	nIdNo ID No. (be sure to set 0)
Return value	See the list of return values.
Memo	To be error when the EDX is not connected. Before using this command, check whether the EDX is connected with the EDX10_UsbConnectCheck() function.

3-3 OUTLINE OF COMMUNICATION PROCEDURES

To send/receive the command and response packets, use API (Function) of the USB communication API library. For formats of the command and response packets, see “4 CONTROL COMMAND SEND/RECEIVE PROTOCOL.”

Outline of USB communication procedures is described in the following.

- (1) Call EDX10_UsbOpen() function and execute initialization process of the USB library.
- (2) Prepare a command packet.
- (3) Call EDX10_UsbConnect Check() function and check the connected status of the EDX.
- (4) Call EDX10_UsbSendCmd() and send the command packet to the EDX.
- (5) Call EDX10_UsbReceiveCmd() and receive the response packet from the EDX.
- (6) Repeat procedures from items (2) to (5) when necessary.
- (7) Call EDX10_UsbClose() function and execute end process of the USB library.

4 CONTROL COMMAND SEND/RECEIVE PROTOCOL

4-1 COMMAND PACKET (PC → EDX)

This section describes format used for sending command packet to the EDX from the PC.

The command packet is composed of fixed length header section, fixed length command identifier, and variable length parameter section. According to the respective control commands, after constructing an appropriate command packet, the command packet is sent to the EDX from the PC.

Header section (64 bytes fixed)	Command identifier (3 bytes fixed)	Parameter section (Variable length)
------------------------------------	---------------------------------------	--

Description of Items

●Header: Always add the following format header at the head of the control command.

No.	Item Name	Types of Variables	The Number of Bytes	Contents
1 (*1)	Model name	char	20	Fixed character string of the "EDX-10A" (" " is not included.)
2	The number of transferred bytes	DWORD	4	Command identifier + The number of parameter bytes
3 (*2)	Load mode (CH1)	BYTE	1	Specify the mode for loading the balance value, zero value, and sensitivity of the CH1, EDX-15A. 0: Load the balance value (strain), zero value (strain), and sensitivity (strain). 1: Load the balance value (voltage), zero value (voltage), and sensitivity (voltage).
	Load mode (CH2)	BYTE	1	Specify the mode for loading the balance value, zero value, and sensitivity of the CH2, EDX-15A. 0: Load the balance value (strain), zero value (strain), and sensitivity (strain). 1: Load the balance value (voltage), zero value (voltage), and sensitivity (voltage).
	• • •	• • •	• • •	• • •
	Load mode (CH16)	BYTE	1	Specify the mode for loading the balance value, zero value, and sensitivity of the CH16, EDX-15A. 0: Load the balance value (strain), zero value (strain), and sensitivity (strain). 1: Load the balance value (voltage), zero value (voltage), and sensitivity (voltage).
4	Reserved	char	24	
Total			64	

(*1) When using the EDX-10B, make sure the fixed character string is "EDX-10A."

(*2) For loading the balance value, zero value, and sensitivity of the EDX-15A by using the MES command. When controlling units (excluding the EDX-15A), be sure to select "0" for all.

For details of the MES command, see "6-3-2 Set/Load Measuring Condition (MES)."

For details of the balance value, zero value, and sensitivity, see "9 CONVERTING A/D DATA INTO RANGE VALUE (HOW TO USE SENSITIVITY, ZERO VALUE, AND BALANCE VALUE)."

●Command identifier: Character string of ASCII code (3 uppercase characters)

●Parameter: When parameters are required for the command, additionally mention it just after the command.

NOTE

- When defining the structure variable, take care to the data packing.
- When constructing a header section, after initializing the entire bytes with "0x00," set the required items.

4-2 RESPONSE PACKET (EDX → PC)

After sending the command packet from the PC to the EDX, since the EDX returns the response packet to the PC, the PC must receive the response packet from the EDX. The response packet is composed of fixed length header and variable length response data sections. The size and format of the response data section depends on the command that is sent to the EDX from the PC just before.

Format of the response packet from the EDX to the PC is described in the following.

Header section (64 bytes fixed)	Response data section (Variable length)
---------------------------------	---

Description of Items

●Header: Always add the following format header at the head of the response packet.

No.	Item Name	Types of Variables	The number of Bytes	Contents
1 (*1)	Model name	char	20	Fixed character string of the “EDX-10A” (“ ” is not included.)
2	The number of response data bytes	DWORD	4	Size of response data section. ‘0’: Only header section with no response data section.
3	EDX status	DWORD	4	EDX status For details, see "4-3 EDX STATUS."
4	EDX error status	DWORD	4	EDX error generating status For details, see "4-4 EDX ERROR STATUS."
5	Sampling frequency	DWORD	4	1 to 20000 Hz (*1, 2, 5 system only)
6	Measuring CH bit	DWORD	4	Bit value (0: Not measure, 1: Measure) Examples are described in the following. The CH to be measured (Meas ON) is CH1 only: 0x00000001 The CH to be measured (Meas ON) are CH1 and CH2: 0x00000003
7	The number of measuring channels	WORD	2	1 to 16
8	Reserved	char	22	
Total			64	

(*1) When using the EDX-10B, the EDX-10A/B returns the fixed character string “EDX-10A.”

●Response data section

The response data section is variable length data and contents and data size vary with control commands. For details, see "6-3 DETAILS INFORMATION OF CONTROL COMMANDS."

MEMO

For the actual examples of the command packet and response packet, see “6-4 EXAMPLE OF DATA DUMP OF COMMUNICATION PACKET.”

NOTE

The size of the response packet is maximum 512 KB (524,288 bytes).
Prepare a folder with a size that can sufficiently save the response packet.

4-3 EDX STATUS

The EDX status is stored in the header section of response packet. The EDX status is in 32-bit numeric value and can be checked by this status. Although bits are independently set, they may be set together at the same time. Depending on the EDX status, there may be a limit when executing the command. See also "6-2 WHETHER CONTROL COMMAND IS ENABLED OR DISABLED."

Bit Value	Contents
0x00000001	Monitor data available
0x00000002	Monitoring data
0x00000004	(Reserved)
0x00000008	(Reserved)
0x00000010	(Reserved)
0x00000020	(Reserved)
0x00000040	(Reserved)
0x00000080	(Reserved)
0x00000100	(Reserved)
0x00000200	(Reserved)
0x00000400	(Reserved)
0x00000800	(Reserved)
0x00001000	(Reserved)
0x00002000	(Reserved)
0x00004000	(Reserved)
0x00008000	(Reserved)
0x00010000	Executing the command (executing balance/burnout checking)
0x00020000	(Reserved)
0x00040000	(Reserved)
0x00080000	(Reserved)
0x00100000	(Reserved)
0x00200000	(Reserved)
0x00400000	(Reserved)
0x00800000	(Reserved)
0x01000000	(Reserved)
0x02000000	(Reserved)
0x04000000	(Reserved)
0x08000000	A/D data becomes discontinuous.
0x10000000	(Reserved)
0x20000000	(Reserved)
0x40000000	(Reserved)
0x80000000	Error occurred status (1 = Error occurring, 0 = No error) (For details, see "4-3 EDX ERROR STATUS.")

MEMO

Monitoring and EDX status are described in the following.

Monitor data available: 0x00000001 is set.
Monitoring data: 0x00000003 is set.

- Monitor data available

To set:

- When no error occur in the measuring-condition-checking while setting measuring conditions at startup.
- When no error occur in the measuring-condition-checking while setting measuring conditions by using the MES command (0x01: Set).
- When the INI command is properly ended.

To clear:

- When connecting no units.
- When an error occurs.

- Monitoring data

To set:

- When the STA command is properly ended.

To clear:

- When the STP command is properly ended.
- When an error occurs.

- Executing the command

To set:

- When receiving the BAL/BOC command from the PC.

To clear:

- When the response data to be sent becomes available after executing the command.
- When an error occurs.

- A/D data becomes discontinuous.

To set:

- When the internal FIFO memory becomes full.

To clear:

- When the header section (EDX-10A/B status) is sent.
- When an error occurs.

- Error occurred status

To set:

- When an error occurs.

To clear:

- When re-connecting the USB and turning OFF and ON the power.
- When the power supply error is cleared.

For details, see "4-4 EDX ERROR STATUS."

4-4 EDX ERROR STATUS

The EDX status is described in 32-bit numeric values. When hardware related error occurred in the EDX, the following bit is set. Details of error contents can be checked with these error statuses.

When fatal error occurred, it can be cleared by restoring the EDX power. However, if error is not cleared or if the error still occurs, contact KYOWA or our representative for repair.

Bit Value	Contents
0x00000001	(Reserved)
0x00000002	(Reserved)
0x00000004	(Reserved)
0x00000008	(Reserved)
0x00000010	Hardware error
0x00000020	(Reserved)
0x00000040	(Reserved)
0x00000080	(Reserved)
0x00000100	EEPROM error of the unit 1 (fatal error)
0x00000200	EEPROM error of the unit 2 (fatal error)
0x00000400	EEPROM error of the unit 3 (fatal error)
0x00000800	EEPROM error of the unit 4 (fatal error)
0x00001000	Power supply error
0x00002000	USB current error (EDX-10B only)
0x00004000	(Reserved)
0x00008000	(Reserved)
0x00010000	(Reserved)
0x00020000	(Reserved)
0x00040000	(Reserved)
0x00080000	(Reserved)
0x00100000	(Reserved)
0x00200000	(Reserved)
0x00400000	(Reserved)
0x00800000	(Reserved)
0x01000000	(Reserved)
0x02000000	(Reserved)
0x04000000	(Reserved)
0x08000000	(Reserved)
0x10000000	(Reserved)
0x20000000	(Reserved)
0x40000000	(Reserved)
0x80000000	(Reserved)

- Hardware error

To set:

- When an error occurs while accessing the EEPROM of the EDX-10A/B.
- When an error occurs while setting the unit.

To clear:

- When re-connecting the USB and turning OFF and ON the power.

- EEPROM error of the unit 1 to 4

To set:

- When an error occurs while accessing the EEPROM of the unit.

To clear:

- When re-connecting the USB and turning OFF and ON the power.

- Power supply error (Conditions vary with the EDX-10A and EDX-10B)

For the EDX-10A

To set:

- When connecting multiple measuring units without connecting the optional AC adapter.
- When the AC adapter voltage becomes incorrect.
- When the number of units is changed after turning ON the EDX-10A/B.
- When turning ON the EDX-10A/B with 5 units or more.

To clear:

- When re-connecting the USB and turning OFF and ON the power. (*1)
- When the AC adapter voltage becomes correct.

For the EDX-10B

To set:

- When the EDX-10A/B is not able to use the USB bus power and is not connecting to the AC adapter. (*2)
- When the AC adapter voltage becomes incorrect.
- When the number of units is changed after turning ON the EDX-10A/B.
- When turning ON the EDX-10A/B with 5 units or more.

To clear:

- When re-connecting the USB and turning OFF and ON the power. (*1)
- When the AC adapter voltage becomes correct.

- USB current error

For the EDX-10A

- Not available.

For the EDX-10B

To set:

- When detecting the excess current on the USB.

To clear:

- When re-connecting the USB and turning OFF and ON the power.

(*1) When the power supply error appears due to the “When the number of units is changed after turning ON the EDX-10A/B” or “When turning ON the EDX-10A/B with 5 units or more”, turn OFF and ON power to clear the power supply status.

(*2) For details of the USB bus power and the number of units (max), see “10 THE NUMBER OF UNITS (MAX).”

5 ERROR CODE

Error code is indicated with 1 byte of the char type. If it is stated as 'Standard type' in response data of control commands, the response data is considered as the error code. In addition, if error occurred during control command process, this error code is returned without returning the response data stated in the control commands. The list of error codes is described in the following.

Error Code No.	Contents
0	Normally ended
-1	Unknown command • The EDX-10A/B returns the error code when receiving the not-specified commands.
-2	Parameter error The EDX-10A/B returns the error code when satisfying the following conditions. • When receiving the MES/SYS/BAL/BOC/URW/USB command, the parameter 1 is not "0x00" or "0x01." • When receiving the USB command (0x01: Set), the parameter 2 is not "0x01" or "0x02." • When receiving a not available command. • When receiving the STA command, the EDX-10A/B satisfies the either conditions. (1) Sampling frequency is 20k Hz and the number of measuring channels is 5 or more. (2) Sampling frequency is 10k Hz and the number of measuring channels is 9 or more.
-5	Power supply error • The EDX-10A/B returns the error code when the EDX-10A/B error status is 0x0001000 (Power supply error).
-6	USB current error (EDX-10B only) • The EDX-10A/B returns the error code when the EDX error status is 0x0002000 (USB current error). The EDX-10A/B returns "-5" (Power supply error) when the EDX-10A/B error status is 0x0001000 (Power supply error) and 0x0002000 (USB current error).
-7	USB setting error (EDX-10B only) • When receiving the USB command (0x01: Set), the USB port is specified. • When receiving the INI/MES/STA/STP/GMD/BAL/BOC command, the USB port is unspecified.

6 CONTROL COMMANDS

6-1 LIST OF CONTROL COMMANDS

EDX control available commands are listed in the following table.

Type	Contents	Command	Ref. Page
Measuring Conditions	Initialize measuring condition	INI	16
	Set/load measuring condition	MES	17
Execute	Start A/D conversion	STA	19
	Stop A/D conversion	STP	19
	Obtain A/D data	GMD	20
	Execute balance	BAL	21
	Execute burnout checking	BOC	23
	Load EDX status	-----	24
	Load system information	SYS	25
System Setting	Load/write the user data	URW	27
	Select USB port while controlling the EDX-10B (USB) (*1)	USB	28

(*1) The USB command supports the EDX-10B only.

When sending the USB command to the EDX-10A, the EDX-10A returns “-1” (unknown command).

6-2 WHETHER CONTROL COMMAND IS ENABLED OR DISABLED

Depending on the EDX status, there may be a limit when executing the command.

Whether executing control commands is enabled or disabled are listed in the following table

For the EDX status, see "4-3 EDX STATUS."

Command	Stopping Monitor data		Monitoring data	Executing the command
	Monitor data disable	Monitor data available		
INI	○	○	×	×
MES	○	○	Δ	×
STA	×	○	×	×
STP	×	×	○	×
GMD	×	×	○	×
SYS	○	○	○	×
BAL	×	○	×	×
BOC	×	○	×	×
-----	○	○	○	○
URW	○	○	×	×
USB	○	○	×	×

○: Enabled, × : Disable, Δ: Loading only

6-3 DETAILS INFORMATION OF CONTROL COMMANDS

This section describes detailed information for every control command.

When sending the control command from the PC to the EDX, construct a command packet with header (64-byte fixed length), command identifier (3-byte fixed length), and parameter (variable length). The number of transferred bytes in the header section includes the total number of bytes of the command identifier and parameter.

The PC receives the response data packet, with header section (64-byte fixed length) at the head, from the EDX. The size of response data, succeeding the header section, is written in the number of response data bytes in the header. The PC can receive the entire response data packet from the EDX.

For the command packet and response data packet, see "4 CONTROL COMMAND SEND/RECEIVE PROTOCOL."

NOTE

- Before controlling the EDX-10B, execute the USB command.
Or, the EDX-10B is not able to start measuring data.
For details, see "6-3-1.1 Select USB port while controlling the EDX-10B (USB)."

MEMO

- Although the number of response data bytes is originally 2 bytes or more, only 1 byte is returned in some cases. At this time, error occurred and the EDX is returning error codes different from the original response data. For error codes, see "5 ERROR CODE."
- Depending on the EDX status, some commands are unavailable. For details, see "6-2 WHETHER CONTROL COMMAND IS ENABLED OR DISABLED."

6-3-1 Initialize Measuring Condition (INI)

Initializes the measuring conditions in the EDX.

● Command: INI

● The number of transferred bytes: 3 bytes

● Parameter: None

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	INI	char	3
Total number of transferred bytes				3

● Response data: Standard type (1 byte)

● Remarks: After sending the INI command, the EDX is in the following status.

Measuring Conditions

Sampling frequency: 1k Hz

The number of channels to be recorded: All the recording available channels

Channel conditions: Default value of every unit (*1)

(*1) For details, see "8-2 SET VALUE OF UNITS."

6-3-2 Set/Load Measuring Condition (MES)

Sets and loads measuring conditions together at the same time.

- Command: MES

◆◆◆ When setting ◆◆◆

- The number of transferred bytes: 1604 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	MES	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Measuring conditions to be set in the EDX.	----	1600
Total number of transferred bytes				1604

- Response data

Result of measuring-condition-checking

The result of measuring-condition-checking is in 32-bit numeric value and is defined as follows.

When the result is not 0x00000000, you cannot start the A/D conversion.

Result (bit)	Contents
0x00000000	Passed, Monitoring can be started
0x00000001	Channel condition error
0x00000002	Undefined (system reserved)
0x00000004	Undefined (system reserved)
0x00000008	Undefined (system reserved)
0x00000010	Undefined (system reserved)
0x00000020	Undefined (system reserved)
0x00000040	Undefined (system reserved)
0x00000080	Undefined (system reserved)
0x00000100	Undefined (system reserved)
0x00000200	Sampling frequency error
0x00000400	Undefined (system reserved)
0x00000800	Undefined (system reserved)
0x00001000	Undefined (system reserved)
0x00002000	Undefined (system reserved)
0x00004000	Undefined (system reserved)
0x00008000	Undefined (system reserved)
0x00010000	Undefined (system reserved)
0x00020000	Undefined (system reserved)
0x00040000	Overall information error
0x00080000	Measuring condition error
0x10000000	Undefined (system reserved)
0x20000000	Undefined (system reserved)
0x40000000	Undefined (system reserved)
0x80000000	Undefined (system reserved)

* Note that the undefined (system reserved) result is 0.

◆◆◆ When loading ◆◆◆

- The number of transferred bytes: 4 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	MES	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

- Response data: 1600 bytes

No.	Name	Contents	Types of Variables	The number of Bytes
1	Response data 1	Measuring conditions pre-set in the EDX.	----	1600
Total number of response data bytes				1600

NOTE

Notes for controlling the EDX-15A

- Regardless of the settings before start-up, the EDX-15A mode is always “1: Voltage.”
To measure the strain, be sure to execute the MES command (0x01: Set) every time you startup the EDX-15A for selecting the “0: Strain.”
- Before sending the MES command (0x00: Load), select the “Load mode”, located on the header section of the command packet.
For details, see "4-1 COMMAND PACKET (PC → EDX)."

MEMO

For the parameter 2 for setting conditions and response data 1 for loading data, see "7 MEASURING CONDITION FORMAT."

6-3-3 Starting A/D Conversion (STA)

Starts A/D conversion.

● Command: STA

● The number of transferred bytes: 3 bytes

● Parameter: None

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	STA	char	3
Total number of transferred bytes				3

● Response data: Standard type (1 byte)

MEMO

To execute this command, Monitor data available status is required.

6-3-4 Stop A/D Conversion (STP)

Stops A/D conversion.

● Command: STP

● The number of transferred bytes: 3 bytes

● Parameter: None

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	STP	char	3
Total number of transferred bytes				3

● Response data: Standard type (1 byte)

6-3-5 Obtain A/D Data (GMD)

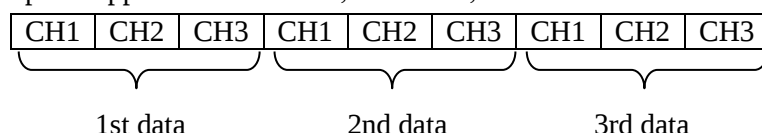
Obtains A/D data.

- Command: GMD
- The number of transferred bytes: 3 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	GMD	char	3
Total number of transferred bytes				3

- Response data: A/D data
(The number of bytes varies with the number of measuring channels and execution timing of commands.)
- A/D data assignment
The A/D data is 4 bytes per CH.
The A/D data of one sampling is assigned in due order from CH1, CH2, and CH3.

Example: Suppose the CH1-data, CH2-data, and CH3-data are measured for 3 times



- The EDX is in 'A/D data becomes discontinuous' status when receiving A/D data
If the GMD command is executed in the above status, only the header section (the number of response data bytes: 0) is returned.
After sending the 'A/D data becomes discontinuous' status to the PC, the EDX clears the status.
- A/D data
The A/D data, obtained by using the GMD command, is row data. With the EDX-10A, sensitivity, zero value, and balance value are not factored. Note that you will need to convert the A/D data into range value. (For details, see "9 CONVERTING A/D DATA INTO RANGE VALUE (HOW TO USE SENSITIVITY, ZERO VALUE, AND BALANCE VALUE.)")

MEMO

- A/D data of the EDX is sent to the PC through internal the FIFO memory.
To obtain the continuous data by the PC, continuously obtain the A/D data by using the GMD command before the internal FIFO memory becomes full. If the internal FIFO memory becomes full, the EDX status 'A/D data becomes discontinuous' is set to have the A/D data in discontinuous state.
- With the 'A/D data becomes discontinuous' state set in the EDX, no new A/D data is stored in the FIFO memory. If the 'A/D data becomes discontinuous' state is cleared, data in the FIFO memory is also cleared to newly store the A/D data.
- Maximum storage time of the FIFO memory can be roughly calculated by the following expression.

$$\text{FIFO storage available time [sec]} = \frac{131072}{(\text{The number of channels to be measured (Meas ON)} \times \text{Sampling frequency [Hz]})}$$

Example: Suppose the number of measuring channels is 16, sampling frequency is 5k Hz.

$$131072 / (16 \times 5000) = \text{Approx. } 1.64 \text{ [sec]}$$

6-3-6 Execute Balance/Load Balance Result (BAL)

Executes balance and obtains the results.

To execute the command, set the target channel in advance.

To set the target channels to be balanced, use the MES command.

With the EDX-13A, "-1 (NONE)" appears as the response data.

- Command: BAL

◆◆◆ When executing ◆◆◆

- The number of transferred bytes: 5 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	BAL	char	3
2	Parameter 1	Balance executing mode (0x00: Load balance result, 0x01: Execute) Set 0x01.	BYTE	1
3	Parameter 2	Balance executing mode 0: Executing balance	BYTE	1
Total number of transferred bytes				5

- Response data: Standard type (1 byte)

◆◆◆ When loading the results ◆◆◆

- The number of transferred bytes: 4 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	BAL	char	3
2	Parameter 1	Balance executing mode (0x00: Load balance result, 0x01: Execute) Set 0x00.	BYTE	1
Total number of transferred bytes				4

- Response data: 144 bytes

No.	Name	Contents	Types of Variables	The number of Bytes
1	Response data 1	Balance 1 byte × 16 channels = 16 bytes -1: No unit, no function, not selected (NONE) 0: Passed 1: Error, the balance value is not 0x7FFFFFFF. 2: OFF 3: Error (OVER), the balance value is 0x7FFFFFFF.	char	16
2	Response data 2	Balance A/D value 4 bytes (A/D value) × 2 (Low/High range) × 16 channels 4 byte × 16 channels = 128 bytes *When the result of the balance is not 0 (passed), the previous balance A/D value appears.	long	128
Total number of response data bytes				144

When loading the results of the balance while controlling the EDX-15A

The EDX-15A has balance value (strain) and balance value (voltage).

When the target channel mode is “0: Strain”, the EDX-10A/B returns the balance value (strain).

When the target channel mode is “1: Voltage”, the EDX-10A/B returns the balance value (voltage).

[Example] Load the results of the balance based on the following conditions.

Unit:	EDX-15A
The number of measuring channels:	4
Channel conditions and results of the balance:	See the following table.

Channel conditions and results of the balance

	CH1	CH2	CH3	CH4
Meas ON/OFF	ON (1)	ON (1)	ON (1)	ON (1)
Mode	Strain	Voltage	Strain	Voltage
BAL	ON (1)	ON (1)	ON (1)	OFF (0)
Results of the balance	Passed (0)	Passed (0)	NG (1)	OFF (2)

Numerals in parentheses () are pre-set values and response data.

Balance value of the CH1: When the target channel load mode is “0: Strain”, the EDX-10A/B returns the balance value (strain).

Balance value of the CH2: When the target channel load mode is “1: Voltage”, the EDX-10A/B returns the balance value (voltage).

Balance value of the CH3: When the results of the balance is “NG”, the EDX-10A/B returns the previous balance value.

Balance value of the CH4: When the BAL is “OFF”, the EDX-10A/B returns the previous balance value.

6-3-7 Execute Burnout Checking/Load Burnout Checking Result (BOC)

Executes burnout checking and obtains the results.

With the EDX-11A, EDX-12A, EDX-14A and EDX-15A, "-1 (not selected)" appears as the response data.

- Command: BOC

◆◆◆ When executing ◆◆◆

- The number of transferred bytes: 5 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	BOC	char	3
2	Parameter 1	Burnout checking executing mode (0x00: Load burnout checking mode, 0x01: Execute) Set 0x01.	BYTE	1
3	Parameter 2	Burnout checking executing mode 0: Execute burnout checking	BYTE	1
Total number of transferred bytes				5

- Response data: Standard type (1 byte)

◆◆◆ When loading the results ◆◆◆

- The number of transferred bytes: 4 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	BOC	char	3
2	Parameter 1	Burnout checking executing mode (0x00: Load burnout checking result, 0x01: Execute) Set 0x00.	BYTE	1
Total number of transferred bytes				4

- Response data: 16 byte

No.	Name	Contents	Types of Variables	The number of Bytes
1	Response data 1	Burnout checking 1 byte × 16 channels = 16 bytes -1: No unit, no function, not selected 0: Passed 1: Error	char	16
Total number of response data bytes				16

6-3-8 Load EDX Status

Generally, since the EDX status is stored in the header section of the response packet, the EDX status can be obtained by executing any command and by referring the header section of the response packet.

However, the EDX status may be required before issuing the command to the EDX or may be required when the next command cannot be issued unless after checking whether or not the processing, requiring a certain time in the EDX, is surely finished.

In the above cases, send only the header section of the command packet (addition data size: 0) to the EDX. The response packet, only storing the header section, is returned. After checking the status of the response packet header section, the EDX status can be obtained.

- Command: None
- The number of transferred bytes: 0 bytes
- Parameter: None
- Response data: 0 bytes

6-3-9 Load System Information (SYS)

Loads the system information of the EDX.

● Command: SYS

● The number of transferred bytes: 4 bytes

● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	SYS	char	3
2	Parameter 1	Load mode 0: Device configuration 1: Unit information + Hardware version	BYTE	1
Total number of transferred bytes				4

● Load mode = 0

● Response data: 48 bytes

No.	Name	Contents	Types of Variables	The number of Bytes
1	Response data 1	Model When using the EDX-10A, the EDX returns the fixed character string "EDX-10A." (" " is not included.) When using the EDX-10B, the EDX returns the fixed character string "EDX-10B." (" " is not included.)	char	20
2	Response data 2	Software version	char	20
3	Response data 3	Unit type	Unit 1 (CH1 to CH4)	BYTE
			Unit 2 (CH5 to CH8)	BYTE
			Unit 3 (CH9 to CH12)	BYTE
			Unit 4 (CH13 to CH16)	BYTE
4	Response data 4	Parameter format version	WORD	2
6	Response data 8	Reserved	char	2
Total number of response data bytes				48

● Load mode = 1

● Response data: 1360 bytes

No.	Name	Contents	Types of Variables	The number of Bytes
1	Response data 1	Unit 1 information	char	68
.	.	.	char	68
4	Response data 4	Unit 4 information	char	68
5	Response data 5	Reserved (68 bytes × 6 = 408 bytes)	char	408
6	Response data 6	Hardware information 1	char	68
.	.	.	.	.
15	Response data 15	Hardware information 10	char	68
Total number of response data bytes				1360

(*1) When using the EDX-10B, the return value of the unit type No. is "0x00" until setting the USB port.
To select the USB port, execute the USB command.
For details, see "6-3-11 Select USB port while controlling the EDX-10B (USB)."

NOTE

All the response data 1 to 15 in load mode = 1 is character string.
Note that display contents may be changed without prior notice.

6-3-10 Load/Write User Data (URW)

Loads and writes arbitrary user data.

- Command: URW

◆◆◆ When setting ◆◆◆

- The number of transferred bytes: 40 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	URW	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Writing No. (0 to 1)	BYTE	1
	Parameter 3	Reserved	char	3
10	Parameter 4	User data	BYTE	32
Total number of transferred bytes				40

- Response data: Standard type (1 byte)

◆◆◆ When loading ◆◆◆

- The number of transferred bytes: 5 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The number of Bytes
1	Command	URW	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
3	Parameter 2	Loading No. (0 to 1)	BYTE	1
Total number of transferred bytes				5

- Response data: 32 bytes

No.	Name	Contents	Types of Variables	The number of Bytes
1	Response data 1	User data	BYTE	32
Total number of response data bytes				32

NOTE

- The DCS-100A uses the user data (No. 0) as the device name.
As you change the user data (No. 0) by using the URW command, the device name on the DCS-100A changes.

6-3-11 Select USB port while controlling the EDX-10B (USB)

Selects USB 2.0 port or USB 3.0 port while controlling the EDX-10B.

The number of units and the EDX-10B threshold value, for detecting the excess current on the USB, vary with the USB port.

- Command: USB

◆◆◆When setting◆◆◆

- The number of transferred bytes: 5 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command	USB	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set)	BYTE	1
3	Parameter 2	USB 2.0 port: 0x01 USB 3.0 port: 0x02	BYTE	1
Total number of transferred bytes				5

- Response data: Standard type (1 byte)
For details, see “5 ERROR CODE.”

◆◆◆When loading◆◆◆

- The number of transferred bytes: 4 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command	USB	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set)	BYTE	1
Total number of transferred bytes				4

- Response data: 2 byte

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Unspecified: 0x00 USB 2.0 port: 0x01 USB 3.0 port: 0x02	BYTE	1
2	Response data 2	Reserved	char	1
Total number of response data bytes				2

NOTE

- Be sure to select the USB port correctly.
Or, it may cause deterioration or trouble.
When the USB port is unknown, select the “USB 2.0 port.”
- The USB command supports the EDX-10B only.
- Before controlling the EDX-10B, execute the USB command.
Or, the EDX-10B is not able to start measuring data.
- After selecting the USB port by using the USB command, you are not able to re-select the USB port by disconnecting and connecting the USB cable of the EDX-10B.
To check whether the USB port is set, check the response data 1 against the USB command (0x00: Load).

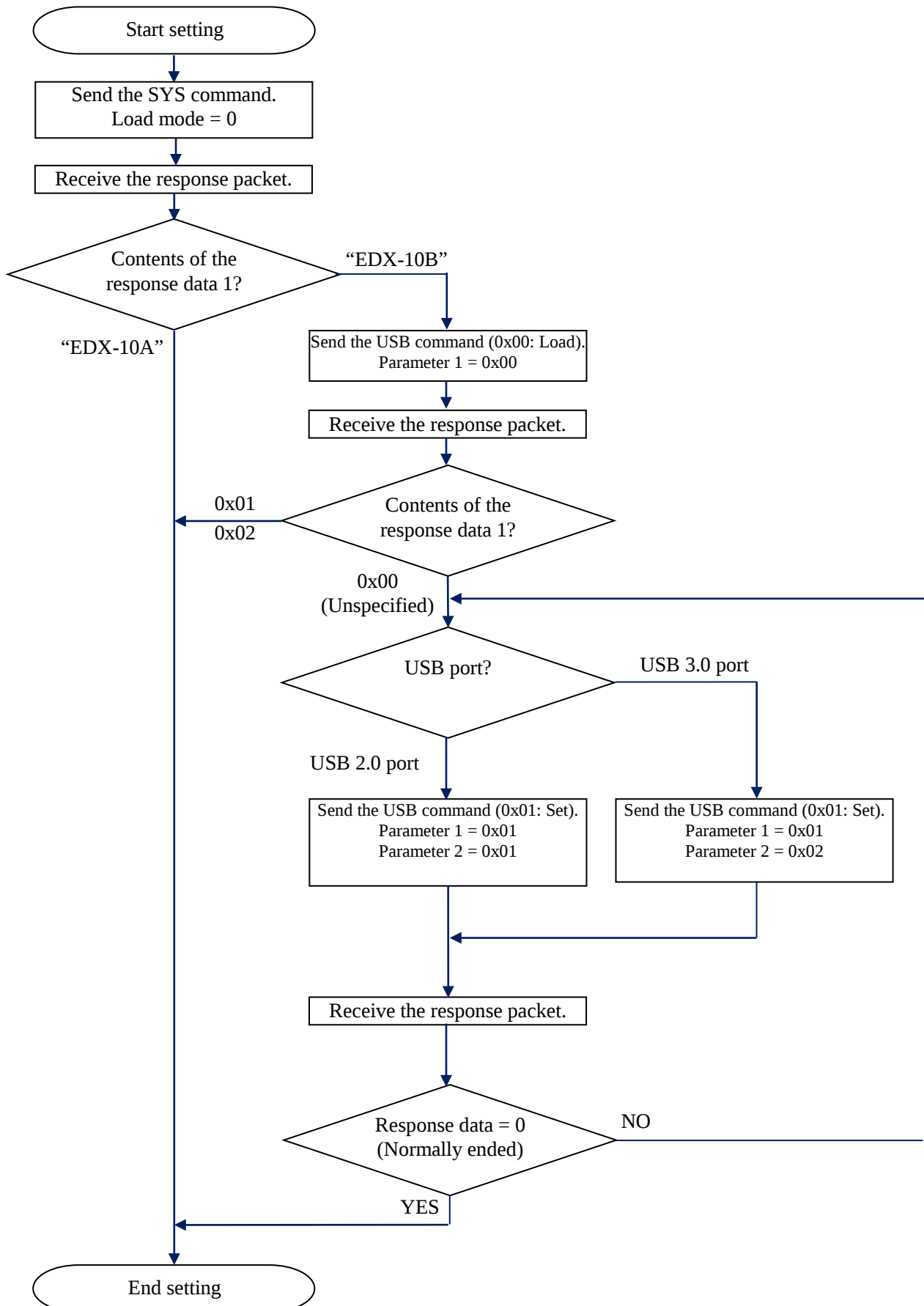
- [Example] USB port while controlling the EDX-10B

Select the USB port as follows.

① Load the model by using the SYS command.

② When the model is “EDX-10B”, select the USB port by using the USB command.

For details of the SYS command, see "6-3-9 Load System Information (SYS)."



6-4 EXAMPLE OF DATA DUMP OF COMMUNICATION PACKET

Example of data dump of command packet (PC → EDX) when executing SYS command (load mode = 0) is described in the following.

The first 64 bytes is a header section, the next 3 bytes, command identifier, and the remaining 1 byte, parameter.

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
000000	45	44	58	2D	31	30	41	00	00	00	00	00	00	00	00	00	EDX-10A.....
000010	00	00	00	00	04	00	00	00	00	00	00	00	00	00	00	00	.....
000020	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000030	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000040	53	59	53	00	00	00	00	00	00	00	00	00	00	00	00	00	SYS.....

The following is an example of data dump of response packet (EDX → PC) when executing the SYS command.

Te first 64 bytes is a header section and the following 48 bytes, response data to the SYS command. Details of the response data is described in the following.

Model (20 bytes):	EDX-10A
Software version (2 bytes):	01.00
Unit 1 type (1 byte):	02 (EDX-11A)
Unit 2 type (1 byte):	00 (no unit)
Unit 3 type (1 byte):	00 (no unit)
Unit 4 type (1 byte):	00 (no unit)
Parameter format version (2 bytes):	1

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
000000	45	44	58	2D	31	30	41	00	00	00	00	00	00	00	00	00	EDX-10A.....
000010	00	00	00	00	30	00	00	00	01	00	00	00	00	00	00	00	0.....
000020	20	4E	00	00	0F	00	00	00	04	00	00	00	00	00	00	00	N.....
000030	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000040	45	44	58	2D	31	30	41	00	00	00	00	00	00	00	00	00	EDX-10A.....
000050	00	00	00	00	30	31	2E	30	30	00	00	00	00	00	00	00	01.00.....
000060	00	00	00	00	00	00	00	00	02	00	00	00	01	00	00	00	.....

MEMO

- For SYS command, see "6-3-9 Load System Information (SYS)."
- For header section, see "4-1 COMMAND PACKET (PC → EDX)" and "4-2 RESPONSE PACKET (EDX → PC)."

7 MEASURING CONDITION FORMAT

Measuring condition format, between the PC and EDX, by executing the set/load measuring condition (MES) command.

Details of the measuring condition format are described in the following.

7-1 DETAILS OF MEASURING CONDITION FORMAT

The whole size: 1600 bytes

No.	Classification	Contents and Range	Types of Variables	The number of Bytes
1	Overall Information 80 bytes	Device ID ("EDX-10A" fixed, " " is not included.) (*1)	char	20
		Parameter format version (1 fixed)	WORD	2
		Reserved	char	2
		Unit 1 type No. (*2)	BYTE	1
		Unit 2 type No. (*2)	BYTE	1
		Unit 3 type No. (*2)	BYTE	1
		Unit 4 type No. (*2)	BYTE	1
		Reserved	char	52
2	Measuring Conditions 16 bytes	Sampling frequency: (1 to 20000, *1, 2, 5 system only)	DWORD	4
		The number of channels to be recorded (0 to 16) The number of channels to be measured (Meas ON)	WORD	2
		Reserved	BYTE	1
		Reference junction of the EDX-13A 0: Internal 1: External	BYTE	1
		Internal sampling frequency of the EDX-13A 0: 2Hz 2: 0.5Hz	BYTE	1
		Reserved	BYTE	7
3	Channel Conditions (conditions of the CH1) (*3) 80 bytes	Measurement ON/OFF -1: No unit or no target CH 0: Not measure 1: Measure	char	1
		Mode No. (0 to)	BYTE	1
		Range No. (0 to)	BYTE	1
		Low pass filter No. (0 to)	BYTE	1
		BAL ON/OFF/NONE (0: OFF, 1: ON, 2: NONE)	BYTE	1
		Reserved	char	3
		Balance value (Low) (*4) (*5)	long	4
		Balance value (High) (*4) (*5)	long	4
		Zero value (Low) (*4) (*5)	long	4
		Zero value (High) (*4) (*5)	long	4
		Sensitivity (Low) (*4) (*5)	long	4
		Sensitivity (High) (*4) (*5)	long	4
		Reserved	char	48
	Channel Conditions (conditions of the CH2)	Ditto	---	80
	Channel Conditions (conditions of the CH3)	Ditto	---	80
	• • •	Ditto	---	
	Channel Conditions (conditions of the CH16)	Ditto	---	80
4	System reserved	Set 0 to all system reserved fields.	---	224

(*1) When using the EDX-10B, make sure the fixed character string is “EDX-10A.”

(*2) For details, see "8 UNIT TYPE NO. AND SET VALUE OF UNITS."

To be error if it differs with the actual unit structure.

(*3) Setting available range of the channel condition varies with the installed unit.

For items other than Meas ON/OFF, if there is no setting item or if unknown or disable unit is used, set the CH condition to '0.'

(*4) The values, saved in the nonvolatile memory of every unit, have been factory configured. Loading only. No setting is allowed. Be sure to set 0.

MEMO

- Initialize the area indicated as 'Reserved' or unused area with '0.'
- For the set value of the units, see "8 UNIT TYPE NO. AND SET VALUE OF UNITS."

(*5) When using the EDX-15A, the values vary with the “Load mode”, located on the header section of the command packet.

When the target channel load mode is “0: Strain”, the EDX-10A/B loads the balance value (strain), zero value (strain), and sensitivity (strain).

When the target channel load mode is “1: Voltage”, the EDX-10A/B loads the balance value (voltage), zero value (voltage), and sensitivity (voltage).

7-2 GUIDE LINE FOR SETTING MEASURING CONDITIONS

When setting measuring conditions, since measuring conditions such as types of installed unit, measuring mode, CH condition to be measured, the number of measuring channels are combined to form various combinations, it is not available to categorically describe the setting contents.

Since the measuring condition may become error when it does not match with the EDX status, it is essential to match the measuring condition with the EDX status to be measured.

When creating a new measuring condition, it is recommended to read the current measuring condition of the EDX to the PC by the MES command, edit the required items, and create the new measuring condition. In this method, since the actual unit structure is properly reflected on the PC, the measuring condition can be created by editing various setting contents such as range, low pass filter, sampling frequency, etc.

For newly creating a measuring condition, see the following procedures.

- (1) Prepare a structure variable based on the measuring condition file format and 0 clear the entire structure variable.
- (2) Set the overall information based on units installed on the actual EDX.
- (3) Set the CH conditions for 32 channels.
 - Set the Meas ON/OFF item as described in the following.
 - Set a slot with installed unit to '0' (Not measure) or to '1' (Measure).
 - Set a slot with no unit to '-1' (no target CH) for 4 channels.
 - Set the unit No. of the installed unit for 8 channels.
- (4) Set the measuring conditions.
 - Set the total number of channels, that are set to 'Meas ON' in item (4), to the number of channels to be recorded.
 - Set the sampling frequency.
- (5) Send the created structure variable to the EDX with the MES command.

MEMO

- When creating measuring conditions, set all the unrelated items to '0.'
- When creating the original control software, the easiest way to understand the measuring condition file is to create a measuring condition file of the EDX with the DCS-100A and to dump the condition file.

7-3 EXAMPLE OF CREATING MEASURING CONDITIONS

Example of creating the actual measuring condition is described in binary dump format.

Assume that the EDX is in the following status.

- EDX-10A
 - Unit 1 (CH1 to CH4): EDX-11A
 - Unit 2 (CH5 to CH8): EDX-11A
 - Unit 3 (CH9 to CH12): Not installed
 - Unit 4 (CH13 to CH16): Not installed
- Sampling frequency: 100 Hz
- The number of measuring channels: 8
- Channel conditions: See the table below.

Channel Condition Setting Contents (Numeric values in parenthesis () are pre-set numbers)

	Unit 1 EDX-11A	Unit 2 EDX-11A	Unit 3 (Not installed)	Unit 4 (Not installed)
Meas ON/OFF	ON (1)	ON (1)	None (-1)	None (-1)
Range	10k $\mu\text{m/m}$ (0)	50k $\mu\text{m/m}$ (1)	--- (0)	--- (0)
Low pass filter	100 Hz (1)	100 Hz (1)	--- (0)	--- (0)
BAL ON/OFF/NONE	ON (1)	NONE (2)	--- (0)	--- (0)
Unit type No.	EDX-11A (2)	EDX-11A (2)	--- (0)	--- (0)

■ Condition Setting Dump Window (overall information)

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
000000	45	44	58	2D	31	30	41	00	00	00	00	00	00	00	00	00	EDX-10A.....
000010	00	00	00	00	00	00	00	00	02	02	00	00	00	00	00	00	.....
000020	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000030	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000040	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....

Address range	Size	Setting contents	Set value
0x0000 to 0x0013	20	Device ID	"EDX-10A"
0x0014 to 0x0015	2	Parameter format version	1
0x0016 to 0x0017	2	Reserved	0
0x0018 to 0x0018	1	Unit 1 type No.	2
0x0019 to 0x0019	1	Unit 2 type No.	2
0x001A to 0x001A	1	Unit 3 type No.	0
0x001B to 0x001B	1	Unit 4 type No.	0
0x001C to 0x004F	52	Reserved	0

■ Condition Setting Dump Window (measuring conditions)

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
000050	64	00	00	00	08	00	00	00	00	00	00	00	00	00	00	00	d.....

Address range	Size	Setting contents	Set value
0x0050 to 0x0053	4	Sampling Frequency	100 [Hz]
0x0054 to 0x0055	2	The number of channels to be measured	8
0x0056 to 0x005F	10	Reserved	0

■ Condition Setting Dump Window (channel conditions, CH1 to CH4)

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
000060	01	00	00	01	01	00	00	00-00	00	00	00	00	00	00	00	00	.....
000070	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000080	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000090	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0000A0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0000B0	01	00	00	01	01	00	00	00-00	00	00	00	00	00	00	00	00	.....
0000C0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0000D0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0000E0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0000F0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000100	01	00	00	01	01	00	00	00-00	00	00	00	00	00	00	00	00	.....
000110	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000120	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000130	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000140	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000150	01	00	00	01	01	00	00	00-00	00	00	00	00	00	00	00	00	.....
000160	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000170	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000180	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000190	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....

Setting contents of the CH1 (the same contents shall be applied for CH2 to CH4)

Address range	Size	Setting contents	Set value
0x0060 to 0x0060	1	Meas ON/OFF	1 (Measure)
0x0061 to 0x0061	1	Mode No.	0
0x0062 to 0x0062	1	Range No.	0 (10k $\mu\text{m}/\text{m}$)
0x0063 to 0x0063	1	Low pass filter No.	1 (100 Hz)
0x0064 to 0x0064	1	BAL ON/OFF/NONE	1 (ON)
0x0065 to 0x0067	3	Reserved	0
0x0068 to 0x006B	4	Reserved	0
0x006C to 0x006F	4	Reserved	0
0x0070 to 0x0073	4	Reserved	0
0x0074 to 0x0078	4	Reserved	0
0x0079 to 0x007B	4	Reserved	0
0x007C to 0x007F	4	Reserved	0
0x0080 to 0x00AF	48	Reserved	0

■ Condition Setting Dump Window (channel conditions, CH5 to CH8)

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
0001A0	01	00	01	01	02	00	00	00-00	00	00	00	00	00	00	00	00	.....
0001B0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0001C0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0001D0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0001E0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0001F0	01	00	01	01	02	00	00	00-00	00	00	00	00	00	00	00	00	.....
000200	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000210	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000220	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000230	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000240	01	00	01	01	02	00	00	00-00	00	00	00	00	00	00	00	00	.....
000250	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000260	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000270	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000280	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
000290	01	00	01	01	02	00	00	00-00	00	00	00	00	00	00	00	00	.....
0002A0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0002B0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0002C0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....
0002D0	00	00	00	00	00	00	00	00-00	00	00	00	00	00	00	00	00	.....

Setting contents of the CH5 (the same contents shall be applied for CH6 to CH8)

Address range	Size	Setting contents	Set value
0x01A0 to 0x01A0	1	Meas ON/OFF	1 (Measure)
0x01A1 to 0x01A1	1	Mode No.	0
0x01A2 to 0x01A2	1	Range No.	1 (50k $\mu\text{m}/\text{m}$)
0x01A3 to 0x01A3	1	Low pass filter No.	1 (100 Hz)
0x01A4 to 0x01A4	1	BAL ON/OFF/NONE	2 (NONE)
0x01A5 to 0x01A7	3	Reserved	0
0x01A8 to 0x01AB	4	Reserved	0
0x01AC to 0x01AF	4	Reserved	0
0x01B0 to 0x01B3	4	Reserved	0
0x01B4 to 0x01B8	4	Reserved	0
0x01B9 to 0x01BB	4	Reserved	0
0x01BC to 0x01BF	4	Reserved	0
0x01C0 to 0x01EF	48	Reserved	0

■ Condition Setting Dump Window (channel conditions, CH9 to CH16)

	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F	0123456789ABCDEF
0002E0	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0002F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000300	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000310	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000320	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000330	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000340	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000350	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000360	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000370	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000380	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000390	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0003A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0003B0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0003C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0003D0	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0003E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0003F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000400	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000410	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000420	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000430	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000440	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000450	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000460	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000470	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000480	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000490	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0004A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0004B0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0004C0	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0004D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0004E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0004F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000500	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000510	FF	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000520	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000530	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000540	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
000550	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....

Setting contents of the CH9 (the same contents shall be applied for CH10 to CH16)

Address range	Size	Setting contents	Set value
0x02E0 to 0x02E0	1	Meas ON/OFF	-1: No target CH
0x02E1 to 0x02E1	1	Mode No.	0
0x02E2 to 0x02E2	1	Range No.	0
0x02E3 to 0x02E3	1	Low pass filter No.	0
0x02E4 to 0x02E4	1	BAL ON/OFF/NONE	0
0x02E5 to 0x02E7	3	Reserved	0
0x02E8 to 0x02EB	4	Reserved	0
0x02EC to 0x02EF	4	Reserved	0
0x02F0 to 0x02F3	4	Reserved	0
0x02F4 to 0x02F8	4	Reserved	0
0x02F9 to 0x02FB	4	Reserved	0
0x02FC to 0x02FF	4	Reserved	0
0x0300 to 0x032F	48	Reserved	0

8 UNIT TYPE NO. AND SET VALUE OF UNITS

8-1 LIST OF UNIT TYPE No.

Unit Type No.	Unit name	Remarks
0	No unit	
1	Unknown unit	
2	EDX-11A	Strain measuring unit
3	EDX-12A	Voltage measuring unit
4	EDX-13A	Thermocouple measuring unit
5	EDX-14A	Low power strain measuring unit:
6	EDX-15A	Low power strain / voltage measuring unit:

8-2 SET VALUE OF UNITS

Set values of units are listed in the following table.
(Shaded portions are initial values set by INI command.)

Unit type No.	Unit type	2: EDX-11A	3: EDX-12A	4: EDX-13A	5:EDX-14A	6:EDX-15A
Mode		No mode (0 fixed)	No mode (0 fixed)	0: K 1: T 2: J 3: N	No mode (0 fixed)	0:Strain 1:Voltage
Range		0: 10k $\mu\text{m}/\text{m}$ (Low) 1: 50k $\mu\text{m}/\text{m}$ (High)	0: 10 V (Low) 1: 50 V (High)	0 (fixed) 1370°C (K) 400°C (T) 1200°C (J) 1300°C(N)	0: 10k $\mu\text{m}/\text{m}$ (Low) 1: 50k $\mu\text{m}/\text{m}$ (High)	<u>When Mode is Strain</u> 0: 10k $\mu\text{m}/\text{m}$ (Low) 1: 50k $\mu\text{m}/\text{m}$ (High) <u>When Mode is Voltage</u> 0: 10 V (Low) 1: 50 V (High)
Low pass filter		0: 2k Hz 1: 100 Hz	0: 2k Hz 1: 100 Hz	No low pass filter (0 fixed)	0: 2k Hz 1: 100 Hz	0: 2k Hz 1: 100 Hz
BAL		0: OFF 1: ON 2: NONE	0: OFF 1: ON 2: NONE	No BAL mode (2 fixed)	0: OFF 1: ON 2: NONE	0: OFF 1: ON 2: NONE

9 CONVERTING A/D DATA INTO RANGE VALUE (HOW TO USE SENSITIVITY, ZERO VALUE, AND BALANCE VALUE)

You can convert A/D data, obtained by using the GMD command, into range value by using the the following items. The balance value, obtained by executing balance or by executing BAL command, sensitivity, loaded by using the MES command, and zero value, loaded by using the MES command. The balance value, obtained by executing balance, can be loaded by using the MES command.

Every range has sensitivity, balance value, and zero value.
When converting A/D data, make sure every value matches the measuring range.

9-1 CONVERTING A/D VALUE WITH BAL NONE STATUS

With the BAL NONE status, cancel the zero output of the unit's amplifier circuit by using the zero value.

$$RANGE \quad VALUE = \frac{(AD - ZERO)}{GAIN} \times RANGE$$

AD: A/D data obtained by using the GMD command
ZERO: Zero value loaded by using the MES command
GAIN: Sensitivity loaded by using the MES command
RANGE: Full scale value of the measuring range

● Examples
(The followings are some examples.)

Measuring conditions

Unit: EDX-11A (strain measuring unit)
Range: 10k $\mu\text{m/m}$ (Low)

(1) Load the sensitivity (Low) and zero value (Low) by using the MES command.

Sensitivity (Low): 7042018
Zero value (Low): -404631

(2) Set conditions. Obtain the A/D data by using the GMD command.

A/D data: 2788796

(3) Convert the A/D data by using the above expression.

$$\frac{(2788796 - (-404631))}{7042018} \times 10000 = 4535 \quad [\mu\epsilon]$$

MEMO

Note that the EDX-13A is always BAL NONE status.
Convert the A/D data into the range value as described the above.

9-2 CONVERTING A/D VALUE WITH BAL ON/OFF STATUS

With the BAL ON status, cancel the output of the unit and zero output of the unit's amplifier circuit by using the balance value, obtained by executing balance or by executing BAL command.

With the BAL OFF status, cancel the output of the unit and zero output of the unit's amplifier circuit by using the balance value, obtained by executing balance or by executing BAL command in previous.

$$RANGE \quad VALUE = \frac{(AD - BAL)}{GAIN} \times RANGE$$

AD: A/D data obtained by using the GMD command

BAL: Balance value obtained by executing balance (or balance value loaded by executing the MES command)

GAIN: Sensitivity loaded by using the MES command

RANGE: Full scale value of the measuring range

● Examples

(The followings are some examples.)

Measuring conditions

Unit: EDX-11A (strain measuring unit)

Range: 50k $\mu\text{m/m}$ (High)

BAL: ON

- ① Load the sensitivity (High) by using the MES command.

Sensitivity (High): 7010560

- ② Set conditions.

Execute balance by using the BAL command.

Make sure the result of the balance is 0 (passed).

* When the result of the balance is 0 (passed), the current balance value can be loaded by using the MES command.

When the result of the balance is 1 (Error) or -1 (NONE), the previous passed balance A/D value appears.

Balance value (High): -60821

- ③ Obtain the A/D data by using the GMD command.

A/D data: 1117316

- ④ Convert the A/D value by using the above expression.

$$\frac{(1117316 - (-60821))}{7010560} \times 50000 = 8403 \quad [\mu\epsilon]$$

10 THE NUMBER OF UNITS (MAX)

This section describes the number of units (max) when operating the EDX-10B by using the USB bus power.

USB port	The number of units (EDX-11A)	The number of units (EDX-12A/13A/14A/15A)	The number of units (max)
3.0	0	Up to 4 units (any combination)	4 units
	1	Any 1 unit	2 units
	2	0	2 units
2.0	0	Up to 2 units (any combination)	2 units
	1	0	1 units

NOTE

- When operating the EDX-10A by using the USB bus power, regardless of the unit type, the number of units (max) is 1.
- When operating the EDX-10A/B by using the AC adapter, the number of units (max) is 4.
- Before using the EDX-10A, make sure the software version is 02.00 or higher.
When the software version is 01.06 or lower, the EDX-10A is not able to control the EDX-14A/15A.