IM-A–1299H March 2026

KYOWA

INSTRUCTION MANUAL

CTRS−100A

(FOR CONTROL COMMAND)

Thank you for purchasing this KYOWA's product.
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 instruction manual.

This Manual only describes Control Command of the CTRS-100A. For hardware, see the "IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware."

Windows are trademarks of Microsoft Corporation, U.S.A. and other countries.
Generally, company names and trade names described in this Instruction Manual are trademarks or registered trademarks of the companies.
This Instruction Manual may not be copied or reproduced, in whole or part, without consent of KYOWA.
Copyright © Kyowa Electronic Instruments Co., Ltd. All rights reserved.
The contents of the Instruction Manual are subjected to change without prior notice.
Kyowa Electronic Instruments Co., Ltd. assumes no liability for any damage resulting from the use of the control command.

KYOWA

— CONTENTS —

NOTATIONS USED IN THE INSTRUCTION MANUAL 1
1. OUTLINE 3
2. TYPES OF VARIABLES 4
3. COMMUNICATION VIA LAN INTERFACE 5
3-1 SETTING THE CTRS 5
3-2 SETTING THE PC 5
3-3 OUTLINE OF COMMUNICATION PROCEDURES 6
4. COMMUNICATION VIA USB INTERFACE 7
4-1 SETTING THE CTRS 7
4-2 ESSENTIAL FILES 7
4-3 API FUNCTION 7
4-3-1 List of API function 7
4-3-2 List of return value of API function 7
4-3-3 Details of API function 8
4-4 OUTLINE OF COMMUNICATION PROCEDURES 10
5. CONTROL COMMAND SEND/RECEIVE PROTOCOL 11
5-1 COMMAND PACKET (PC to CTRS) 11
5-2 RESPONSE PACKET (CTRS to PC) 12
5-3 CTRS STATUS 16
5-4 ERROR STATUS OF CTRS 23
5-5 INPUT OVER STATUS 28
5-6 RECORDED FILE NAME 29
5-6-1 File Number 29
5-6-2 Recording start time 30
5-7 RECORDING FOLDER NAME 32
6. ERROR CODE 33
7. CONTROL COMMAND 34
7-1 LIST OF CONTROL COMMANDS 34
7-2 ENABLE OR DISABLE CONTROL COMMANDS 36
7-3 DETAILED SPECIFICATIONS OF CONTROL COMMANDS 42
7-3-1 Set/load data file name (DFN) 43
7-3-2 Set/load the monitor data output condition (SMD) 45
7-3-3 Save/load the measuring condition file (MSD) 49
7-3-4 Set/load the measuring condition (MES) 51
7-3-5 Initialize the measuring condition (INI) 55
7-3-6 Start A/D conversion (STA) 57
7-3-7 Start recording (REC) 58
7-3-8 Stop the A/D conversion/recording (STP) 59
7-3-9 Pause the recording operation (PAU) 60
7-3-10 Over reset (ROS) 61
7-3-11 Execute a measurement channel check or load the results (CCH) 62
7-3-12 Obtain the monitor data (GMD) 66
7-3-13 Load Peak/Valley 400 data (GPV) 80
7-3-14 Execute manual CAN output (ECO) 82
7-3-15 Manual CAN output by any one condition (CMO) 83
7-3-16 Execute/load/stop the CAN output test (CSC) 84
7-3-17 Execute/load/stop CAN communication speed research automatically (ACT) 89
7-3-18 Insert/load marker (IMK) 92
7-3-19 Set/load the keylock status (LOC) 94

7-3-20 Set/load the time (TIM)..... 96
7-3-21 Load the system information (SYS) 98
7-3-22 Load the unit information (RUI) 100
7-3-23 Check the device/unit (LED)..... 110
7-3-24 Obtain SD card remaining capacity (FFR) 111
7-3-25 Open file (FOF) 112
7-3-26 Load file data (FRF) 113
7-3-27 Seek file (FSF) 114
7-3-28 Close file (FCF)..... 115
7-3-29 Delete file (FDF)..... 116
7-3-30 Execute quick format (FMT)..... 117
7-3-31 Start finding file (FFF)..... 118
7-3-32 Continue finding file (FFN)..... 120
7-3-33 End finding file (FFC) 125
7-3-34 Delete last recorded data files (FDK) 126
7-3-35 Set/load wireless LAN setting (WLS)..... 127
7-3-36 Set/load the TCP/IP information (LAN)..... 130
7-3-37 Load/write the TEDS information (TED) 133
7-3-38 Load/write the user data (URW) 142
7-3-39 Measuring/Obtaining Average Value (AVG)..... 144
7-3-40 Execute auto range(ATR)..... 146
7-3-41 Load the CTRS status 149
8. MEASURING CONDITION FORMAT 150
8-1 MEASURING CONDITION FORMAT.....150
8-2 CAN MEASUREMENT BY CAN UNIT 163
8-2-1 Outline..... 163
8-2-2 Details of parameters 163
8-3 MEASUREMENT BY GPS UNIT 164
8-3-1 Point zero measurement..... 164
8-3-2 Recording GPS data 165
8-3-3 CTRS time adjustment 165
8-4 UNIT TYPE NO. 166
8-5 VALUES OF MEASURING UNITS 167
9. CAN CONDITION FORMAT.....169
9-1 CAN CONDITION FORMAT 169
9-2 SUPPLEMENT OF SETTING CAN CONDITIONS 182
9-2-1 General information..... 182
9-2-2 Analog trigger conditions..... 183
9-2-3 Digital trigger conditions 183
9-2-4 Start/Stop complex trigger general conditions..... 183
9-2-5 Start/Stop complex trigger conditions 1 to 8..... 183
9-2-6 Communication conditions 1 to 2..... 185
9-2-7 Node information (No.0 to No.1023) 186
9-2-8 Message conditions (No.0 to No.1023) 186
9-2-9 Signal consitions (CH1 to CH1024) 188
9-2-10 CAN output conditions (General conditions) 190
9-2-11 CAN output conditions (Output at start conditions) (No.1 to No.32)..... 191
9-2-12 CAN output conditions (Output at stop conditions) (No.1 to No.32) 192
9-2-13 CAN output conditions (Interval output conditions) (No.1 to No.32)..... 192
9-2-14 CAN output conditions (Manual output conditions) (No.1 to No.32) 192

NOTATIONS USED IN THE INSTRUCTION MANUAL

This Instruction Manual is written based on the assumption that customers fully understand basic knowledge and terms related to method for creating software including the PC, TCP/IP communication, program language, etc.

Informational Notes

- Related and reference items are enclosed with bracket quotation marks " ". In addition, header No. and header character string may be adopted. (“IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware,” “7 CONTROL COMMAND” etc.)
- Personal Computer is described as the PC and CTRS-100A, as the CTRS.
- The types of units that can be connected to the CTRS are divided into measuring, expansion, and remote control units.
- Input CH of the measuring units may be described as "Analog CH."
- CH Nos. of the measuring units is described as "CH1, CH2, to CH32."
- The CTRS control unit is sometimes called the "main unit", while the CTRS measuring unit is sometimes called "measuring unit 1".
- Low pass filter may be simply described as "LPF," and High pass filter, as "HPF."
- There are four types of master/slave settings that can be specified using the synchronous unit DIP switch: M, S1, S2, and S3. However, to control the CTRS, numbers are assigned as follows:
  M = 0, S1 = 1, S2 = 2, S3 = 3
  In this instruction manual, these numbers are called "ID numbers. For details on how to set DIP switches, refer to the "IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware".
- When the CTRS is solely used (with ID No. set to 0), it is described as "Stand-alone."
- Connecting a PC to the CTRS via USB/LAN, etc. to make measurements is called "online measurement", while making measurements with the CTRS alone without such a connection is called "offline measurement".
- The CTRS with the ID No. set to ‘0’ in synchronous operation is described as "Master."
- The CTRS with the ID No. set to ‘1 to 3’ in synchronous operation is described as "Slave."
- Unless otherwise specified, prefix that is expressing the size is described as follows.
  "K" (Kilo) = 1024, "M" (Mega) = 1024^2, and "G" (Giga) = 1024^3
  (1K byte = 1,024 bytes, 1M byte = 1,048,576 bytes, 1G bytes = 1,073,741,824 bytes)

Precautions

The following messages are provided for reference purpose as necessary to attract your attention to information that requires special care when handling the CTRS.

Examples of Notations

NOTE

Essential precautions required when handling the CTRS.

MEMO

Reference items required when handling the CTRS.

1. OUTLINE

This Instruction Manual is to define Communication Command through LAN interface or USB interface between the CTRS-100A (hereinafter referred to as the CTRS) and the Personal Computer (hereinafter referred to as the PC). The CTRS and the PC is connected via LAN or USB, thereby enabling the PC to control the CTRS with the Communication Command. This Instruction Manual is written based on the assumption that customers fully understand basic knowledge of the LAN and USB including programming using the TCP/IP or socket. For details, refer to commercially available textbooks, etc.
In addition, for how to connect the CTRS and the PC, how to prepare the CTRS for every communication interface, and for details of units, see the "IM-A-1283 CTRS-100A Compact Recorder Instruction Manual 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 CTRS from the PC, the CTRS executes the specified operation and processing and then, returns the response data (hereinafter referred to as the Response packet) to the PC. The LAN interface and USB interface have common command-packet format and common response-packet format.

When using the LAN interface, the PC communicates with the CTRS by using API (Application Program Interface) called socket. The socket is a communication API using the TCP/IP protocol and normally it is provided as OS or middleware package. The PC sends the Command packet to the CTRS using data transfer function of the socket and receives the Response packet from the CTRS using data receiving function.

When using the USB interface, the PC communicates with the CTRS by using the dedicated USB device driver, which controls the CTRS. The PC sends the Command packet to the CTRS using data transfer function of the USB device driver and receives the Response packet from the CTRS 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 describes 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 LAN INTERFACE

Using a synchronous unit or wireless LAN unit enables the control of the CTRS by using a LAN (TCP/IP). In this case, the PC is the TCP client, and the CTRS is the TCP server. The PC sends line connection, line disconnection, data transmission, and data reception requests to the CTRS, and the CTRS sends request responses to the PC.

When a line connection is successfully established via a LAN, the synchronous unit's "REMOTE" LED lights up in blue.

3-1 SETTING THE CTRS

Since the TCP/IP is used, it is required to set enabled IP address, subnet mask, gateway address, etc. on the CTRS side. When using a network that is closed only between the PC and CTRS, users can freely set each of the addresses. However, when using the CTRS by connection to the existing network, consult the Network Administrator in advance. It is necessary to set the communication interface of CTRS to "LAN". For details, see
"IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware."

3-2 SETTING THE PC

Create a control program using socket API on user's side.
When you control CTRS using control commands, please use the port number: **34440** of TCP/IP.

NOTE

- CTRS is using the communication port of 34381, 34383, 34385, 34440, 34441, and 34442.The communication port of 34440 is an object for control commands. For other communication ports 34381, 34383, 34385, 34441, 34442 are reserved, please do not use.
- When setting firewall, etc. on the PC side, the LAN communication may be suspended. Set an appropriate setting that enables communication with the CTRS.

3-3 OUTLINE OF COMMUNICATION PROCEDURES

Socket API (function) provided on the PC side is used for sending and receiving Command and Response packets.
For details, refer to the relevant API materials, etc. In addition, for format of the Command or Response packets, see "5 CONTROL COMMAND SEND/RECEIVE PROTOCOL"

Outline of LAN communication procedures is described in the following.

(1) Prepare a socket corresponding to port No. and set necessary optional, etc.
(2) Send connection request to the CTRS ("connect").
(3) Send Command packet to the CTRS through the socket ("send").
(4) Receive Response packet to the CTRS through the socket ("recv").
(5) Repeat procedures in items (3) and (4) when necessary.
(6) Send shutdown request to the CTRS ("shutdown").
(7) Release the socket.

4. COMMUNICATION VIA USB INTERFACE

When controlling the CTRS through the USB interface, the application program makes a demand to the CTRS for control command send/receive request through KYOWA's USB communication API library (Ctrs100Usb.dll) function dedicated for the CTRS.

NOTE

- The USB interface is applicable only on Windows OS.
- To connect the CTRS to a PC via USB, a USB driver must be installed if necessary. In this case, please download the Kyowa USB driver from the KYOWA website and then set it up.

4-1 SETTING THE CTRS

It is necessary to set the communication interface of CTRS to "USB".
For details, see "IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware."

4-2 ESSENTIAL FILES

When the special CTRS USB communication API library is downloaded from the KYOWA website and extracted, two folders are created: "DLL" and "DLL64". The 32-bit version of the files below is stored in the "DLL" folder, while the 64-bit version is stored in the "DLL64" folder, and these are necessary when creating or executing an application program. Please use the right files for the number of bits of application programs you plan to create.

(1) Ctrs100Usb.h・・・ API defined file (required when creating the program)
Should be included in the API using source file.
(2) Ctrs100Usb.lib・・・ API import library (required when creating the program)
Should be linked to the library when creating the program.
(3) Ctrs100Usb.dll・・・ API library main body (required when executing the program)
Should be copied to the same folder with the application program.

4-3 API FUNCTION

4-3-1 List of API function

Function	Command Name
USB library start processing	Ctrs100Usb_Open()
USB library end processing	Ctrs100Usb_Close()
Receive time-out time	Ctrs100Usb_SetTimeOut()
Connection check	Ctrs100Usb_CheckConnect()
Send command	Ctrs100Usb_SendCmd()
Receive command	Ctrs100Usb_ReceiveCmd()
Reconnect CTRS	Ctrs100Usb_Reconnect()

4-3-2 List of return value of API function

Return values of the API function are as follows.

Return value	Results
0	Normally ended
-1	The argument is faulty.
-2	The ID No. device, specified by the argument, does not exist.
-3	Communication error or time-out error
-4	Internal DLL error
-5	Another process is using the DLL
-6	DLL not open

4-3-3 Details of API function

(1) Ctrs100Usb_Open

Function	Initialization of USB library
Definition	long Ctrs100Usb_Open (void)
Return value	See the list of return values.
Memo	Do not forget to execute the function when starting the application program. By activating this function, initialization of the DLL and CTRS's contact-monitoring-process are executed inside the PC. * After this function is executed, when the CTRS is connected to the PC, the synchronous unit's "REMOTE" LED lights up in blue.

(2) Ctrs100Usb_Close

Function	USB library end processing
Definition	long Ctrs100Usb_Close (void)
Return value	See the list of return values.
Memo	Do not forget to execute the function when ending the application program. By activating this function, the DLL-using resource is released. * After this function is executed, the "REMOTE" LED of the synchronous unit for the connected CTRS is turned off to indicate that the remote status has ended.

(3) Ctrs100Usb_SetTimeOut

Function	Setting the receive time-out time
Definition	long Ctrs100Usb_SetTimeOut (WORD wTimeOut)
Argument	wTimeOut time-out time(0 to 300[sec])
Return value	See the list of return values.
Memo	If this API is not used, the time-out time is 5 (sec.).

(4) Ctrs100Usb_CheckConnect

Function	Returns the status of the connected CTRS.
Definition	long Ctrs100Usb_CheckConnect (WORD *pwConnect)
Argument	pwConnect Storage destination of the CTRS status
Return value	See the list of return values.
Memo	The ID No. of the connected CTRS is returned to the argument pwConnect in binary digit. If the CTRS is being connected, the relevant bit is '1'. The CTRS with the ID No. '0' is relevant to bit '0' and the CTRS with the ID No. '1', to bit '1.' [Example] When one CTRS with the ID No. '0' is connected, 0x0001 is returned. [Example] When two CTRS units with the ID No. '0' and with the ID No. '1' are connected, 0x0003 is returned.

(5) Ctrs100Usb_SendCmd

Function	Sending command packet
Definition	long Ctrs100Usb_SendCmd (WORD wIdNo, void *pBuff, DWORD dwSendSize)
Argument	wIdNo ID No. (0 to 3) of the send-destination CTRS pBuff Storage destination for the command packet to be sent dwSendSize Size of the command packet to be sent (byte)
Return value	See the list of return values.
Memo	The maximum command packet size is 2M bytes. To be error when the send-destination CTRS is not connected. Before executing this function, check whether the send-destination CTRS is connected by using the Ctrs100Usb_CheckConnect() function.

(6) Ctrs100Usb_ReceiveCmd

Function	Receiving response packet
Definition	long Ctrs100Usb_ReceiveCmd (WORD wIdNo, void *pBuff, DWORD dwBuffSize, DWORD *pdwRecvSize)
Argument	wIdNo ID No. (0 to 3) of the receive-destination CTRS pBuff Storage destination for the response packet to be received dwBuffSize Size of the storage destination for the response packet to be received(byte) pdwRecvSize Storage destination of received response packet size (bytes)
Return value	See the list of return values.
Memo	The maximum response packet size is 2M bytes. To be error when the receive-destination CTRS is not connected. Before executing this function, check whether the receive-destination CTRS is connected by using the Ctrs100Usb_CheckConnect() function. Size of the storage destination for storing the response packet varies with the command. Make sure the storage has enough free space to save the response packets.

(7) Ctrs100Usb_Reconnect

Function	After disconnecting the USB connection of the CTRS with the specified ID No., reconnect the USB connection.
Definition	long Ctrs100Usb_Reconnect (WORD wIdNo)
Argument	wIdNo ID No. (0 to 3) of the CTRS
Return value	See the list of return values.
Memo	To be error when the CTRS with the specified ID No. is not connected. Before executing this function, check whether the CTRS with the specified ID No. is connected by using the Ctrs100Usb_CheckConnect() function.

4-4 OUTLINE OF COMMUNICATION PROCEDURES

The API (function) of the USB communication API library is used for sending and receiving command packets and response packets. For formats of the Command or Response packets, see "5 CONTROL COMMAND SEND/RECEIVE PROTOCOL" and after.

Outline of USB communication procedures is described in the following.

(1) Ctrs100Usb_Open() function and initialize the USB library.
(2) Prepare command packets.
(3) Call Ctrs100Usb_CheckConnect() function and check the connected status of the CTRS.
(4) Call Ctrs100Usb_SendCmd() and send the Command packet to the CTRS.
(5) Call Ctrs100Usb_CheckConnect() function and check the connected status of the CTRS.
(6) Call Ctrs100Usb_ReceiveCmd() and receive the Response packet from the CTRS.
(7) Repeat procedures in items (2) to (6) when necessary.
(8) Call Ctrs100Usb_Close() function and end the USB library.

NOTE

After calling the Ctrs100Usb_Open(), be sure to call the Ctrs100Usb_Close() before unloading the API library (Ctrs100Usb.dll) or before exiting the control program. Or, the control program will remain in memory in an abnormal state. Note that you will not start the control program since then.

5. CONTROL COMMAND SEND/RECEIVE PROTOCOL

5-1 COMMAND PACKET (PC to CTRS)

This section describes format used for sending Command packet to the CTRS 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 CTRS from the PC.

Header section (512 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	Model name	char	32	Fixed character string of the "CTRS-100A" (" " is not included.)
2	The number of transferred bytes	DWORD	4	Command identifier + The number of parameter bytes
3	Reserved	char	476	
Total			512	

● Command identifier: Character string of ASCII code (3 alphabets, 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 on the PC, after initializing the entire header section with "0x00."

5-2 RESPONSE PACKET (CTRS to PC)

After sending the Command packet from the PC to the CTRS, since the CTRS returns the Response packet to the PC, the PC must receive the Response packet from the CTRS.
Each response packet consists of a fixed-length header section (common information of devices engaged in synchronous operation as well as individual information) and a variable-length response data section.
The size and format of the response data section depends on the command that is sent to the CTRS from the PC just before. Format of the Response packet is as follows.

Header Common information (256 bytes fixed)	Header Individual information * (64 bytes×4=256 bytes fixed)	Response data section (Variable length)

* The header-section individual information is stored in the following order: master, slave 1, slave 2, and then slave 3.

Description of Items

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

・Common information

No.	Item Name	Types of Variables	The Number of Bytes	Contents
1	Model name	char	32	Fixed character string of the "CTRS-100A" (" " 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	External clock input frequency	DWORD	4	External clock frequency input to the CTRS. However, this is zero if an internal clock is selected.
4	Reserved	char	24	
5	File name	char	128	File name (maximum 120 characters) **(*1)**
6	Connected status of the slave CTRS	BYTE	1	Bit notation that includes slaves in the case of a master Bit notation of slave information only in the case of a slave (same as Ctrs100Usb_CheckConnect) Master: 0x01 1st slave: 0x02 2nd slave: 0x04 3rd slave: 0x08
7	Reserved	char	3	
8	Current file number	DWORD	4	Number after the file name (0 to 99,999)
9	Current number of recording repetitions	DWORD	4	Repetition number for repeated recording (0 to 99,999)
10	Set number of recording repetitions	DWORD	4	Set number of recording repetitions

[From the previous page]

No.	Item Name	Types of Variables	The Number of Bytes	Contents
11	Recording start time	WORD	2	Year (2019 to 2099) **(*2)**
12		BYTE	1	Month (1 to 12) **(*2)**
13		BYTE	1	Day (1 to 31) **(*2)**
14		BYTE	1	Hour (0 to 23) **(*2)**
15		BYTE	1	Minute (0 to 59) **(*2)**
16		BYTE	1	Second (0 to 59) **(*2)**
17		char	3	Reserved
18	Reserved	char	6	
19	Number of markers	BYTE	10	Marker 1 to 10
20	Reserved	char	22	
Total of Common information			256	

・Individual information

No.	Item Name	Types of Variables	The Number of Bytes	Contents
1	CTRS status	DWORD	4	CTRS status
2	CTRS error status	DWORD	4	CTRS error status
3	Input over status	DWORD	4	Indicates whether the input has gone over for each channel.
4	Number of analog data recording bytes	DWORD	4	Indicates the number of recorded analog data bytes for the current recording operation. Cleared to 0 when AD is stopped.
5	Number of CAN data recording bytes	DWORD	4	Indicates the number of recorded CAN data bytes for the current recording operation. Cleared to 0 when AD is stopped.
6	Number of GPS data recording bytes	char	4	Indicates the number of recorded GPS data bytes for the current recording operation. Cleared to 0 when AD is stopped.
7	Number of recordable analog bytes	INT64	8	Indicates the number of recordable analog bytes at the current recording operation.
8	Remaining battery power	BYTE	1	0 to 100% Remaining battery error: 5% or less
9	Battery integrity	BYTE	1	0 to 100% Good: 100~85%, Caution: 84~70%, Replace: 69~51%, Battery deteriorated error: 50% or less
10	Reserved	char	4	
11	SD remaining amount	BYTE	1	0 to 100% Indicates the remaining usable SD card capacity as a percentage of the total capacity.
12	Result of channel check	BYTE	1	Indicates the result of the channel check.(in binary digit) (0: OK, 1: There is a CH of NG) 0x01: Balance, 0x02: Input resistance check, 0x04: Burnout check
13	CAN overflow count	WORD	2	Indicates the CAN overflow count.
14	Reserved	char	22	
Total of individual information for one unit			64	
Total of all individual information			256	
Total of header			512	

(*1) For the data file name, see "5-6 RECORDED FILE NAME."

(*2) The next recording start time in the case of interval measurement.

● Response data section

The response data section is variable length data. The contents and data size vary with the control commands.

For details, see "7-3 DETAILED SPECIFICATIONS OF CONTROL COMMANDS."

NOTE

The size of the Response packet is maximum 2 MB (2,097,152 bytes).
Make sure the memory has enough free space to save the response packets.

5-3 CTRS STATUS

The CTRS status is stored in the header section of Response packet. The CTRS status is 32-bit numeric value. The status of the CTRS can be checked by using the 32-bit numeric value. Every bit is independent. Some bits may be set together at the same time. Depending on the status of the CTRS, there may be a limit when executing the command.
See also "7-2 ENABLE OR DISABLE CONTROL COMMANDS."

Bit Value	Contents
0x00000001	A/D conversion available status
0x00000002	During the A/D conversion (measurements)
0x00000004	Recording the manual-measurement data
0x00000008	Pausing the manual-measurement-data recording
0x00000010	Waiting for trigger measurements
0x00000020	Recording the trigger-measurement data
0x00000040	Waiting for interval measurements
0x00000080	Recording the interval-measurement data
0x00000100	Waiting to start recording at a certain time
0x00000200	System running (Busy)
0x00000400	Opening the file or finding the file by using the control command
0x00000800	Updating
0x00001000	Recording data file exists
0x00002000	Measurement channel check result exists
0x00004000	Inserting the SD card
0x00008000	Accessing to the SD card
0x00010000	Outputting the CAN
0x00020000	(Reserved)
0x00040000	On-line controlling
0x00080000	Time adjustment status by GPS (0: Unexecuted, 1: Executed)
0x00100000	Operating on battery power
0x00200000	Charging battery
0x00400000	Control interface (0: USB, 1: LAN)
0x00800000	Using wireless LAN
0x01000000	(Reserved)
0x02000000	(Reserved)
0x04000000	Discontinuous analog monitor data
0x08000000	Discontinuous CAN monitor data
0x10000000	Executing auto range processing
0x20000000	Auto range result exists
0x40000000	GPV data exists
0x80000000	Error (For details, see "5-4 ERROR STATUS OF CTRS.")

The conditions to which CTRS status is set, and the conditions to which CTRS status is cleared are shown below.

● A/D conversion available status (0x00000001)

To set:

- When no error occur in the measuring-condition-checking while setting measuring conditions at startup.
- When no error occurs in the measuring-condition-checking when start monitoring data by using the OPTION button (when the start monitoring function is assigned).
- When no error occurs in the measuring-condition-checking while setting measuring conditions by using the MSD command, MES command, or READ button.
- When no error occurs in the measuring-condition-checking while inserting or removing the SD card.
- When the INI command is properly ended.
- When recording with the current measuring conditions is possible by using the FDF, FDK, or FMT command.

To clear:

- When an error occurs in the measuring-condition-checking while setting measuring conditions at startup.
- When an error occurs in the measuring-condition-checking while setting measuring conditions by using the MSD command, MES command, or READ button.
- When an error occurs in the measuring-condition-checking while inserting or removing the SD card.
- When an error occurs in the measuring-condition-checking when start monitoring data by using the OPTION button (when the start monitoring function is assigned).
- When the SD card is removed during measurement and AD is stopped.

● During the A/D conversion (measurements) (0x00000002)

To set:

- When start monitoring data by using the STA command
- When start recording data by using the REC button while the CTRS is in stop mode.
- When start monitoring data by using the OPTION button (when the start monitoring function is assigned)
- When start auto range.

To clear:

- When stop monitoring data.

● Recording the manual-measurement data (0x00000004)

To set:

- When start recording data by using the REC command or REC button when the manual measurement is included in the measuring mode.

To clear:

- When the specified number of data recording is ended.
- When stop recording data.
- When pause recording data.

● Pausing the manual-measurement-data recording (0x00000008)

To set:

・When manual-measurement-data recording is paused by using the PAU command or an OPTION button to which the PAUSE function has been assigned (only if the number of recording repetitions is 1).

To clear:

・When recording is resumed by using the REC command or REC button.

・When stop recording data.

● Waiting for trigger measurements (0x00000010)

To set:

・When start waiting for trigger measurements by using the REC command or REC button when the trigger measurement is included in the measuring mode.

To clear:

・When canceling the waiting for trigger measurements by using the STP command or STOP button.

・When a trigger measurement starts by a trigger event.

● Recording the trigger-measurement data (0x00000020)

To set:

・When a trigger measurement starts by a trigger event during the "waiting for trigger measurements" status.

To clear:

・When the specified number of data recording is ended.

・When stop recording data.

● Waiting for interval measurements (0x00000040)

To set:

・When start waiting for interval measurements by using the REC command or REC button when the interval measurement is included in the measuring mode.

To clear:

・When canceling the waiting for interval measurements by using the STP command or STOP button.

・When an interval measurement starts by specifying interval conditions.

● Recording the interval-measurement data (0x00000080)

To set:

・When an interval measurement starts by satisfying interval conditions during the "waiting for interval measurements" status.

To clear:

・When the specified number of data recording is ended.

・When stop recording data.

● Waiting to start recording at a certain time (0x00000100)

To set:

・When manual recording starts at the specified time.

To clear:

・When start recording data.

● System running (Busy) (0x00000200)

To set:

・When a command is received from the PC, or processing for which only header responses are possible starts.

・When the CAN output at start, output at stop, or manual output (other than during AD) is being executed.

To clear:

・When the response data to be sent becomes available after executing the command.

・When the CAN output at start, output at stop, or manual output (other than during AD) ended.

※The master clears this bit after confirming that the CAN output of itself and the entire slave has been completed. If you want to send the next command after the CAN output, make sure that this bit is cleared before sending it.

● Opening the file or finding the file by using the control command (0x00000400)

To set:

・When the FOF command and FFF command are properly ended.

To clear:

・When the FCF command and FFC command are properly ended.

● Updating (0x00000800)

To set:

・When the update starts.

To clear:

・When the update ends.

● Recorded data file exists (0x00001000)

To set:

・When recording ends in the case of manual or trigger measurement with the number of recording repetitions set to 1.

To clear:

・When no error occurs in the measuring-condition-checking while setting measuring conditions by using the MSD command, MES command, or READ button.

・When start recording data.

・When removing the SD card.

・When the INI, FMT, FDK command is properly ended.

● Measurement channel check result exists (0x00002000)

To set:

・When a CCH-command or BAL-button measurement channel check ends normally.

To clear:

・When no error occurs in the measuring-condition-checking while setting measuring conditions by using the MSD command, MES command, or READ button.

・When start recording data.

・When the INI command is properly ended.

● Inserting the SD card (0x00004000)

To set:

・When an SD card is inserted and successfully mounted.

To clear:

・When removing the SD card.

・When an SD card is inserted but mounting it fails.

● Accessing to the SD card (0x00008000)

To set:

・When the FDF, FMT, FDK command is properly ended.

・When deleting the recorded data by using the OPTION function (when the delete the recorded data function is assigned)

To clear:

・When the file deleting is ended.

● Outputting the CAN (0x00010000)

To set:

・When CAN output is started.

To clear:

・When CAN output is ended.

● On-line controlling (0x00040000)

To set:

・When LAN connection or USB connection is successfully established.

To clear:

・When LAN connection or USB connection is disconnected.

● Time adjustment status by GPS (0x00080000)

To set:

・When the exact time obtained from GPS is set to CTRS.

To clear:

・When GPS time adjustment has not been performed for more than one hour.

● Operating on battery power (0x00100000)

To set:

・When no AC adapter is connected to the battery unit.

To clear:

・When an AC adapter is connected to the battery unit.

● Charging battery (0x00200000)

To set:

・When an AC adapter is connected to the battery unit.

To clear:

・When no AC adapter is connected to the battery unit.

● Control interface (0x00400000)

To set:

・When the CTRS is started up with a synchronous unit connected and the communication interface set to LAN.

To clear:

・None

● Using wireless LAN (0x00800000)

To set:

・When the CTRS is started up with a wireless LAN unit connected and the communication interface set to wireless LAN.

To clear:

・None

● Discontinuous analog monitor data (0x04000000)

To set:

・When the analog data internal FIFO memory becomes full.

To clear:

・When executing measuring condition setting, monitor start, recording start, balance execution, or auto range processing.

・When a GMD-command monitor reset is received.

●Discontinuous CAN monitor data (0x08000000)

To set:

・When the CAN data internal FIFO memory becomes full.

To clear:

・When executing measuring condition setting, monitor start, recording start, balance execution, or auto range processing.

・When a GMD-command monitor reset is received.

● Executing auto range processing (0x10000000)

To set:

・When start auto range.

To clear:

・When auto range processing ends due to an STP command, the STOP button, or an error.

● Auto range result exists (0x20000000)

To set:

・When auto range processing ends due to an STP command, the STOP button, or an error.

To clear:

・When measuring conditions are set by using the MSD (load) command, MES (setting) command, or READ button, or when auto range processing is started.

・When start recording data.

・When the INI command is properly ended.

● GPV data exists (0x40000000)

To set:

- When auto range processing ends due to an STP command, the STOP button, or an error.
- When recording ends in the case of manual or interval measurement while the pause function is set to invalid.

To clear:

- When measuring conditions are set by using the MSD (load) command, MES (setting) command, or READ button, or when auto range processing is started.
- When start recording data.
- When the INI command is properly ended.

● Error (0x80000000)

To set:

- When the error status of the CTRS is not 0x00000000.
  For details, see "5-4 ERROR STATUS OF CTRS."

To clear:

- When the error status of the CTRS is 0x00000000.

MEMO

When the status of the return value, after sending the control command, is 0x00000200, the processing of the control command is not yet completed. Check the status until the bit of the 0x00000200 returns 0.

MEMO

The A/D behavior and CTRS status are as follows.

- A/D conversion available status: 0x00000001 is set.
- Monitoring: 0x00000003 is set and 0x00000004 to 0x00000100 is cleared.
- Recording the manual-measurement data: 0x00000007 is set.
- Pausing the manual-measurement-data recording: 0x0000000B is set.
- Waiting for trigger measurements: 0x00000013 is set.
- Recording the trigger-measurement data: 0x00000023 is set.
- Waiting for interval measurements: 0x00000043 is set.
- Recording the interval-measurement data: 0x00000083 is set.

5-4 ERROR STATUS OF CTRS

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

Bit Value	Content
0x00000001	Folder capacity for storing the measured data is not enough.
0x00000002	(Reserved)
0x00000004	SD card access error
0x00000008	External clock error
0x00000010	The number of repeat times error
0x00000020	File No. error
0x00000040	Folder No. error
0x00000080	(Reserved)
0x00000100	Error during communication with the synchronous slave
0x00000200	Recording data writing error
0x00000400	CAN overflow occurs **(*1)**
0x00000800	(Reserved)
0x00001000	No remaining battery power **(*2)**
0x00002000	Battery deteriorated (replacement required, recording operations not possible) **(*2)**
0x00004000	Excessive battery current
0x00008000	(Reserved)
0x00010000	(Reserved)
0x00020000	(Reserved)
0x00040000	(Reserved)
0x00080000	(Reserved)
0x00100000	Hardware error
0x00200000	Abnormal memory content
0x00400000	(Reserved)
0x00800000	(Reserved)
0x01000000	(Reserved)
0x02000000	(Reserved)
0x04000000	(Reserved)
0x08000000	(Reserved)
0x10000000	(Reserved)
0x20000000	(Reserved)
0x40000000	(Reserved)
0x80000000	(Reserved)

(*1) Subject to the CAN condition "Stop recording when CAN overflow occurs" in "No.1 General information"

(*2) Subject to the measuring condition "Do not judge battery errors" in "No.1 General information"

The conditions to which CTRS error status is set, and the conditions to which CTRS error status is cleared are shown below.

● Folder capacity for storing the measured data is not enough (0x00000001)

To set:

・When there is not enough free space with the current condition settings to record even one file upon inserting an SD card, starting monitoring, or preparing to record again after the end of repeated measurement recording.

To clear:

・By making it possible to record at least one file with the current condition settings upon inserting an SD card, starting monitoring, or preparing to record again after the end of repeated measurement recording, or after deleting a file (with the FDF or FDK command) or executing a quick format (with the FMT command).

・When changing to the PC recording mode.

● SD card access error (0x00000004)

To set:

・When an error occurs while accessing the SD card, such as during file reading/writing or SD card space acquisition.

To clear:

・When inserting/removing an SD card, executing measuring condition setting, measurement start, recording start balance execution, or auto range processing, or receiving some kind of control command.

● External clock error (0x00000008)

To set:

・When the inputting external clock signal level is not within the specifications while using the external-clock-input function. (See "IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware.")

To clear:

・When inputting the correct external clock signal.

● The number of repeat times error (0x00000010)

To set:

・When the file naming conventions call for number specification, and the set number of file digits is exceeded when preparing to record again after the end of repeated measurement recording.

To clear:

・When inserting/removing an SD card or executing measuring condition setting, monitor start, recording start, balance execution, or auto range processing.

● File No. error (0x00000020)

To set:

・When the file naming conventions call for number specification, and measurement is started with a file number that exceeds the set number of file digits.

・When the file naming conventions call for number specification, and the set number of file digits is exceeded at the end of measurement.

To clear:

・When the file naming conventions call for number specification, and measurement is started with a settable number of file digits set.

・When the file naming conventions are set to date specification.

● Folder No. error (0x00000040)

To set:

・When the number of files in the CTRS100A.99 folder on the SD card reaches the recordable upper limit given the current settings.

To clear:

・When the number of files in the CTRS100A.99 folder on the SD card becomes recordable given the current settings.

● Error during communication with the synchronous slave (0x00000100)

To set:

・When the master cannot communicate with the slave while synchronous operation is set.

・When an error occurs while the master is communicating with the slave during synchronous operation.

To clear:

・When the master can communicate with the slave while synchronous operation is set.

・When no error occurs while the master is communicating with the slave during synchronous operation.

● Recording data writing error (0x00000200)

To set:

・During recording, if the analog or CAN recording data is not written in time, and all the data cannot be written.

To clear:

・When executing measuring condition setting, measurement start, recording start balance execution, or auto range processing.

● CAN overflow occurs (0x00000400)

To set:

・If the CAN unit cannot receive all of the CAN data in time during recording. **(*1)**

To clear:

・When executing measuring condition setting, measurement start, recording start balance execution, or auto range processing.

● No remaining battery power (0x00001000)

To set:

・When the remaining battery power falls under the specified value (5%) during battery operation. **(*2)**

・When the AC adapter is removed and the unit switches to battery operation while the remaining battery power is under the specified value (5%). **(*2)**

・When the battery is completely discharged.

To clear:

・When an AC adapter is inserted into the battery unit to start charging the battery.

・When the battery is charged to a usable status after being completely discharged.

・When the "Do not judge battery errors" setting is changed to valid.

● Battery deteriorated (0x00002000)

To set:

・When the battery integrity falls below the specified value (50%). **(*2)**

To clear:

・When the "Do not judge battery errors" setting is invalid, and the battery integrity is at the specified value or higher.

・When the "Do not judge battery errors" setting is valid.

● Excessive battery current (0x00004000)

To set:

・When excessive current occurs for a group 1 compact recorder.

To clear:

・When the excessive current for a group 1 compact recorder is eliminated.

● Hardware error (0x00100000)

To set:

・When an error occurs during communication between units or EEPROM access.

To clear:

・None

● Abnormal memory content (0x00200000)

To set:

・When it is not possible to normally read the EEPROM of the CTRS, measuring unit, or expansion unit upon starting up.

To clear:

・None

(*1) This is only set when the "Do not judge battery errors" setting in the "No.1 General information" of ”8-1 MEASURING CONDITION FORMAT” is set to "0: Judge".

(*2) This is only set when the "Stop recording when CAN overflow occurs" setting in the ”General information” of ”9-1 CAN CONDITION FORMAT” is set to "1: ON".

NOTE

・When a "hardware error" or "abnormal memory content" is set, restart the CTRS power supply, and then check whether the error status has been cleared. If the status is not cleared even after repeatedly restarting the CTRS, the CTRS unit might be malfunctioning.

5-5 INPUT OVER STATUS

The input over status is 32-bit numeric value. The most significant bit is corresponding to the CH32 and the least significant bit, to the CH1.
When the input signal exceeds the pre-set range during the A/D conversion, the relevant bit is set. (For example, when the CH1-input and CH31-input exceed during the A/D conversion, 0x40000001 is set.)
The 32-bit numeric value indicates the history of the excessive inputs. The 32-bit numeric value is not cleared even if the input exceeding status is canceled. The following conditions should be used to clear the status.

・When A/D conversion is temporarily paused and started once again.
・When executing the start-recording operation (REC).
・When executing balance.
・When executing the over reset command (ROS).

5-6 RECORDED FILE NAME

The collection file name is determined by the setting of "File name assignment rule" in "No.2 File information" of the measuring condition.

5-6-1 File Number

If the "File name assignment rule" is "0: Number", then the name of the data file, recorded in the CTRS, is as follows.

○○○#＊＊＊＊_△□□□□_◇.KS3

○○○	: Arbitrary file name (maximum 60 characters)
＊＊＊＊	: File No. (000 to 99,999) Automatically incremented every time recording ends.
△	: Measuring mode when setting the number of repeat times M: Manual measurement (when the number of repeat times is 2 or larger) I: Interval measurement A: Analog trigger measurement E: External trigger measurement L: Manual trigger measurement C: Complex trigger measurement N: CAN trigger measurement
□□□□	: The number of repeat times (000 to 99,999) Automatically incremented every time recording ends.
◇	: CTRS-ID No. (0 to 3) during the synchronous operation
KS3	: The file extension is KS3 fixed.

[Example 1]
Suppose the CTRS is stand-alone, manual measurement (file No. 0)
TEST#0000.KS3

[Example 2]
Suppose the CTRS is synchronous master (ID = 0), manual measurement (file No. 1)
TEST#0001_0.KS3

[Example 3]
Suppose the CTRS is stand-alone, interval measurement
(file No. 2, the number of repeat times = 3)
TEST#0002_I0003.KS3

[Example 4]
Suppose the CTRS is synchronous master (ID = 0), analog trigger measurement
(file No. 4, the number of repeat times = 5)
TEST#0004_A0005_0.KS3

5-6-2 Recording start time

If the "File name assignment rule" is "1: Recording start time ", then the name of the data file, recorded in the CTRS, is as follows. Unlike the case when you set "0: Number", the information on the measurement mode and the number of repetitions is not included in the file name.

○○○**#YYYYMMDD_hhmmss_sss_◇.**KS3

○○○	: Arbitrary file name (maximum 60 characters)
The following is the date and time when the recording started	
YYYY	: Year
MM	: Month
DD	: Date
hh	: Hour
mm	: Minute
ss_sss	: Second_millisecond
◇	: CTRS-ID No. (0 to 3) during the synchronous operation
KS3	: The file extension is KS3 fixed.

[Example 1]
Suppose the CTRS is stand-alone, manual measurement,
Start recording on 2021/01/02 15:41:30.123
TEST#20210102_154130_123.KS3

[Example 2]
Suppose the CTRS is synchronous master (ID = 0), manual measurement,
Start recording on 2021/10/21 08:04:50.004
TEST#20211021_080450_004_0.KS3

[Example 3]
Suppose the CTRS is synchronous slave2 (ID = 2), interval measurement,
Start recording on 2021/06/01 18:23:55.000
TEST#20210601_182355_000_2.KS3

MEMO

- When recording CAN data by using the CTRS-CAG010A, the CTRS create the KC3 file (extension: .KC3). The KC3 file is nemed in the same way as the KS3 file.
- When recording GPS data by using the CTRS-CAG011A, the CTRS create the NMEA file (extension: .NMEA). The NMEA file is nemed in the same way as the KS3 file.
- When "File name assignment rule" is set to "1: Recording start time", the date and time used in the file name may differ from the date and time written in the recording file depending on the measurement mode and the type of the recording file.
- The number of digits for the file number and number of recording repetitions depends on the settings of the measuring conditions "No.2 File information" and "Number of file digits". For details, refer to "8-1 MEASURING CONDITION FORMAT ".
- For KS3 and KC3 file format, see “IM-A-1319 Instruction manual for Kyowa standard format 3”

NOTE

・The following characters cannot be used for file names:
¥ / : * ? " < > | #

5-7 RECORDING FOLDER NAME

With the CTRS, recorded data files are stored in a folder named as shown below.

○○○.＊＊

○○○ : CTRS100A
＊＊ : Folder No. (01 to 99)

The name of the first created folder is "CTRS100A", and the folder number is incremented for subsequently created folders as shown above. Up to 1,000 files can be stored in each folder. Once the number of files in a folder reaches 1,000, a folder with the next folder number is automatically created upon recording again, and recorded files are stored in it.

MEMO

・Recorded files are stored in the folder that has the biggest number.

6. 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 the error code.
In addition, if an 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 are as follows.

Error code No.	Contents
0	Normally ended
-1	Unknown command
-2	Parameter error
-3	SD card access error
-4	No SD card inserted.
-5	Remaining capacity of the SD card is not enough.
-6	No file
-7	(Reserved)
-8	(Reserved)
-9	(Reserved)
-10	Cannot execute because the file is operating by control commands.
-11	(Reserved)
-12	Cannot execute due to abnormal memory content.
-13	The measurement start time has ended.
-14	The A/D conversion is stopped because the number of repeat times is the maximum value.
-15	The A/D conversion is stopped because the file No. is the maximum value.
-16	The A/D conversion is stopped because the folder No. is the maximum value.
-17	Cannot execute due to no remaining battery power.
-18	Cannot execute because A/D conversion is not currently possible.
-19	Cannot execute because A/D conversion is in operation.
-20	(Reserved)
-21	(Reserved)
-22	Cannot execute due to an error during communication with the synchronous slave.
-23	Cannot execute because of the external clock error.
-24	Cannot execute due to battery deterioration.
-25	Cannot execute due to excessive battery current.

7. CONTROL COMMAND

7-1 LIST OF CONTROL COMMANDS

The list of control commands are as follows.

Type	Contents	Command Name	Ref. Page
Measuring Condition	Set/load data file name	DFN	43
	Set/load the monitor data output condition	SMD	45
	Save/load the measuring condition file	MSD	49
	Set/load the measuring condition	MES	51
	Initialize the measuring condition	INI	55
Execute	Start A/D conversion	STA	57
	Start recording	REC	58
	Stop the A/D conversion/recording	STP	59
	Pause the recording operation	PAU	60
	Over reset	ROS	61
	Execute a measurement channel check or load the results	CCH	62
	Obtain the monitor data	GMD	66
	Load Peak/Valley400 data	GPV	80
	Execute manual CAN output	ECO	82
	Manual CAN output by any one condition	CMO	83
	Execute/load/stop the CAN output test	CSC	84
	Execute/load/stop CAN communication speed research automatically	ACT	89
	Insert/load marker	IMK	92
Environment	Set/load the keylock status	LOC	94
	Set/load the time	TIM	96
	Load the system information	SYS	98
	Load the unit information	RUI	100
	Check the device/unit	LED	110
File	Obtain the remaining capacity of the SD card.	FFR	111
	Open file	FOF	112
	Load file data	FRF	113
	Seek file	FSF	114
	Close file	FCF	115
	Delete file	FDF	116
	Execute quick format	FMT	117
	Start finding file	FFF	118
	Continue finding file	FFN	120
	End finding file	FFC	125
	Delete last recorded data files	FDK	126

Type	Contents	Command Name	Ref. Page
Others	Set/load wireless LAN setting	WLS	127
	Set/load the TCP/IP information	LAN	130
	Load/write the TEDS information	TED	133
	Load/write the user data	URW	142
	Measuring/Obtaining Average Value	AVG	144
	Execute auto range	ATR	146
	Load the CTRS status	———	149

7-2 ENABLE OR DISABLE CONTROL COMMANDS

Usable commands may be limited by the status of the CTRS or the synchronous operation status. Available the command is listed in the following table. For the status of the CTRS, see "5-3 CTRS STATUS."

(1) For stand-alone and master CTRS (A/D conversion is in stop status)

Command	Stopping A/D conversion				
	A/D conversion disable status	A/D conversion available status	Finding file	Opening file	Executing CCH,AVG(*1)
DFN	×	○	×	×	×
SMD	○	○	×	×	×
MSD	○	○	×	×	×
MES	○	○	×	×	×
INI	○	○	×	×	×
STA	×	○	×	×	×
REC	×	○	×	×	×
STP	×	×	×	×	×
PAU	×	×	×	×	×
ROS	○	○	×	×	×
CCH	×	○	×	×	×
GMD	×	×	×	×	×
GPV	○	○	×	×	×
ECO	○	○	×	×	×
CMO	○	○	×	×	×
CSC	○	○	×	×	×
ACT	○	○	×	×	×
IMK	×	×	×	×	×
LOC	○	○	×	×	×
TIM	○	○	×	×	×
SYS	○	○	×	×	×
RUI	○	○	×	×	×
LED	○	○	×	×	×
FFR	○	○	×	×	×
FOF	○	○	×	×	×
FRF	○(*2)	○(*2)	×	○	×
FSF	○(*2)	○(*2)	×	○	×
FCF	○(*2)	○(*2)	×	○	×
FDF	○	○	×	×	×
FMT	○	○	×	×	×
FFF	○	○	×	×	×
FFN	○(*3)	○(*3)	○	×	×
FFC	○(*3)	○(*3)	○	×	×
FDK	×	○(*4)	×	×	×
WLS	○	○	×	×	×
LAN	○	○	×	×	×
TED	○	○	×	×	×
URW	○	○	×	×	×
AVG	×	○	×	×	×
ATR	×	○	×	×	×

○: Available commands, ×: Non applicable, △: Only loading is enabled

(*1) Status during the balance adjustment execution, input resistance check execution, burnout check execution, or average value measurement.
(*2) Enabled only during opening file.
(*3) Enabled only during finding file.
(*4) Only valid during the period from when AD is stopped immediately after recording to when recording is next started.

(2) For stand-alone and master CTRS (A/D conversion is in operating status)

Command	Monitoring	Manual measurement		Trigger measurement		Interval measurement	
		Recording	Pausing	Waiting	Recording	Waiting	Recording
DFN	△	△	△	△	△	△	△
SMD	○	○	○	○	○	○	○
MSD	×	×	×	×	×	×	×
MES	△	△	△	△	△	△	△
INI	×	×	×	×	×	×	×
STA	×	×	×	×	×	×	×
REC	○	×	○	×	×	×	×
STP	○	○	○	○	○	○	○
PAU	×	○**(*1)**	×	×	×	×	×
ROS	○	○	○	○	○	○	○
CCH	○	×	○	×	×	×	×
GMD	○	○	○	○	○	○	○
GPV	×	×	×	×	×	×	×
ECO	○	○	○	○	○	○	○
CMO	○	○	○	○	○	○	○
CSC	×	×	×	×	×	×	×
ACT	×	×	×	×	×	×	×
IMK	×	○	×	×	○	×	○
LOC	○	○	○	○	○	○	○
TIM	△	△	△	△	△	△	△
SYS	○	○	○	○	○	○	○
RUI	○	○	○	○	○	○	○
LED	×	×	×	×	×	×	×
FFR	×	×	×	×	×	×	×
FOF	×	×	×	×	×	×	×
FRF	×	×	×	×	×	×	×
FSF	×	×	×	×	×	×	×
FCF	×	×	×	×	×	×	×
FDF	×	×	×	×	×	×	×
FMT	×	×	×	×	×	×	×
FFF	×	×	×	×	×	×	×
FFN	×	×	×	×	×	×	×
FFC	×	×	×	×	×	×	×
FDK	×	×	×	×	×	×	×
WLS	△	△	△	△	△	△	△
LAN	△	△	△	△	△	△	△
TED	×	×	×	×	×	×	×
URW	×	×	×	×	×	×	×
AVG	×	×	×	×	×	×	×
ATR	○	×	×	×	×	×	×

○: Available commands, ×: Non applicable, △: Only loading is enabled

(*1) Enabled only during recording data in manual measurements.

(3) Slave CTRS (A/D conversion is in stop status)

Command	Stopping A/D conversion				
	A/D conversion disable status	A/D conversion available status	Finding file	Opening file	Executing CCH,AVG(*1)
DFN	×	○	×	×	×
SMD	○	○	×	×	×
MSD	○	○	×	×	×
MES	○	○	×	×	×
INI	○	○	×	×	×
STA	×	×	×	×	×
REC	×	×	×	×	×
STP	×	×	×	×	×
PAU	×	×	×	×	×
ROS	×	×	×	×	×
CCH	×	×	×	×	×
GMD	×	×	×	×	×
GPV	○	○	×	×	×
ECO	×	×	×	×	×
CMO	○	○	×	×	×
CSC	×	×	×	×	×
ACT	×	×	×	×	×
IMK	×	×	×	×	×
LOC	○	○	×	×	×
TIM	○	○	×	×	×
SYS	○	○	×	×	×
RUI	○	○	×	×	×
LED	○	○	×	×	×
FFR	○	○	×	×	×
FOF	○	○	×	×	×
FRF	○(*2)	○(*2)	×	○	×
FSF	○(*2)	○(*2)	×	○	×
FCF	○(*2)	○(*2)	×	○	×
FDF	○	○	×	×	×
FMT	○	○	×	×	×
FFF	○	○	×	×	×
FFN	○(*3)	○(*3)	○	×	×
FFC	○(*3)	○(*3)	○	×	×
FDK	×	×	×	×	×
WLS	○	○	×	×	×
LAN	○	○	×	×	×
TED	○	○	×	×	×
URW	○	○	×	×	×
AVG	×	×	×	×	×
ATR	×	×	×	×	×

○: Available commands, ×: Non applicable, △: Only loading is enabled

(*1) Status during the balance adjustment execution, input resistance check execution, burnout check execution, or average value measurement.
(*2) Enabled only during opening file.
(*3) Enabled only during finding file.

(4) Slave CTRS (A/D conversion is in operating status)

Command	Monitoring	Manual measurement		Trigger measurement		Interval measurement	
		Recording	Pausing	Waiting	Recording	Waiting	Recording
DFN	△	△	△	△	△	△	△
SMD	○	○	○	○	○	○	○
MSD	×	×	×	×	×	×	×
MES	△	△	△	△	△	△	△
INI	×	×	×	×	×	×	×
STA	×	×	×	×	×	×	×
REC	×	×	×	×	×	×	×
STP	×	×	×	×	×	×	×
PAU	×	×	×	×	×	×	×
ROS	×	×	×	×	×	×	×
CCH	×	×	×	×	×	×	×
GMD	○	○	○	○	○	○	○
GPV	×	×	×	×	×	×	×
ECO	×	×	×	×	×	×	×
CMO	○	○	○	○	○	○	○
CSC	×	×	×	×	×	×	×
ACT	×	×	×	×	×	×	×
IMK	×	×	×	×	×	×	×
LOC	○	○	○	○	○	○	○
TIM	△	△	△	△	△	△	△
SYS	○	○	○	○	○	○	○
RUI	○	○	○	○	○	○	○
LED	×	×	×	×	×	×	×
FFR	×	×	×	×	×	×	×
FOF	×	×	×	×	×	×	×
FRF	×	×	×	×	×	×	×
FSF	×	×	×	×	×	×	×
FCF	×	×	×	×	×	×	×
FDF	×	×	×	×	×	×	×
FMT	×	×	×	×	×	×	×
FFF	×	×	×	×	×	×	×
FFN	×	×	×	×	×	×	×
FFC	×	×	×	×	×	×	×
FDK	×	×	×	×	×	×	×
WLS	△	△	△	△	△	△	△
LAN	△	△	△	△	△	△	△
TED	×	×	×	×	×	×	×
URW	×	×	×	×	×	×	×
AVG	×	×	×	×	×	×	×
ATR	×	×	×	×	×	×	×

○: Available commands, ×: Non applicable, △: Only loading is enabled

7-3 DETAILED SPECIFICATIONS OF CONTROL COMMANDS

This section describes detailed information for every control command.
When sending the control command from the PC to the CTRS, construct a command packet with header (512-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 packet added with header section (512-byte fixed length) at the head from the CTRS. Since the size of response data succeeding the header section is written with the number of response data bytes in the header, the PC can receive the entire response packet from the CTRS.
For command packets and response packets see "5 CONTROL COMMAND SEND/RECEIVE PROTOCOL."

MEMO

Although response data is almost 2 bytes or more, PC might receive 1 byte Data.
In this case, error occurred and the CTRS is returning error codes as the response data.
For details, see "6 ERROR CODE."

7-3-1 Set/load data file name (DFN)

Sets and loads the data file name.

● Command: DFN
● Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

● The number of transferred bytes: 512 bytes
● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	DFN	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Data file name (maximum 60 characters) [Example] TEST	char	128
4	Parameter 3	File title	char	128
5	Parameter 4	Reserved	char	256
Total number of transferred bytes				512

● 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 Name	DFN	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
3	Parameter 2	Loading target (0: Current recorded data, 1: Previous recorded data)	BYTE	1
Total number of transferred bytes				5

● Response data: 512 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Current recorded data file name	char	128
2	Response data 2	File title	char	128
3	Response data 3	First recorded data file name	char	128
4	Response data 4	Final recorded data file name	char	128
Total number of response data bytes				512

When the A/D conversion is not in available status, all the response data 1 shall be '0x00.'

NOTE

・For synchronous operation, when the A/D conversion is started, the final file information is set from the master to slave CTRS. Therefore, for slave CTRS, results of this command may differ before and after starting the A/D conversion.
・To obtain the correct data file name, execute this command during the A/D conversion.
・Response data 3 is updated when recording starts, while response data 4 is updated either when recording stops or recording is completed the specified number of times.
・If this command is used to try to change the file name and the setting of the "No.2 File information" measuring condition "File name duplicate check" is "1: Valid", the system checks for the same file name on the SD card. If such a file exists, an error is returned. For details, refer to "8-1 MEASURING CONDITION FORMAT".

7-3-2 Set/load the monitor data output condition (SMD)

Sets and loads the monitor data output condition.

- Command: SMD
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

- The number of transferred bytes: 20 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	SMD	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Monitor data output mode **(*1)** -1: No monitor data output 0: Continuous monitor data output mode 1: Intermittent monitor data output mode	char	1
4	Parameter 3	Output the monitor data of the analog data (0: OFF, 1: ON)	BYTE	1
5	Parameter 4	Output the monitor data of the auto range data (0: OFF, 1: ON)	BYTE	1
6	Parameter 5	Output the monitor data of the CAN data (0: OFF, 1: ON)	BYTE	1
7	Parameter 6	Output the GPS status (0: OFF, 1: ON)	BYTE	1
8	Parameter 7	Output the monitor data of the GPS data (0: OFF, 1:ON)	BYTE	1
9	Parameter 8	Reserved	char	10
Total number of transferred bytes				20

- Response data: Standard type (1 byte)

MEMO

- During synchronous communication, if parameter 2 is -1, transmit commands from the master in order. If parameter 2 is 0 or 1, transmit commands from the slave in order.
- When the number of analog CHs to be recorded is 0, if the analog data monitor data output is set to ON, the analog monitor data storing only the counter is output regardless of the setting of the counter assignment to the measurement data.
- In the synchronous connection, set the analog data monitor data output to ON regardless of the number of analog CHs if you want to acquire the analog data monitor data synchronized between the master and slave. For example, even if the number of analog channels of the master is 0, the analog monitor data that contains only counters is output, so the information necessary to send the GMD command to the slave can be acquired. For details, see "7-3-12 Obtain the monitor data (GMD)."
- When the GPS status output is set to ON, the GPS status can be obtained by the GMD command even when it is not being monitored.

(*1) Monitor data output mode

・For no monitor data is output (Monitor data output mode = -1)

Not outputting monitor data.

Even if monitor data obtaining command (GMD) is sent, the number of monitor data is always '0.'

When the CTRS is in off-line status, this mode is automatically set.

・For continuous monitor data output mode (Monitor data output mode = 0)

Monitor data of all the connected CTRS units is continuously obtained.

Depending on the number of connected CTRS units and PC's performance, all the monitor data may not be obtained.

・For intermittent monitor data output mode (Monitor data output mode = 1)

Monitor data is intermittently obtained.

Although the obtained data is continuous monitor data, it lacks in continuity with data of the monitor data obtained the next time.

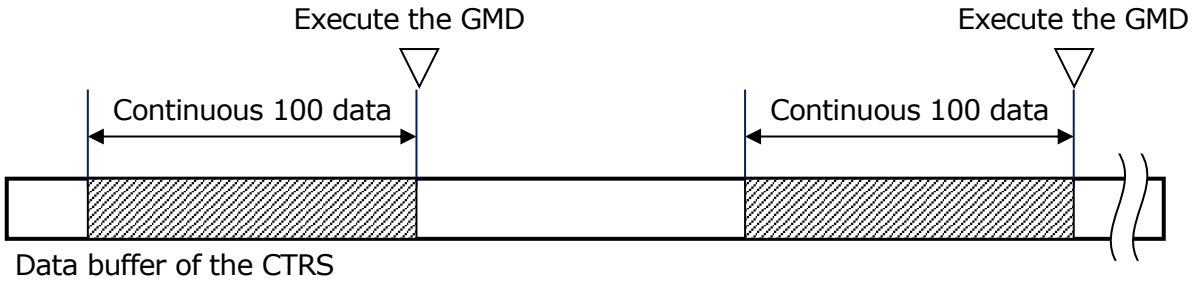
[Example]

Obtaining the monitor data with the intermittent monitor data output mode

Suppose the parameter 1 (the number of obtained data/CH) of the GMD is 100.

Indicates the data buffer of the CTRS. Suppose data stores from left to right.

Indicates the range of the obtained data.



MEMO

・Available information varies with the monitor data command.
For details, see "7-3-12 Obtain the monitor data (GMD)."

・When the intermittent monitor data output mode is set and the CAN or GPS data monitor data output is set to ON, the CAN or GPS data monitor data to be acquired will be the monitor data from a maximum of one second before the GMD reception.

♦♦♦ 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 Name	SMD	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 16 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Monitor data output mode -1: No monitor data output 0: Continuous monitor data output mode 1: Intermittent monitor data output mode	char	1
2	Response data 2	Output the monitor data of the analog data (0: OFF, 1: ON)	BYTE	1
3	Response data 3	Output the monitor data of the auto range data (0: OFF, 1: ON)	BYTE	1
4	Response data 4	Output the monitor data of the CAN data (0: OFF, 1: ON)	BYTE	1
5	Response data 5	Output the GPS status (0: OFF, 1: ON)	BYTE	1
6	Response data 6	Output the monitor data of the GPS data (0: OFF, 1:ON)	BYTE	1
7	Response data 7	Reserved	char	10
Total number of response data bytes				16

MEMO

See also "7-3-12 Obtain the monitor data (GMD)."

7-3-3 Save/load the measuring condition file (MSD)

Saves measuring conditions, pre-set in the CTRS, to the SD card or loads measuring conditions, stored in the SD card, and sets the obtained measuring conditions in the CTRS.

- Command: MSD
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

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

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	MSD	char	3
2	Parameter 1	Save/load the measuring condition file mode 0x00: Load, 0x01: Save Set 0x01.	BYTE	1
Total number of transferred bytes				4

- Response data: Standard type (1 byte)

♦♦♦ 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 Name	MSD	char	3
2	Parameter 1	Save/load the measuring condition file mode 0x00: Load, 0x01: Save Set 0x00.	BYTE	1
Total number of transferred bytes				4

- Response data:

The "7-3-4 Set/load the measuring condition (MES)" measuring condition check result.

MEMO

- When the parameter 1 is set Load (0), measuring conditions stored in the SD card is set in the CTRS and the measuring conditions are automatically checked on the CTRS side.
- When the parameter 1 is set Save (1), measuring conditions are automatically checked on the CTRS side. Only when the status is available for starting A/D conversion, after updating the measuring condition in the CTRS, the checked measuring conditions are saved in the SD card.
- If parameter 1 is set to Load (0) and this command is transmitted to a slave, the condition file on the slave's SD card is loaded and set.
- If parameter 1 is set to Save (1) and this command is transmitted to a slave, the slave's currently set measuring conditions are saved to its SD card.
- The file name is CTRS-100A_0.SET for the master, CTRS-100A_1.SET for the 1st slave, or CTRS-100A_2.SET for the 2nd slave.

7-3-4 Set/load the measuring condition (MES)

The CTRS sets/loads the measuring conditions and can conditions.
Check parameters for starting the A/D conversion by using the STA command.

- Command: MES
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

- The number of transferred bytes: 40004 to 440004 bytes **(*1)**
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	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 CTRS	---	40000
4	Parameter 3	CAN conditions to be set in the CTRS	---	(400000) **(*1)**
Total number of transferred bytes				40004 to 440004 **(*1)**

(*1) The number of transferred bytes varies with the presence or absence of the CAN conditions.
Measuring conditions only: 40004 bytes
Measuring conditions + CAN conditions: 440004 bytes

MEMO

- For the parameter 2, see "8-1 MEASURING CONDITION FORMAT."
- For the parameter 3, see "9-1 CAN CONDITION FORMAT."
- To record CAN data, set the CAN conditions.
- If "CAN data measurement" in "No.3 Measurement condition (common)" of the measurement conditions stored in parameter 2 is set to "0: Invalid", the data will not be reflected in CTRS even if the CAN condition is stored in parameter 3 and sent. Also, if 40004 bytes are sent without storing the CAN condition even though "CAN data measurement" is set to "1: Valid", an error (0x00000008) in setting the measurement condition (common) is returned as the response data.
- If A/D conversion is in operation, the setting is not reflected in CTRS even if this command is sent.

● Response data:

Results of the measuring-condition-checking

Measuring condition check results is defined with 32-bit numeric value as shown in the following table. When the result is not 0x00000000, A/D conversion cannot be started.

Results (bit)	Contents
0x00000000	Check results are OK and starting the A/D conversion is available.
0x00000001	Sampling frequency setting error
0x00000002	General information setting error
0x00000004	File information setting error
0x00000008	Measuring condition (Common) setting error
0x00000010	No measurement target exists.
0x00000020	Measuring condition (Manual) setting error
0x00000040	Measuring condition (Interval) setting error
0x00000080	Measuring condition (Common for trigger) setting error
0x00000100	Measuring condition (Analog trigger) setting error
0x00000200	(Reserved)
0x00000400	Measuring condition (External trigger) setting error
0x00000800	(Reserved)
0x00001000	Measuring condition (Complex trigger) setting error
0x00002000	Marker condition error
0x00004000	Channel condition setting error
0x00008000	Channel range setting error
0x00010000	Remaining capacity is not enough.
0x00020000	No SD card inserted.
0x00040000	File No. error
0x00080000	Folder No. error
0x00100000	CAN general information setting error
0x00200000	CAN trigger condition setting error
0x00400000	CAN communication condition setting error
0x00800000	CAN Message condition setting error
0x01000000	CAN Signal condition setting error
0x02000000	CAN output condition setting error
0x04000000	(Reserved)
0x08000000	(Reserved)
0x10000000	(Reserved)
0x20000000	(Reserved)
0x40000000	(Reserved)
0x80000000	(Reserved)

※Note that the (Reserved) result is 0.

NOTE

- If using the MES command to specify settings during synchronous operation, first specify settings for slave units, and then specify settings for the master unit last.
- When issuing the command to master, every status of the synchronous-connected CTRS is checked and result. A/D conversion cannot be started unless status of the synchronous-connected CTRS are all passed.
- With the stand-alone and master, when many recorded data files exist in the SD card, the CTRS takes maximum of about 10 seconds to answer the command. Because when executing the command, the CTRS is checking whether the data file names in the SD card are overlapping. The more files the SD card stores, the more time it will take to process.
  Therefore, when creating multiple files in the SD card, we recommend you to collect data early and delete files in the SD card or replace the SD card with a new one.
- When the ”File name duplicate check” of ”No.2 File Information” is ”0:Invalid” , the CTRS will not check whether files are overlapping. For details, see "8-1 MEASURING CONDITION FORMAT."
- If the remaining SD card capacity is less than the system reserved area (approximately 16 MB), the remaining capacity will be judged to be insufficient.

♦♦♦ 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 Name	MES	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 40000 to 440004 bytes **(*1)**

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Measuring conditions to be set in the CTRS	---	40000
2	Response data 2	CAN conditions to be set in the CTRS	---	(400000)**(*1)**
Total number of response data bytes				40000 to 440000**(*1)**

(*1) The number of response bytes varies with the presence or absence of the CAN conditions.
Measuring conditions only: 40000 bytes
Measuring conditions + CAN conditions: 440000 bytes

MEMO

・For the response data 1, see "8-1 MEASURING CONDITION FORMAT."
・For the response data 2, see "9-1 CAN CONDITION FORMAT."
・If ”CAN data measurement” in ”No.3 Measurement condition (common)” of the measurement condition is set to ”1: Valid”, the response data contains the CAN condition.

7-3-5 Initialize the measuring condition (INI)

Initializes the measuring conditions (parameters) in the CTRS.

● Command: INI
● Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

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

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	INI	char	3
2	Parameter 1	Initialization mode 0: Initializes measuring condition, user's unit, etc. (TCP/IP related conditions are not initialized.) 1: All the conditions are initialized to the factory default. Since the TCP/IP related conditions are also initialized, after receiving the response data, communication may not be available. 2: Initialize the SSID and security key of the wireless LAN unit.	BYTE	1
Total number of transferred bytes				4

● Response data: Standard type (1 byte)

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

・If parameter 1 is 0

Data written by URW command: No change
Date and time: No change
Synchronous operation setting
(device operation mode, number of connected devices): No change
Number of recording channels: Measure all the recording available channels.
Channel condition: Default value of every unit.
For details, see "8-5 VALUES OF MEASURING UNITS"
Balance value: 0

Other parameters are initialized to the shaded values in "8-1 MEASURING CONDITION FORMAT" and "9-1 CAN CONDITION FORMAT."

・If parameter 1 is 1

Date and time:	No change
Synchronous operation setting (device operation mode, number of connected devices):	No change
CTRS-100A IP address:	192.168.70.100
Subnet mask:	255.255.255.0
Default gateway address:	0.0.0.0
Number of recording channels:	Measure all the recording available channels.
Channel condition:	Default value of every unit. For details, see "8-5 VALUES OF MEASURING UNITS"
Balance value:	0
SSID:	The value on the wireless LAN unit sticker (*)
Security ket:	The value on the wireless LAN unit sticker (*)
Radio frequency band:	2.4GHz (*)
Wireless LAN CH:	11CH (*)
Wireless LAN security mode:	WPA2[AES] (*)
Wireless LAN module IP address:	192.168.70.90 (*)

(*) Only initialized if a wireless LAN unit is connected

Other parameters are initialized to the shaded values in "8-1 MEASURING CONDITION FORMAT" and "9-1 CAN CONDITION FORMAT."

・If parameter 1 is 2

SSID:	The value on the wireless LAN unit sticker (*)
Security ket:	The value on the wireless LAN unit sticker (*)

(*) Only initialized if a wireless LAN unit is connected

NOTE

・If parameter 1 is 1

(1) 0x00 is written to writing areas No. 1 to 15 of the URW command.

(2) URW command writing area No. 0 is set to the default character string "CTRS-100A-" + "serial number".

Ex.) If the serial number is 123456789, the writing area No. 0 default character string is "CTRS-100A-123456789".

(3) If no wireless LAN unit is connected, all the wireless conditions are initialized to 0x00.

(4) The TCP/IP setting details are applied the next time the power supply is turned on. Be sure to restart the power supply after initialization.

・If parameter 1 is 2

(1) The wireless LAN unit setting details are applied the next time the power supply is turned on. Be sure to restart the power supply after initialization.

7-3-6 Start A/D conversion (STA)

Starts A/D conversion and moves to the monitoring status.

- Command: STA
- Target CTRS: Stand-alone, and master

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

MEMO

To execute the command, A/D conversion available status is required.

7-3-7 Start recording (REC)

Starts recording data.

For manual measurements: The first recording operation starts when the CTRS is monitoring data or Stopping A/D conversion.
The recording operation re-starts when the CTRS is pausing the recording operation.
For trigger measurements: The first "waiting for trigger measurements" status starts.
The recording operation starts in waiting for trigger measurements when the measurement mode is set to manual trigger.
The recording operation will be stopped if it is in the recording operation state and the end trigger is set.
For interval measurements: The first "waiting for interval measurements" status starts.

- Command: REC
- Target CTRS: Stand-alone, and master

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

MEMO

・The command is available during monitoring data, during pausing or in A/D conversion available status only.
・When the measuring mode is "-1: PC recording mode", CTRS does not start recording operation even if this command is sent.

7-3-8 Stop the A/D conversion/recording (STP)

Stops the A/D conversion or data recording.

After sending the STP command, the CTRS will operate as follows.

・When the CTRS is recording data or is pausing:
Ends the data recording and moves to the monitoring status.

・When the CTRS is monitoring data:
Stops the A/D conversion.

・When the CTRS is in the "waiting for trigger measurements" status:
Ends the "waiting for trigger measurements" status and moves to the monitoring status.

・When the CTRS is in the "waiting for interval measurements" status:
Ends the "waiting for interval measurements" status and moves to the monitoring status.

● Command: STP
● Target CTRS: Stand-alone, and master

● The number of transferred bytes: 3 bytes
● Parameter: None

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

● Response data: Standard type (1 byte)

MEMO

When ”After recording, restart the A/D conversion” in ”No.3 Measuring condition (common)” is ”0: Invalid”, the CTRS is not moved to the monitoring status and A/D conversion is in stopped status. For details, see "8-1 MEASURING CONDITION FORMAT."

7-3-9 Pause the recording operation (PAU)

Pauses the recording operation of manual measurements.

- Command: PAU
- Target CTRS: Stand-alone, and master

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

MEMO

・The command is available when satisfying the following all conditions.
  ・Manual measurements (the number of repeat times = 1)
  ・Without the specified number of data
  ・Recording data
  ・CAN measurement is Invalid
  ・GPS measurement is Invalid
・When the ”PAUSE function” in ”No.3 Measuring condition (common)” is ”0: Invalid”, the PAU command is always invalid. For details, see "8-1 MEASURING CONDITION FORMAT."

7-3-10 Over reset (ROS)

Clears the range over status that occurs during AD.

- Command: ROS
- Target CTRS: Stand-alone, and master

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

7-3-11　Execute a measurement channel check or load the results (CCH)

Executes a measurement channel check and acquires the results.
Before executing this command, the target channel must be set.
Channel settings targeted for balance and input resistance check and burnout check can be specified by using the MES command.

● Command: CCH
● Target CTRS: Stand-alone, and master

♦♦♦ When executing ♦♦♦

● The number of transferred bytes: 8 bytes
● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	CCH	char	3
2	Parameter 1	CCH executing mode (0x00: Load result, 0x01: Execute) Set 0x01.	BYTE	1
3	Parameter 2	Executing mode (in binary digit) 0x01: Executing balance, 0x02: Executing input resistance check, 0x04: Executing burnout check	BYTE	1
4	Parameter 3	Reserved	char	3
Total number of transferred bytes				8

● Response data: Standard type (1 byte)

● Remarks: After executing the CCH command, use the status load command to check the CTRS status. After checking that the status is not in "System running (Busy)" status, load the checked results.

♦♦♦ When loading ♦♦♦

● The number of transferred bytes: 8 bytes
● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	CCH	char	3
2	Parameter 1	CCH executing mode (0x00: Load result, 0x01: Execute) Set 0x00.	BYTE	1
3	Parameter 2	Reserved	char	4
Total number of transferred bytes				8

● Response data: 8 byte+64 byte×32CH×the number of connected units = 2056 to 8200 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Check execution item (in binary digit) 0x01: Executing balance, 0x02: Executing input resistance check, 0x04: Executing burnout check	BYTE	1
		Reserved	char	7
	General measurement channel check result information		—	8
2	Response data 2	Result of balance -1: No unit, no function, measurement OFF 0: OK 1: NG 2: Function OFF 3: Balance NONE 4: Balance result write error	char	1
		Reserved	char	3
		Balance remaining AD value	long	4
		Result of input resistance check -1: No unit, no function, measurement OFF 0: OK 1: BV NG (not available in current BV) 2: RESISTANCE NG (The resistance value exceeded the specified value.) 3: Function OFF	char	1
		Reserved	char	3
		input resistance value (Ω) ※Valid only when the result of input resistance check is 0 or 1 or 2.	long	4
		Result of burnout check -1: No unit, no function, measurement OFF 0: OK 1: NG 2: Function OFF	char	1
		Reserved	chsr	47
	Number of bytes per channel		—	64
	Master measurement channel check result (64×32 = 2048)		—	2048
3	Response data 3	Slave 1 measurement channel check result	—	2048
4	Response data 4	Slave 2 measurement channel check result	—	2048
5	Response data 5	Slave 3 measurement channel check result	—	2048
Total number of response data bytes				2056 to 8200

NOTE

・While executing a measurement channel check, commands other than status loading cannot be used.

MEMO

・When the input resistance check, if the resistance value exceeds 1500Ω, the "Result of input resistance check" will be "2: RESISTANCE NG". If the resistance value is less than 0Ω or greater than 9999Ω, "Input resistance value (Ω)" will contain 9999.

7-3-12 Obtain the monitor data (GMD)

Obtains monitor data.
Set the monitor data output mode by using the SMD command in advance.

- Command: GMD
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When executing ♦♦♦

- The number of transferred bytes: 19 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	GMD	char	3
2	Parameter 1	The number of analog monitor data/CH Note that the value to be set varies with the monitor data output mode of the SMD command. ・Continuous monitor data output mode Master: Set 0. Slave: Set the number of analog data/CH obtained from the master. ・Intermittent monitor data output mode Set the number of analog data/CH. ※Special usage When setting "0xFFFFFFFF" or "0xFFFFFFFE" in the parameter, the CTRS-100A operates as follows. 0xFFFFFFFF: Clear the "Discontinuous monitor data" status. 0xFFFFFFFE: Request the response without monitor data.	DWORD	4
3	Parameter 2	Reserved	char	4
4	Parameter 3	Monitor data point Valid only for slaves (Set master response data 1)	UINT64	8
Total number of transferred bytes				19

MEMO

・With regard to obtains monitor data, See also "7-3-2 Set/load the monitor data output condition (SMD)"

・In intermittent monitor data output mode, the maximum value that can be set for parameter 1 is the smaller of the following conditions. If a value exceeding the maximum value is set for parameter 1, -2 (parameter error) is returned as response data.

(1) Counter assignment to measurement data is invalid:
600,000 / (4×the number of analog channels to be measured)
Counter assignment to measurement data is valid:
600,000 / ((4×the number of analog channels to be measured) + 8)

(2) The number of data items in the case of 30 seconds of monitoring at the set sampling frequency

Ex.: If counter assignment to measurement data is valid, sampling frequency is 1 kHz, Number of analog CHs for measurement ON is 2
(1) 600,000 / ((2×4) + 8) = 37,500
(2) 1000×30 = 30,000
In this case, 30,000 is the maximum value in the settable range.

● Response data: Monitor data (The number of bytes varies with the settings of the SMD command, the number of channels to be measured, and command executing timing.)

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Number of monitor output data The number of monitor output data output from the start of A/D.	UINT64	8
2	Response data 2	Number of analog channels (0 to 32)	BYTE	1
3	Response data 3	Number of bytes of analog data per channel (4 bytes)	BYTE	1
4	Response data 4	Number of bytes in timestamp counter for analog data (0 or 8 bytes)	BYTE	1
5	Response data 5	Number of bytes of auto range data per channel (0 or 16 bytes)	BYTE	1
6	Response data 6	CAN measurement (0: Invalid, 1: Valid)	BYTE	1
7	Response data 7	Number of bytes of GPS status (0 or 128 bytes)	BYTE	1
8	Response data 8	Reserved	char	18
9	Response data 9	Number of bytes in monitor data array (analog/counter) (number of bytes in response data 18)	DWORD	4
10	Response data 10	Number of bytes of auto range data (number of bytes of response data 19)	DWORD	4
11	Response data 11	Number of bytes in monitor data array (CAN) (number of bytes in response data 20)	DWORD	4
12	Response data 12	Number of bytes of GPS data (number of bytes in response data 22)	DWORD	4
13	Response data 13	Reserved	char	52
14	Response data 14	CAN bus status of each port of the CAN unit (in binary digit) 0: Normal, 1: Bus error occurred Example: Bus error on ports 1 and 2: 0x03	BYTE	1
15	Response data 15	Reserved	char	11

[From the previous page]

No.	Name	Contents		Types of Variables	The Number of Bytes
16	Response data 16	Date when response data is sent	Year (2019 to 2099)	WORD	2
			Month (1 to 12)	BYTE	1
			Day (1 to 31)	BYTE	1
			Hour (0 to 23)	BYTE	1
			Minute (0 to 59)	BYTE	1
			Second (0 to 59)	BYTE	1
			Reserve	char	1
			Millisecond (0 to 999)	WORD	2
			Reserve	char	6
17	Response data 17	Reserve		char	128
18	Response data 18	Monitor data array (analog/counter)		---	A
19	Response data 19	Auto range data		---	B
20	Response data 20	Monitor data array (CAN)		---	C
21	Response data 21	GPS status (When response data 7 is not 0)		---	D
22	Response data 22	GPS data (When response data 12 is not 0)		---	E
Total number of response data bytes					256 +A+B+C +D+E

MEMO

- If the specified number of data items have not yet accumulated in the internal FIFO memory, only response data items 1 to 9 are returned.
- If the setting is such that analog data is not output as monitor data, 0 is stored in response data 1 and 8 and returned. Therefore, the number of bytes in response data 18 will also be 0. In the intermittent monitor data output mode, if the specified number of data has not yet been stored in the internal FIFO memory for analog data, the number of bytes in response data 18 will be 0 as well.
- If the size of the response packet is to acquire monitor data in an amount exceeding 2MB (2,097,152 bytes), only response data 1 to 15 will be returned as a response, and monitor discontinuity will be set.

○ Auto range data details

Name	No.	Contents	Types of Variables	The Number of Bytes
Response data 19	1	Maximum/minimum validity 1: Maximum/minimum exists, 0: No maximum/minimum	BYTE	1
	2	Reserved	char	3
	3	Current latest data	long	4
	4	Maximum from the start of auto range processing	long	4
	5	Minimum from the start of auto range processing	long	4
	Auto range data (1st channel)		—	16
	・		・	・
	Auto range data (32nd channel)		—	16
Total bytes				16 to 512

○CAN data details(Response data 20)

Classification	No.	Contents	Types of Variables	The number of Bytes
Single data (1st data) 24 to 88 bytes	1-1	Signature (0x24,0x24,0x24,0x24)	BYTE	4
	1-2	CAN data recording mode 0: Designated ID mode, 1: All ID mode	BYTE	1
	1-3	Number of valid data bytes (0 to 64)	BYTE	1
	1-4	Communication condition No. 0 to (*2)	BYTE	1
	1-5	ID format 0: CAN standard, 1: CAN extension, 2: CAN FD standard, 3: CAN FD extension	BYTE	1
	1-6	Measurement Message number (*3) 0 to: In all ID modes, 0xFFFF	WORD	2
	1-7	Reserved	char	2
	1-8	Message ID	DWORD	4
	1-9	Internal counter value (*4)	UINT64	8
	1-10	CAN data	BYTE	0 to 64
・	・	・	・	・
Single data ("N"th data(*1)) 24 to 88 bytes	N-1	Signature (0x24,0x24,0x24,0x24)	BYTE	4
	N-2	CAN data recording mode 0: Designated ID mode, 1: All ID mode	BYTE	1
	N-3	Number of valid data bytes (0 to 64)	BYTE	1
	N-4	Communication condition No. 0 to (*2)	BYTE	1
	N-5	ID format 0: CAN standard, 1: CAN extension, 2: CAN FD standard, 3: CAN FD extension	BYTE	1
	N-6	Measurement Message number (*3) 0 to: In all ID modes, 0xFFFF	WORD	2
	N-7	Reserved	char	2
	N-8	Message ID	DWORD	4
	N-9	Internal counter value (*4)	UINT64	8
	N-10	CAN data	BYTE	0 to 64

(*1) If the collected CAN data is for N data

(*2) The Communication condition of the CAN conditions is checked from the top to see if they are used for measurement, and the consecutively numbered 0, 1 in order, and the number is defined as the Communication condition No.
For example, if a CAN condition is such that only Communication condition 2 (port 2) is used for measurement, 0 is stored in the Communication condition No. for CAN data measured at port 2.
If any of the following applies, the Communication condition is judged to be used for measurement.
・It is set to "Port No." of Message condition that is measurement ON.
・The "CAN data recording mode" of the Communication condition is set to "All ID mode".
For the Communication conditions, see "9-2-6 Communication conditions 1 to 2".
For the Message conditions, see "9-2-8 Message conditions (No.0 to No.1023)".

(*3) The Message condition of the CAN condition is checked from the top, and the Message condition of the measurement ON is consecutively numbered 0, 1, 2, ... in order, and the number is defined as the measurement Message number.
For the Message conditions, see "9-2-8 Message conditions (No.0 to No.1023)".
[Example]
Suppose as follows.
・The number of messages to be measured: 2
・Message conditions (No.100): Measurement ON
・Message conditions (No.200): Measurement ON
The measurement Message number, attached to the obtained CAN data, and Message conditions, pre-set in the CAN conditions, are as follows.
- If the "Measurement Message number" of the CAN data is "0", the data is the CAN data recording by the contents set in No. 100 of the Message condition in the CAN condition.
- If the "Measurement Message number" of the CAN data is "1", the data is the CAN data recording by the contents set in No. 200 of the Message condition in the CAN condition.

(*4) A counter for time stamping that operates at 100 kHz or 65536 Hz, separate from the sampling clock.

○GPS status details

Classification	No.	Contents		Types of Variables	The number of Bytes
Response data 21	1	Latitude (+: North latitude, -: South latitude) (-90.0000 to 90.0000)		double	8
	2	Longitude (+: East longitude, -: West longitude) (-180.0000 to 180.0000)		double	8
	3	The number of satellites (0 to 12)		BYTE	1
	4	Positioning state (0: ERROR, 1: OK)		BYTE	1
	5	Reserved		char	6
	6	Current date and time (UTC)	Year (2011 to 2099)	WORD	2
			Month (1 to 12)	BYTE	1
			Day (1 to 31)	BYTE	1
			Hour (0 to 23)	BYTE	1
			Minute (0 to 59)	BYTE	1
			Second (0 to 59)	BYTE	1
			Millisecond 0: 0 msec 2: 200 msec 4: 400 msec 6: 600 msec 8: 800 msec	BYTE	1
	7	Speed (0 to 1851.8148 km/h)		Float	4
	8	Angle (TN: 0 degree) (0 to 359.9)		Float	4
	9	Reserved		char	4
	10	Altitude above sea level (-9999.9 to 99999.9)		Float	4
	11	Geoidal height (-999.9 to 9999.9)		Float	4
	12	Horizontal dilution of precision (0.5 to 99.9)		Float	4
	13	Position dilution of precision (0.5 to 99.9)		Float	4
	14	Vertical dilution of precision (0.5 to 99.9)		Float	4
	15	Reserved		char	64
Total bytes					128

● Monitor data(analog/counter) assignment

For analog CH, monitor data is 1CH = 4 bytes.

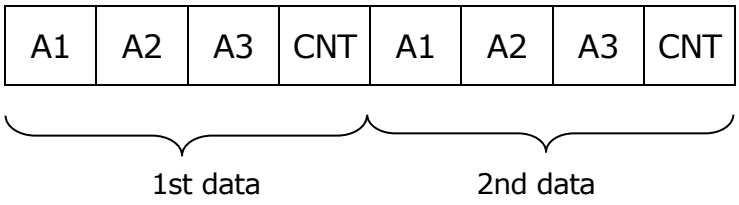
The monitor data of one sampling is assigned in due order from analog CH1, CH2, and CH3.

[Example]

When measuring 3 analog data (CH1, CH2, CH3) and enabled timestamp counter (CNT) assignment for 2 sampling events.

・Total size of the monitor data

(analog 3CH × 4 bytes +) × 2 times = 24 bytes



● When monitor data output mode of the SMD command is 0 to 1 in synchronous operation

For obtaining the monitor data in synchronous operation, firstly obtain the monitor data of the master CTRS. Then, obtain the monitor data of the slave CTRS. For the master CTRS, the general method is used for sending the GMD command. However, for the slave CTRS, the GMD command is sent by the following method.

(1) Receives the response data (monitor data) after sending the GMD command to the master CTRS.

(2) When receiving the response data, temporarily store the monitor data point value of header section.

(3) Substitutes the monitor data point value stored in the header section (item 2) when the GMD command is sent to the slave CTRS. If unusual value is specified for the monitor data point, the slave CTRS returns only the header section (no monitor data).

(4) Receives the response data (monitor data) of the CTRS command. The above monitor data is synchronizing with the monitor data of the master CTRS.

● When monitor data output mode of the SMD command is -1.

If the GMD command is executed in the above status, only the header section (no monitor data) is returned.

● When the A/D conversion is not available status.

If the GMD command is executed in the above status, only the header section (no monitor data) is returned.

● When the CTRS status is "Discontinuous monitor data" status.

When the CTRS status is "Discontinuous analog monitor data" or "Discontinuous CAN monitor data" status at executing the GMD command, the response data of the GMD command is header section only (no monitor data).

If you want to clear discontinuous monitor data status, set the parameter1 "0xFFFFFFFF" and send the GMD command.

In synchronous operation, when CTRS status is discontinuous monitor data status, the synchronous monitor data of every unit will not be obtained. At that time, set the parameter1 "0xFFFFFFFF" and send the GMD command to all slave units. Then, set the parameter1 "0xFFFFFFFF" and send the GMD command to the master unit.

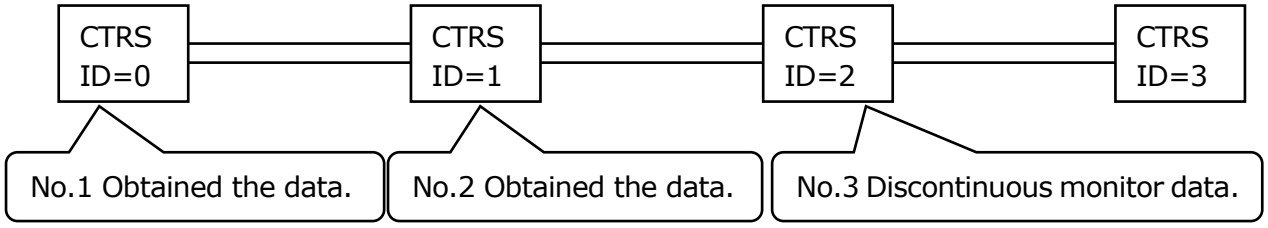
After then, obtain the monitor data from the master unit to slave units again. You will obtain the synchronous monitor data of every unit.

[Example]

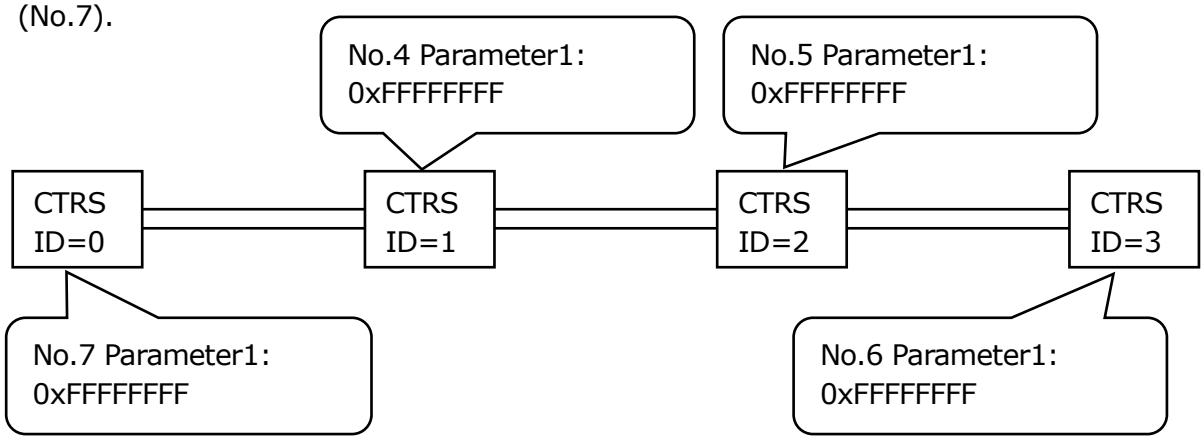
Synchronous operation: 4 units

Slave CTRS (ID=2) status is discontinuous monitor data status.

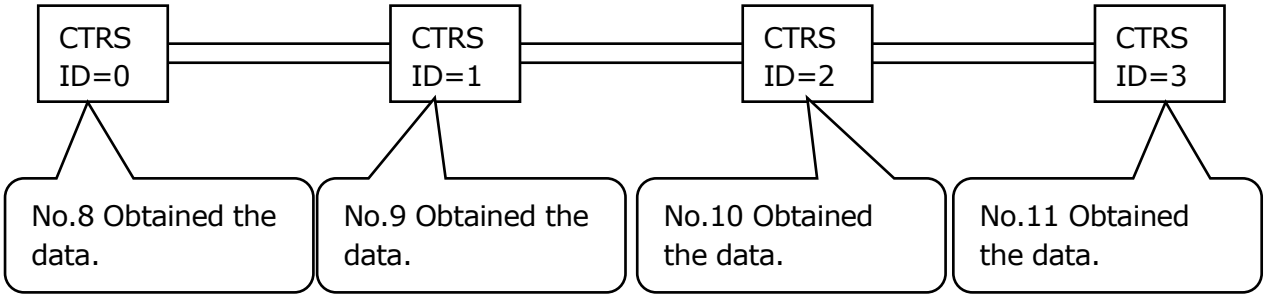
1. When obtaining the monitor data from the master unit to slave units(No.1, 2), the slave CTRS (ID=2) status is discontinuous monitor data status (No.3).



2. Set the parameter1 "0xFFFFFFFF" and send the GMD command to all slave units (No.4,5,6). Then, set the parameter1 "0xFFFFFFFF" and send the GMD command to the master unit (No.7).



3. Obtain the monitor data from the master unit to slave units again (No.8,9,10,11). You will obtain the synchronous monitor data of every unit.



MEMO

・Monitor data of the CTRS is sent to the PC through the internal 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 CTRS status of the "Discontinuous monitor analog data" or "Discontinuous monitor CAN data" is set to have the A/D data in discontinuous state.

・With the discontinuous monitor data status set in the CTRS, no new monitor data is stored in the internal FIFO memory. If the discontinuous monitor data status is cleared, data in the internal FIFO memory is also cleared to newly store the monitor data.

・The maximum storage time of the internal analog FIFO memory is roughly calculated by the following calculation formula.

・Counter assignment to measurement data is invalid.
FIFO storage available time [sec]
= 4194304 / ((4×the number of analog channels to be measured)×
sampling frequency [Hz])

・Counter assignment to measurement data is valid.
FIFO storage available time [sec]
= 4194304 / ((4×the number of analog channels to be measured + 8)×
sampling frequency [Hz])

[Example]
Suppose the number of channels to be measured is 32, sampling frequency is 1 kHz
4194304 / (4×32×1000) = Approx. 32.8 [sec]

・The physical value can be calculated from analog monitor data using the following formula.

Physical value = Monitor data×Range value / AD full scale value×Calibration coefficient
×Cable coefficient + Offset + Offset zero value
(Offset zero value is added only when "Offset zero ON/OFF" in "No.30 CH Condition" is "1:ON.)

For range value, refer to "No.30 CH Condition" in "8-1 MEASURING CONDITION FORMAT" together with the response data of the RUI command. For AD full scale value, refer to the response data of the RUI command, and for other values, refer to "No.30 CH Condition" in "8-1 MEASURING CONDITION FORMAT".

● CAN data

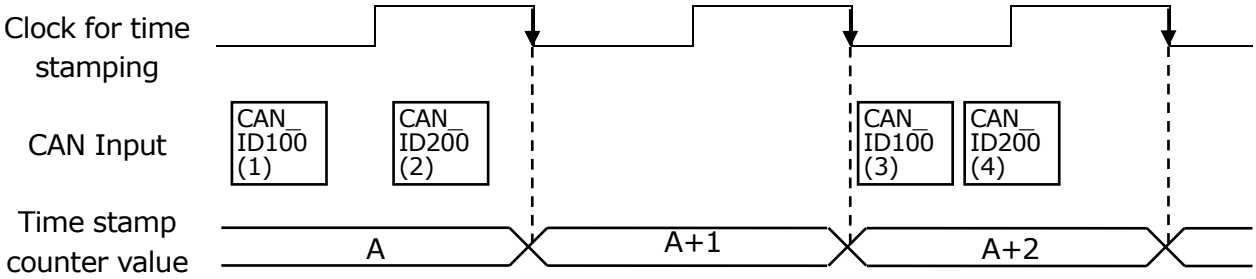
Unlike other CH data, CAN data is not always recorded at every sampling, but only when a CAN data frame is received.

Therefore, a time stamp counter value indicating the timing of CAN data reception is assigned to the CAN data. The time stamp counter value is counted by a 100kHz or 65536 Hz clock generated from a source with a sampling frequency, thus ensuring time synchronization with the analog data.

[Example]

CAN data timing and data assignment

CAN conditions: CAN_ID100 (Message conditions No.100)
CAN_ID200 (Message conditions No.200)



When a CAN input is received at the CAN unit at the timing shown in the above figure, the data sequence will be as follows, assuming the counter value at the falling edge of the first time stamp clock is A.

Message number 0(1)			Message number 1(2)		
Measure Message number =0	Time stamp counter value =A	CAN_ ID100 (1) data	Measure Message number =1	Time stamp counter value =A	CAN_ ID200 (2) data

Message number 0(3)			Message number 1(4)		
Measure Message number =0	Time stamp counter value =A+2	CAN_ ID100 (3) data	Measure Message number =1	Time stamp counter value =A+2	CAN_ ID200 (4) data

● Analog data and CAN data

This section describes the data assignment, analog data, and CAN data, based on the following conditions.

[Example]

Sampling frequency:	1 kHz (sampling period: 0.001[sec])
Clock frequency for time stamp counter:	100 kHz
CH conditions:	A1, A2
Counter for time stamp:	CNT
CAN consitions:	CAN_ID0(Message conditions No.0), CAN_ID1(Message conditions No.1)

Obtain the monitor data between "0" and "400" of the "time stamp counter value" (0.000 to 0.004 [sec]).

"Measurement Message number" of the first data of CAN data is "0" and "Time stamp counter value" is "100".

"Measurement Message number" of the first data of CAN data is "1" and "Time stamp counter value" is "200".

"Measurement Message number" of the first data of CAN data is "0" and "Time stamp counter value" is "400".

The data assignment is as follows.

A1(1)	A2(1)	CNT(1) =0	A1(2)	A2(2)	CNT(2) =100

1st data　　2nd data

A1(3)	A2(3)	CNT(3) =200	A1(4)	A2(4)	CNT(4) =300

3rd data　　4th data

A1(5)	A2(5)	CNT(5) =400	CAN_ID0(1)		
			Measure Message number=0	Time stamp counter value =100	CAN_ID0 data

5th data　　1st data of CAN data

CAN_ID1(2)			CAN_ID0(3)		
Measure Message number =1	Time stamp counter value =200	CAN_ID1 data	Measure Message number =0	Time stamp counter value =400	CAN_ID0 data

2nd data of CAN data　　3rd data of CAN data

The data reproducing positions are as follows.

Time[sec]	Analog data, counter for time stamp	CAN data
0.000	A1(1), A2(1), CNT(1)	
0.001	A1(2), A2(2), CNT(2)	CAN_ID0(1)
0.002	A1(3), A2(3), CNT(3)	CAN_ID1(2)
0.003	A1(4), A2(4), CNT(4)	
0.004	A1(5), A2(5), CNT(5)	CAN_ID0(3)

● GPS status

If a GPS unit is used, the GPS status can be obtained when the GMD command is executed.

● GPS data

If a GPS unit is used, the GPS data can be obtained when the GMD command is executed. GPS data is stored in NMEA format.

7-3-13 Load Peak/Valley 400 data (GPV)

Load Peak/Valley 400 data.

- Command: GPV
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When executing ♦♦♦

- The number of transferred bytes: 3 bytes
- Parameter: NONE

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

● Response data: 3408 bytes×1 to 32CH=3408 to 109056 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Peak/Valley is valid/invalid 0: Invalid, 1: Valid	WORD	2
		Reserved	char	14
		Maximum value of recording data If Peak/Valley is invalid: 8192000	long	4
		Number of peaks detected	short	2
		Reserved	char	10
		Peak data 1	long	4
		Peak data 2 to 5	—	16
		Reserved	char	12
		Peak data point 1	UINT64	8
		Peak data point 2 to 5	—	32
		Reserved	char	8
		Peak400 data	long	4×400=1600
		Minimum value of recording data If Peak/Valley is invalid: -8192000	long	4
		Number of valleys detected	short	2
		Reserved	char	10
		Valley data 1	long	4
		Valley data 2 to 5	—	16
		Reserved	char	12
		Valley data point 1	UINT64	8
		Valley data point 2 to 5	—	32
		Reserved	char	8
		Valley 400 data	long	4×400=1600
	Peak/Valley 400 data for CH1		—	3408
	・		・	・
	Peak/Valley 400 data for CH32		—	3408
Total number of response data bytes				3408 to 109056

MEMO

・Peak / Valley processing is not executed under the following conditions.
  ・Trigger measurement mode
  ・PAUSE function is valid.

7-3-14 Execute manual CAN output (ECO)

Outputs the CAN manually by the CAN unit.
The slave CTRS unit outputs the CAN manually when sending the command to the synchronous master.

- Command: ECO
- Target CTRS: Stand-alone, and master

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

MEMO

・The CTRS outputs CAN data based on the "CAN output conditions (Manual output conditions)" in the CAN conditions. Note that the CTRS outputs nothing when all conditions are OFF.
For details, see "No.28 CAN output conditions (General conditions)" and "No.32 CAN output conditions (Manual output conditions)" in "9 CAN CONDITION FORMAT".

7-3-15 Manual CAN output by any one condition (CMO)

Execute manual CAN output of any one condition by CAN unit.

- Command: CMO
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 99 bytes
- Parameter: See the table below.

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Command Name	CMO		char	3
2	Parameter 1	CAN output conditions	Reserved	char	1
			Output ID format	BYTE	1
			Output data length	BYTE	1
			Output port number	BYTE	1
			Reserved	char	8
			Output Message ID	DWORD	4
			Output data	BYTE	64
			Reserved	char	16
Total number of transferred bytes					99

- Response data: Standard type (1 byte)

MEMO

・Even if this command is executed, "No.32 CAN output conditions(Manual output conditions)" in "9 CAN CONDITION FORMAT" will not be changed.
・If a port number that is set to the listen only mode is specified, CAN output is not executed. In this case, 0 (Normally ended) is returned as the response data.

7-3-16 Execute/load/stop the CAN output test (CSC)

Executes the CAN output test by the CAN unit. The CSC command is available when the A/D conversion in stop status. The CTRS executes the CAN output test based on the pre-set CAN conditions.
You can check the confirmation and communication error by executing the "CAN output test" actually.
Depending on the parameters of the output test target, the slave CTRS unit executes the CAN output test when sending the command to the synchronous master.

- Command: CSC
- Target CTRS: Stand-alone, and master

♦♦♦ When outputting ♦♦♦

- The number of transferred bytes: 8 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	CSC	char	3
2	Parameter 1	Parameter mode 0x00: Load, 0x01: Execute, 0x02: Stop Set 0x01.	BYTE	1
3	Parameter 2	Output test target (in binary digit) 0x00: ID0 to 3, 0x01: ID0, 0x02: ID1, 0x04: ID2, 0x08: ID3	BYTE	1
4	Parameter 3	Output mode(in binary digit) 0x00: Output of all conditions 0x01: Output at start 0x02: Output at stop 0x04: Interval output 0x08: Manual output	BYTE	1
5	Parameter 4	Reserved	char	2
Total number of transferred bytes				8

- Response data: Standard type (1 byte)

MEMO

・When executing the multiple "CAN output test", the CTRS executes the "Output at start" → "Output at stop" → "Interval output" → "Manual output".
・While executing the "CAN output test", "System running (Busy)" flag (0x00000200) would be set at the CTRS status. Make sure the "CAN output test" completes correctly by checking this flag. For details, see "5-3 CTRS STATUS"

※Depending on the contents of the CAN output condition setting and the presence or absence of response confirmation, the maximum CAN output test time is about 256 seconds.

[Example]

When all conditions (32 conditions for output at start, 32 conditions for output at stop, 32 conditions for interval output, and 32 conditions for output at manual) are set to output ON, response confirmation ON, timeout time 1000 [msec], and interval to next output 1000 [msec], executing an output test in all output modes by this command will take about 256 [sec] if no response is obtained in all conditions.

4[Output mode]×32[conditions]×(1000[msec]+1000[msec]) = 256[sec]

♦♦♦ 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 Name	CSC	char	3
2	Parameter 1	Parameter mode 0x00: Load, 0x01: Execute, 0x02: Stop Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 512 bytes

No.	Name	Contents(*1)			Types of Variables	The Number of Bytes
1	Response data 1	Result of master	Result of output at start	Condition No.1 result	char	1
				Condition No.2 result	char	1
				・	・	・
				Condition No.32 result	char	1
			Result of output at stop	Condition No.1 result	char	1
				Condition No.2 result	char	1
				・	・	・
				Condition No.32 result	char	1
			Result of interval output	Condition No.1 result	char	1
				Condition No.2 result	char	1
				・	・	・
				Condition No.32 result	char	1
			Result of manual output	Condition No.1 result	char	1
				Condition No.2 result	char	1
				・	・	・
				Condition No.32 result	char	1
2	Response data 2	Result of slave 1				128
3	Response data 3					・
4	Response data 4	Result of slave 3				128
Total number of response data bytes						512

(*1) Details of the result data

0	:	No CAN unit
1	:Not a target	CAN output OFF, Not tested
2	:Output error	CAN output failed
3	:Before Execution	Before test run
4	:OK	No communication error, response received
5	:NG	Timeout (no response)

♦♦♦ When stoping ♦♦♦

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

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	CSC	char	3
2	Parameter 1	Parameter mode 0x00: Load, 0x01: Execute, 0x02: Stop Set 0x02.	BYTE	1
Total number of transferred bytes				4

● Response data: Standard type (1 byte)

MEMO

・If the connection between the PC and the CTRS is broken during the CAN output test, the CTRS will automatically stop the output test.

7-3-17 Execute/load/stop CAN communication speed research automatically (ACT)

Receives CAN data that is actually flowing and research the communication speed.
This command is valid only when A/D is stopped.
When this command is sent to the master, the automatic CAN communication speed survey of the slave CTRS is also executed.

● Command: ACT
● Target CTRS: Stand-alone, and master

♦♦♦ When executing ♦♦♦

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

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	ACT	char	3
2	Parameter 1	Parameter mode 0x00: Load, 0x01: Execute, 0x02: Stop Set 0x01.	BYTE	1
Total number of transferred bytes				4

● Response data: Standard type (1 byte)

MEMO

・In order to investigate the communication speed using the data actually flowing on the bus, connect the bus on which CAN data is flowing to each port of the CAN unit to be investigated.
・During execution, the "System running (Busy)" flag in the CTRS status is set.
For details, see "5-3 CTRS STATUS"

♦♦♦ 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 Name	ACT	char	3
2	Parameter 1	Parameter mode 0x00: Load, 0x01: Execute, 0x02: Stop Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 128 bytes

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Master CAN unit communication conditions	Result of research 0: No CAN unit 1: Executing 2: End of research	BYTE	1
			Communication speed(0 to 12)	BYTE	1
			CAN FD data bit rate(0 to 5)	BYTE	1
			Reserved	char	5
			Port 1 communication conditions		8
			Port 2 communication conditions		8
			Reserved		16
			Total		32
2	Response data 2	Slave 1 CAN unit communication conditions			32
3	Response data 3	Slave 2 CAN unit communication conditions			32
4	Response data 4	Slave 3 CAN unit communication conditions			32
Total number of response data bytes					128

MEMO

- For the setting values of communication speed and CAN FD data bit rate, refer to "No.23 Communication Condition" in "9 CAN CONDITION FORMAT".
- To reflect the investigation results in the communication conditions, execute the MES command based on the response data at the time of reading.
- The items communication speed and CAN FD data bit rate are valid only when "Result of research" is "2: End of research".
- When the "Result of research" is "1: Executing", if the "System running (Busy)" of the CTRS status is cleared, it indicates that the communication speed could not be investigated correctly.

♦♦♦ When stoping ♦♦♦

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

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	ACT	char	3
2	Parameter 1	Parameter mode 0x00: Load, 0x01: Execute, 0x02: Stop Set 0x02.	BYTE	1
Total number of transferred bytes				4

● Response data: Standard type (1 byte)

MEMO

・If the connection between the PC and the CTRS is broken while the communication speed research is running, the CTRS will automatically stop the speed search.

7-3-18 Insert/load marker (IMK)

Inserts and reads markers into the recording file.

● Command: IMK
● Target CTRS: Stand-alone, and master

♦♦♦ When inserting ♦♦♦

● The number of transferred bytes: 20 bytes
● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	IMK	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Executing) Set 0x01.	BYTE	1
3	Parameter 2	Marker specification (in binary digit 0x0001 to 0x0200)	WORD	2
4	Parameter 3	Reserved	char	14
Total number of transferred bytes				20

● Response data: Standard type (1 byte)

♦♦♦ 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 Name	IMK	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Executing) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 16 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Total number of markers 1 inserted	BYTE	1
・	・	・	・	
10	Response data 10	Total number of markers 10 inserted	BYTE	1
11	Response data 11	Reserved	char	6
Total number of response data bytes				16

MEMO

・This command is valid during recording.
・During synchronous operation, markers are only inserted for the master.
・Each marker can be inserted in a given recorded file up to 255 times.

7-3-19 Set/load the keylock status (LOC)

Locks the buttons on the remote control unit and loads the locked status.

- Command: LOC
- Target CTRS: Stand-alone, and master

♦♦♦ When setting ♦♦♦

- The number of transferred bytes: 8 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	LOC	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Keylock status (1: Valid, 0: Invalid) (0x01: REC, 0x02: STOP, 0x04: BAL, 0x08: READ, 0x10: OPTION1, 0x20: OPTION2)	BYTE	1
4	Parameter 3	Reserved	char	3
Total number of transferred bytes				8

- Response data: Standard type (1 byte)

♦♦♦ 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 Name	LOC	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

- Response data: 4 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Keylock status (1: Valid, 0: Invalid) (0x01: REC, 0x02: STOP, 0x04: BAL, 0x08: READ, 0x10: OPTION1, 0x20: OPTION2)	BYTE	1
2	Response data 2	Reserved	char	3
Total number of response data bytes				4

MEMO

・The current keylock status is cleared when a connection with the PC is disconnected.
・For slaves, regardless of the LOC command, all keylock settings are ignored.

7-3-20 Set/load the time (TIM)

Sets and loads the date and time.

- Command: TIM
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

- The number of transferred bytes: 20 bytes
- Parameter: See the table below.

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Command Name	TIM		char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.		BYTE	1
3	Parameter 2	Date	Year (2019 to 2099)	WORD	2
			Month (1 to 12)	BYTE	1
			Day (1 to 31)	BYTE	1
			Hour (0 to 23)	BYTE	1
			Minute (0 to 59)	BYTE	1
			Second (0 to 59)	BYTE	1
4	Parameter 3	Reserved		char	9
Total number of transferred bytes					20

- Response data: Standard type (1 byte)

MEMO

・Although the time can be set for slaves directly, when starting the measurement by synchronous operation, the time will be automatically set to the time of the master.
・When the CTRS status "Time adjustment status by GPS" is set, time cannot be set by the TIM1 command.

♦♦♦ 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 Name	TIM	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 16 bytes

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Date	Year (2019 to 2099)	WORD	2
			Month (1 to 12)	BYTE	1
			Day (1 to 31)	BYTE	1
			Hour (0 to 23)	BYTE	1
			Minute (0 to 59)	BYTE	1
			Second (0 to 59)	BYTE	1
2	Response data 2	Reserved		char	9
Total number of response data bytes					16

7-3-21 Load the system information (SYS)

Loads the system information of the CTRS.

- Command: SYS
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 3 bytes
- Parameter: None

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

● Response data: 5312 bytes

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Unit information (Main unit)	Model name	char	32
			CPU version	char	16
			FPGA version	char	16
			Unit type No.	BYTE	1
			Equipment ID No.	BYTE	1
			Unit class No.	BYTE	1
			Unit group no.	BYTE	1
			Reserved	char	12
		Total of unit information (Main unit)		—	80
2	Response data 2	Unit information (Measuring unit 1)		—	80
・	・	・		・	・
8	Response data 8	Unit information (Measuring unit 7)		—	80
9	Response data 9	Unit information (Measuring unit 8)		—	80
10	Response data 10	Unit information (Expansion unit 1)		—	80
・	・	・		・	・
14	Response data 11	Unit information (eExpansion unit 5)		—	80
15	Response data 12	Reserved		char	240
16	Response data 13	Unit information (Remote control unit)		—	80
17	Response data 14	Reserved		char	160
18	Response data 15	Detailed information 1(Main unit)		char	128
・	・	・		・	・
27	Response data 27	Detailed information 10(Main unit)		char	128
28	Response data 28	Detailed information (Measuring unit 1)		char	128
・	・	・		・	・
34	Response data 34	Detailed information (Measuring unit 7)		char	128
35	Response data 35	Detailed information (Measuring unit 8)		char	128
36	Response data 36	Detailed information (Expansion unit 1)		char	128
・	・	・		・	・
40	Response data 40	Detailed information (Expansion unit 5)		char	128
41	Response data 41	Reserved		char	384
42	Response data 42	Detailed information (Remote control unit)		char	128
43	Response data 43	Reserved		char	256
Total number of response data bytes					5312

7-3-22　Load the unit information (RUI)

Loads the information of measuring units supported or installed for the CTRS.

- Command: RUI
- Target CTRS: Stand-alone, master, and slave

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

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	RUI	char	3
2	Parameter 1	Specify the unit information. -1: Connected unit information (fixed to eight units' worth of information) 0 or higher: Measuring unit type No. (specified unit information)	short	2
Total number of transferred bytes				5

● Response data: 10000 or 80000 bytes

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Measuring unit 1	Model name	char	32
			Unit type No.	BYTE	1
			Unit class No.	BYTE	1
			Unit group No.	BYTE	1
			Maximum supported type No.	BYTE	1
			The number of modes (maximum 10)	BYTE	1
			Reserved	char	11
			The number of low pass filter (maximum 16) Mode No.1	BYTE	1
			・	・	・
			The number of low pass filter (maximum 16) Mode No.10	BYTE	1
			Reserved	char	6
			The number of high pass filter (maximum 4) Mode No.1	BYTE	1
			・	・	・
			The number of high pass filter (maximum 4) Mode No.10	BYTE	1
			Reserved	char	6
			The number of balance (maximum 4) Mode No.1	BYTE	1
			・	・	・
			The number of balance (maximum 4) Mode No.10	BYTE	1
			Reserved	char	6
			The number of range (maximum 10) Mode No.1	BYTE	1
			・	・	・
			The number of range (maximum 10) Mode No.10	BYTE	1
			Reserved	char	6
			Low pass filter AUTO setting number (Mode No.1) -1: No AUTO 0 to: AUTO setting number	char	1
			・	・	・
			Low pass filter AUTO setting number (Mode No.10)	char	1
			Reserved	char	6

[From the previous page]

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Measuring unit 1	The number of any range setting step Mode No.1 0: Can not be set 1 to 4: Number of steps	BYTE	1
			・	・	・
			The number of any range setting step Mode No.10	BYTE	1
			Reserved	char	6
			Any range setting Mode No.1 — Setting range Step No.1	DWORD	4
			Any range setting Mode No.1 — Step value Step No.1	DWORD	4
			Any range setting Mode No.1 — ・	・	・
			Any range setting Mode No.1 — Setting range Step No.4	DWORD	4
			Any range setting Mode No.1 — Step value Step No.4	DWORD	4
			Any range setting Mode No.2	—	32
			・	・	・
			Any range setting Mode No.10	—	32
			Mode string Japanese (16 bytes/1 item×10=160)	char	160
			Mode string English (16 bytes/1 item×10=160)	char	160

[From the previous page]

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Measuring unit 1	Low pass filter string(Mode No.1) (16 bytes/1 item×16=256)	char	256
			・	・	・
			Low pass filter string(Mode No.10)	char	256
			High pass filter string(Mode No.1) (16 bytes/1 item×4=64)	char	64
			・	・	・
			High pass filter string(Mode No.10)	char	64
			Balance string(Mode No.1) (16 bytes/1 item×4=64)	char	64
			・	・	・
			Balance string(Mode No.10)	char	64
			Range string Japanese(Mode No.1) (16 bytes/1 item×10=160)	char	160
			・	・	・
			Range string Japanese(Mode No.10)	char	160
			Range string English(mode No.1) (16 bytes/1 item×10=160)	char	160
			・	・	・
			Range string English(mode No.10)	char	160
			Range unit Japanese (16 bytes/1 item×10=160)	char	160
			Range unit English (16 bytes/1 item×10=160)	char	160
			Range value(Mode No.1) (16 bytes/1 item×10=160)	char	160
			・	・	・
			Range value(Mode No.10)	char	160

[From the previous page]

No.	Name	Contents		Types of Variables	The Number of Bytes
	Response data 1	Measuring unit 1	AD full scale value	DWORD	4
			Reserved	char	4
			Magnification when setting to range value (Mode No.1)	DWORD	4
			・	・	・
			Magnification when setting to range value (Mode No.10)	DWORD	4
			Any range minimum value (Mode No.1)	DWORD	4
			・	・	・
			Any range minimum value (Mode No.10)	DWORD	4
			Input check function(Mode No.1) 0x01: Balance, 0x02: Input resistance check	BYTE	1
			・	・	・
			Input check function(Mode No.10)	BYTE	1
			Mode initial value	BYTE	1
			Range initial value	BYTE	1
			Low pass filter initial value	BYTE	1
			High pass filter initial value	BYTE	1
			Balance initial value	BYTE	1
			Reserved	char	153
			Total number of bytes in measuring unit 1		10000
		・			・
		Total number of bytes in measuring unit 8			10000
Total number of response data bytes					80000

MEMO

・If a value other than -1 is set for parameter 1, only the information of the measuring unit with the type number specified for parameter 1 is stored in response data 1, so the number of response data bytes will be 10,000.

● RUI command response data

The following is an example assuming the information of the built-in strain/voltage measuring unit CTRS-100A and strain/voltage measuring unit CTRS-CDV010A is loaded.

Contents	Built-in strain/voltage measuring unit	Strain/voltage measuring unit
Model name	CTRS-100A	CTRS-CDV010A
Unit type No.	2	3
Unit class No.	1	1
Unit group No.	0	
Maximum supported type No.	※1	
The number of modes	5	
Reserved	All 0	
The number of low pass filter(Strain(2V))	12	
The number of low pass filter(Strain(5V))	12	
The number of low pass filter(Voltage)	12	
The number of low pass filter(Voltage(2V))	12	
The number of low pass filter(Voltage(5V))	12	
The number of low pass filter(No.6 to 10)	All 0	
Reserved	All 0	
The number of high pass filter(Strain(2V))	3	
The number of high pass filter(Strain(5V))	3	
The number of high pass filter(Voltage)	3	
The number of high pass filter(Voltage(2V))	3	
The number of high pass filter(Voltage(5V))	3	
The number of high pass filter(No.6 to 10)	All 0	
Reserved	All 0	
The number of balance(Strain(2V))	3	
The number of balance(Strain(5V))	3	
The number of balance(Voltage)	3	
The number of balance(Voltage(2V))	3	
The number of balance(Voltage(5V))	3	
The number of balance(No.6 to 10)	All 0	
Reserved	All 0	
The number of range(Strain(2V))	7	
The number of range(Strain(5V))	7	
The number of range(Voltage)	7	
The number of range(Voltage(2V))	7	
The number of range(Voltage(5V))	7	
The number of range(No.6 to 10)	全て0	
Reserved	全て0	
Low pass filter AUTO setting number(Strain(2V))	0	
Low pass filter AUTO setting number(Strain(5V))	0	
Low pass filter AUTO setting number(Voltage)	0	
Low pass filter AUTO setting number(Voltage(2V))	0	
Low pass filter AUTO setting number(Voltage(5V))	0	
Low pass filter AUTO setting number(No.6 to 10)	All -1	
Reserved	All 0	

※1　The maximum type number supported by the firmware version used for control.

[From the previous page]

Contents		Value
The number of any range setting step(Strain(2V))		2
The number of any range setting step(Strain(5V))		2
The number of any range setting step(Voltage)		2
The number of any range setting step(Voltage(2V))		2
The number of any range setting step(Voltage(5V))		2
The number of any range setting step(No.6 to 10)		All 0
Reserved		All 0
Any range setting (Strain(2V))	Setting range(Step No.1)	10000
	Step value(Step No.1)	100
	Setting range(Step No.2)	50000
	Step value(Step No.2)	1000
	Setting range(Step No.3 to 4)	All 0
	Step value(Step No.3 to 4)	All 0
Any range setting (Strain(5V))	Setting range(Step No.1)	10000
	Step value(Step No.1)	100
	Setting range(Step No.2)	50000
	Step value(Step No.2)	1000
	Setting range(Step No.3 to 4)	All 0
	Step value(Step No.3 to 4)	All 0
Any range setting (Voltage)	Setting range(Step No.1)	10000
	Step value(Step No.1)	100
	Setting range(Step No.2)	50000
	Step value(Step No.2)	1000
	Setting range(Step No.3 to 4)	All 0
	Step value(Step No.3 to 4)	All 0
Any range setting (Voltage(2V))	Setting range(Step No.1)	10000
	Step value(Step No.1)	100
	Setting range(Step No.2)	50000
	Step value(Step No.2)	1000
	Setting range(Step No.3 to 4)	All 0
	Step value(Step No.3 to 4)	All 0
Any range setting (Voltage(5V))	Setting range(Step No.1)	10000
	Step value(Step No.1)	100
	Setting range(Step No.2)	50000
	Step value(Step No.2)	1000
	Setting range(Step No.3 to 4)	All 0
	Step value(Step No.3 to 4)	All 0
Any range setting (No.6 to 10)	Setting range(Step No.1 to 4)	All 0
	Step value(Step No.1 to 4)	All 0

[From the previous page]

Contents	Value
Mode string Japanese	ひずみ(2V)，ひずみ(5V)，電圧，電圧(2V)，電圧(5V)
Mode string English	Strain(2V), Strain(5V), Voltage, Voltage(2V), Voltage(5V)
Low pass filter string(Strain(2V))	AUTO, FLAT, 10kHz, 5kHz, 2kHz, 1kHz, 500Hz, 200Hz, 100Hz, 50Hz, 20Hz, 10Hz
Low pass filter string(Strain(5V))	AUTO, FLAT, 10kHz, 5kHz, 2kHz, 1kHz, 500Hz, 200Hz, 100Hz, 50Hz, 20Hz, 10Hz
Low pass filter string(Voltage)	AUTO, FLAT, 10kHz, 5kHz, 2kHz, 1kHz, 500Hz, 200Hz, 100Hz, 50Hz, 20Hz, 10Hz
Low pass filter string(Voltage(2V))	AUTO, FLAT, 10kHz, 5kHz, 2kHz, 1kHz, 500Hz, 200Hz, 100Hz, 50Hz, 20Hz, 10Hz
Low pass filter string(Voltage(5V))	AUTO, FLAT, 10kHz, 5kHz, 2kHz, 1kHz, 500Hz, 200Hz, 100Hz, 50Hz, 20Hz, 10Hz
Low pass filter string(No.6 to 10)	All 0
High pass filter string(Strain(2V))	OFF, 0.2Hz, 1Hz
High pass filter string(Strain(5V))	OFF, 0.2Hz, 1Hz
High pass filter string(Voltage)	OFF, 0.2Hz, 1Hz
High pass filter string(Voltage(2V))	OFF, 0.2Hz, 1Hz
High pass filter string(Voltage(5V))	OFF, 0.2Hz, 1Hz
High pass filter string(No.6 to 10)	All 0
Balance string(Strain(2V))	OFF, ON, NONE
Balance string(Strain(5V))	OFF, ON, NONE
Balance string(Voltage)	OFF, ON, NONE
Balance string(Voltage(2V))	OFF, ON, NONE
Balance string(Voltage(5V))	OFF, ON, NONE
Balance string(No.6 to 10)	All 0
Range string Japanese(Strain(2V))	1kμε, 2kμε, 5kμε, 10kμε, 20kμε, 50kμε, OFF
Range string Japanese(Strain(5V))	1kμε, 2kμε, 5kμε, 10kμε, 20kμε, 50kμε, OFF
Range string Japanese(Voltage)	1.0V, 2.0V, 5.0V, 10.0V, 20.0V, 50.0V, OFF
Range string Japanese(Voltage(2V))	1.0V, 2.0V, 5.0V, 10.0V, 20.0V, 50.0V, OFF
Range string Japanese(Voltage(5V))	1.0V, 2.0V, 5.0V, 10.0V, 20.0V, 50.0V, OFF
Range string Japanese(No.6 to 10)	All 0
Range string English(Strain(2V))	1kum/m, 2kum/m, 5kum/m, 10kum/m, 20kum/m, 50kum/m, OFF
Range string English(Strain(5V))	1kum/m, 2kum/m, 5kum/m, 10kum/m, 20kum/m, 50kum/m, OFF
Range string English(Voltage)	1.0V, 2.0V, 5.0V, 10.0V, 20.0V, 50.0V, OFF
Range string English(Voltage(2V))	1.0V, 2.0V, 5.0V, 10.0V, 20.0V, 50.0V, OFF
Range string English(Voltage(5V))	1.0V, 2.0V, 5.0V, 10.0V, 20.0V, 50.0V, OFF
Range string English(No.6 to 10)	All 0

[From the previous page]

Contents	Value
Range unit Japanese	μ ε , μ ε , V, V, V
Range unit English	um/m, um/m, V, V, V
Range value(Strain(2V))	1000,2000,5000,10000,20000,50000,0
Range value(Strain(5V))	1000,2000,5000,10000,20000,50000,0
Range value(Voltage)	1,2,5,10,20,50,0
Range value(Voltage(2V))	1,2,5,10,20,50,0
Range value(Voltage(5V))	1,2,5,10,20,50,0
Range value(No.6 to 10)	All 0
AD full scale value	8192000
Magnification when setting to range value (Strain(2V))	1
Magnification when setting to range value (Strain(5V))	1
Magnification when setting to range value (Voltage)	1000
Magnification when setting to range value (Voltage(2V))	1000
Magnification when setting to range value (Voltage(5V))	1000
Magnification when setting to range value (No.6 to 10)	All 0
Any range minimum value(Strain(2V))	1000
Any range minimum value(Strain(5V))	1000
Any range minimum value(Voltage)	1000
Any range minimum value(Voltage(2V))	1000
Any range minimum value(Voltage(5V))	1000
Any range minimum value(No.6 to 10)	All 0
Input check function(Strain(2V))	3
Input check function(Strain(5V))	3
Input check function(Voltage)	1
Input check function(Voltage(2V))	1
Input check function(Voltage(5V))	1
Input check function(No.6 to 10)	All 0
Mode initial value	0
Range initial value	0
Low pass filter initial value	5
High pass filter initial value	0
Balance initial value	1
Reserved	All 0

MEMO

- For example, when setting 2.5V as an any range in the "Voltage(2V)" mode, the "Magnification when setting to range value" is 1000, so 2.5×1000 = 2500 is the range value set for the CH condition. In addition, from "Any range minimum value," 1000, to "Setting range(Step No.1)" of "Any range setting," 10000, the range value can be set in increments of "Step value(Step No.1)," 100. In the same way, from 10000 to 50000, the range value can be set in increments of "Step value(Step No.2)," 1000.
- "Input Check Function" will contain following values depending on the type of function that can be performed(in binary digit).
  0x01: Balance, 0x02: Input resistance check, 0x04: Burnout check

7-3-23　Check the device/unit (LED)

Makes the operation-target CTRS LED flash or light up.

● Command: LED
● Target CTRS: Stand-alone, master, and slave

● The number of transferred bytes: 19 bytes
● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	LED	char	3
2	Parameter 1	Target unit (in binary digit) 0: All unit 1 bit: Main unit **(*1)** 2 to 8 bit: Measuring unit 2 to 8 9 to 13 bit: Expansion unit 1 to 5 16 bit: Remote control unit	WORD	2
3	Parameter 2	Specify the flash operation. **(*2)** 0: Reserved 1: Light up in blue (3 seconds) 2: Light up in red (3 seconds) 3: Light up in purple (3 seconds) 4: Flash blue (3 seconds) 5: Flash red (3 seconds) 6: Flash purple (3 seconds)	BYTE	1
4	Parameter 3	Reserved	char	13
Total number of transferred bytes				19

● Response data: Standard type (1 byte)

(*1) Includes measuring unit 1, the CTRS measuring unit.
(*2) If there is no LED of the corresponding color, that LED will be turned off or lit up in one color.

MEMO

・The LED command is not available during A/D conversion.
・The CTRS returns response data after the LED flashing operation ends.

7-3-24 Obtain SD card remaining capacity (FFR)

Checks the remaining capacity of the SD card.

- Command: FFR
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: 16 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Remaining capacity of the SD card	INT64	8
2	Response data 2	Total capacity of the SD card	INT64	8
Total number of response data bytes				16

MEMO

Since the remaining capacity of the SD card is a value after subtracting the system reserve area (approx. 16M bytes), it shall be a value smaller than a value indicated on the PC.

7-3-25 Open file (FOF)

Open the file to be loaded.

NOTE

- Target files are files saved in the data folder in the SD card.
- The command is not able to specify the folder. When multiple same name files exist in the SD card, the command will open any of the files.

- Command: FOF
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 132 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	FOF	char	3
2	Parameter 1	Open mode (0: Load)	BYTE	1
3	Parameter 2	File name Be sure to set the extension.	char	128
Total number of transferred bytes				132

- Response data: Standard type (1 byte)

MEMO

- When the file open results of the response data is '0' (Normally ended), the CTRS status is "Opening the file or finding the file by using the control command." At this time, commands available to be executed are FRF, FSF, and FCF.
- To close the file, execute the FCF command.
- For the CTRS status, see "5-3 CTRS STATUS."

7-3-26 Load file data (FRF)

Loads the file data opened by using the FOF command.

- Command: FRF
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 7 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	FRF	char	3
2	Parameter 1	The number of bytes to be loaded (maximum 2,000,000 bytes)	DWORD	4
Total number of transferred bytes				7

- Response data: 1 byte or 16 bytes + the number of bytes to be loaded

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Loaded result (same as standard type) Only when the loaded result is '0' (Normally ended), values on and after the response data 2 are available.	char	1
2	Response data 2	Reserved	char	3
3	Response data 3	The number of actually loaded bytes (the number of bytes of the response data 5)	DWORD	4
4	Response data 4	Reserved	char	8
5	Response data 5	The loaded data (0 to 2,000,000 bytes)	---	---
Total number of response data bytes				16 to 2,000,016

MEMO

Data size that can be loaded at a time by using the command is maximum 2,000,000 bytes. To load a file exceeding 2,000,000 bytes, repeat the command for the number of required times.

7-3-27 Seek file (FSF)

Changes the loading start position of the file data opened by using the FOF command.

- Command: FSF
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 12 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	FSF	char	3
2	Parameter 1	Loading-start position 0: Head of the file 1: Current loading position 2: End of the file	BYTE	1
3	Parameter 2	Moving amount of file read position	INT64	8
Total number of transferred bytes				12

- Response data: Standard type (1 byte)

NOTE

Although the types variables of ”Moving amount of file read position” in the above parameter 2 is INT64, the actual available range is limited to long (-2,147,483,648 to +2,147,483,647).

7-3-28 Close file (FCF)

Closes the file data opened by using the FOF command.

- Command: FCF
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

MEMO

・When the file close results of the response data is '0' (Normally ended), the CTRS status of the "Opening the file or finding the file by using the control command" is cleared.
・For the CTRS status, see "5-3 CTRS STATUS."

7-3-29 Delete file (FDF)

Deletes the file.

NOTE

・Target files are files saved in the data folder in the SD card.
・The command is not able to specify the folder. When multiple same name files exist in the SD card, the command will delete any of the files.

● Command: FDF
● Target CTRS: Stand-alone, master, and slave

● The number of transferred bytes: 131 bytes
● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	FDF	char	3
2	Parameter 1	File name to be deleted (including the extension)	char	128
Total number of transferred bytes				131

● Response data: Standard type (1 byte)

● Remarks:

Before completing the file deletion, the command sends the response data.
While deleting the file, the CTRS status is "Accessing to the SD card".
To check whether the file deletion is completed or not, check the "Accessing to the SD card" status is cleared.
When the CTRS status is "Accessing to the SD card", sending commands is not available except the "Load the CTRS status".

MEMO

・Capable of deleting files other than the KS3 files.
・To delete files, do not use wildcards including question mark (?) and asterisk (*) in the file names, specified in the parameter.
To delete multiple files, specify every file name and execute the command one by one.

7-3-30 Execute quick format (FMT)

Quick format the SD card.

NOTE

The quick formatting will delete all files and folders, saved in the SD card.

- Command: FMT
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

- Remarks:

Before completing the quick formatting, the command sends the response data.
While quick formatting, the CTRS status is "Accessing to the SD card".
To check whether the quick formatting is completed or not, check the "Accessing to the SD card" status is cleared.
When the CTRS status is "Accessing to the SD card", sending commands is not available except the "Load the CTRS status".

MEMO

The quick formatting will delete the management domain only.

7-3-31 Start finding file (FFF)

Starts finding the file.

NOTE

Target files are saved in the data folder in the SD card.

- Command: FFF
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 131 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	FFF	char	3
2	Parameter 1	File name to be found (including the extension)	char	128
Total number of transferred bytes				131

MEMO

・Question mark (?) or asterisk (*) can be specified to the "file name to be found" in the parameter 1. Question mark '?' is an arbitrary 1-byte character and '*,' an arbitrary character string. (No need to specify ' '.)

[Example 1]
To find all files
Set '*' to the parameter 1.

[Example 2]
To find all files with character string 'TEST' at the head of the file
Set 'TEST*.KS3' to the parameter 1.

[Example 3]
To find all files which executed the analog trigger of synchronous operation master (ID = 0).
Set '*_A*_0.KS3' to the parameter 1.

[Example 4]
To start finding files with the file name of 'TEST' and file No. 20 to file No. 29.
Set 'TEST002?.KS3' to the parameter 1.

● Response data: 1 byte or 160 bytes

No.	Name	Contents			Types of Variables	The Number of Bytes
1	Response data 1	File find result (same as standard type) Only when the loaded result is '0' (Normally ended), values on and after the response data 2 are available.			char	1
2	Response data 2	Reserved			char	3
3	Response data 3	Number of file information			DWORD	4
4	Response data 4	Total number of files			DWORD	4
5	Response data 5	Reserved			char	4
6	Response data 6	File information	File name (including the extension)		char	128
			File size		INT64	8
			File creation date	Year (2019 to)	WORD	2
				Month (1 to 12)	BYTE	1
				Day (1 to 31)	BYTE	1
				Hour (0 to 23)	BYTE	1
				Minute (0 to 59)	BYTE	1
				Second (0 to 59)	BYTE	1
			Reserved		char	1
Total number of response data bytes						160

MEMO

- When the file find results of the response data is '0' (Normally ended), the CTRS status is "Opening the file or finding the file by using the control command." At this time, commands available to be executed are FFN and FFC.
- To end the file finding, execute the FFC command.
- For the CTRS status, see "5-3 CTRS STATUS."

7-3-32 Continue finding file (FFN)

Continues finding the file next to the file started by the FFF command.

- Command: FFN
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When conventional operation ♦♦♦

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: 1 byte or 160 bytes

No.	Name	Contents			Types of Variables	The Number of Bytes
1	Response data 1	File find result (same as standard type) Only when the loaded result is '0' (Normally ended), values on and after the response data 2 are available.			char	1
2	Response data 2	Reserved			char	3
3	Response data 3	Number of file information			DWORD	4
4	Response data 4	Total number of files			DWORD	4
5	Response data 5	Reserved			char	4
6	Response data 6	File information	File name (including the extension)		char	128
			File size		INT64	8
			File creation date	Year (2019 to)	WORD	2
				Month (1 to 12)	BYTE	1
				Day (1 to 31)	BYTE	1
				Hour (0 to 23)	BYTE	1
				Minute (0 to 59)	BYTE	1
				Second (0 to 59)	BYTE	1
			Reserved		char	1
		Number of bytes per file			—	144
Total number of response data bytes						160

MEMO

・When the file find results of the response data is ‘-6’ (No file), the CTRS status of the “Opening the file or finding the file by using the control command” is cleared.
・For the CTRS status, see "5-3 CTRS STATUS."

♦♦♦ When bulk search ♦♦♦

● The number of transferred bytes: 8 bytes

● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	FFN	char	3
2	Parameter 1	Executing mode (0x00: Load result, 0x01: Executing bulk search) Set 0x01.	BYTE	1
3	Parameter 2	Number of search files(1 to 1000)	DWORD	4
Total number of transferred bytes				8

● Response data: Standard type (1 byte)

● Remarks: After executing the FFN command, use the status load command to check the CTRS status.
After checking that the status is not in "System running (Busy)" status, load the checked results.

♦♦♦ 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 Name	FFN	char	3
2	Parameter 1	Executing mode (0x00: Load result, 0x01: Executing bulk search) Set 0x00.	BYTE	1
3	Parameter 2	Reserved	char	4
Total number of transferred bytes				8

● Response data: 1 byte or 160 to 144016 bytes

No.	Name	Contents			Types of Variables	The Number of Bytes
1	Response data 1	File find result (same as standard type) Only when the loaded result is '0' (Normally ended), values on and after the response data 2 are available.			char	1
2	Response data 2	Reserved			char	3
3	Response data 3	Number of file information			DWORD	4
4	Response data 4	Total number of files			DWORD	4
5	Response data 5	Reserved			char	4
6	Response data 6	File information 1 to 1000	File name (including the extension)		char	128
			File size		INT64	8
			File creation date	Year (2019 to)	WORD	2
				Month (1 to 12)	BYTE	1
				Day (1 to 31)	BYTE	1
				Hour (0 to 23)	BYTE	1
				Minute (0 to 59)	BYTE	1
				Second (0 to 59)	BYTE	1
			Reserved		char	1
		Number of bytes per file			—	144
Total number of response data bytes						160 to 144016

MEMO

- Repeatedly alternate between FFN bulk search execution and result loading.
- When a bulk search is executed, if no files that match the search conditions are found, the CTRS status "file currently open or being searched by a control command" is cleared. In addition, when results are loaded, -6 (indicating that no files exist) is stored in response data 1.
- When a bulk search is executed, if the specified number of search files are not found, only the information of the files that match the search conditions is stored as a result. In this case, the CTRS status "file currently open or being searched by a control command" is cleared.
- The information of the number of files specified as the value for response data 3 is stored in response data 6.
- For the CTRS status, see "5-3 CTRS STATUS."

7-3-33 End finding file (FFC)

Ends the finding of files started by the FFF command.

- Command: FFC
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

MEMO

・When the file finding end results of the response data is '0' (Normally ended), the CTRS status of the "Opening the file or finding the file by using the control command" is cleared.
・For the CTRS status, see "5-3 CTRS STATUS."

7-3-34 Delete last recorded data files (FDK)

Deletes the last recorded data files.

- Command: FDK
- Target CTRS: Stand-alone, and master

- The number of transferred bytes: 3 bytes
- Parameter: None

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

- Response data: Standard type (1 byte)

- Remarks:

  Before completing the file deletion, the command sends the response data.
  While deleting the file, the CTRS status is "Accessing to the SD card".
  To check whether the file deletion is completed or not, check the "Accessing to the SD card" status is cleared.
  When the CTRS status is "Accessing to the SD card", sending commands is not available except the "Load the CTRS status".

NOTE

- It can be executed only when the CTRS status "Recording data file exists" is set. After the recording is finished, send a command with A/D conversion in stop status.
- The command is not available during "waiting for interval measurements", "waiting for trigger measurements" or during recording data.
- Delete the last recorded data file. File numbers are decremented.
- Manual measurements (the number of repeat times = 1) or trigger measurements (the number of repeat times = 1) only.

7-3-35 Set/load wireless LAN setting (WLS)

Sets or loads the wireless LAN unit settings.

The setting details are applied the next time the power supply is turned on.

● Command: WLS

● Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

● The number of transferred bytes: 260 bytes

● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	WLS	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Frequency band (0: 2.4GHz, 1: 5GHz)	BYTE	1
4	Parameter 3	Reserved	char	15
5	Parameter 4	SSID(8 to 30 characters)	char	32
6	Parameter 5	Security key(8 to 60 characters)	char	64
7	Parameter 6	Reserved	char	144
Total number of transferred bytes				260

● Response data: Standard type (1 byte)

NOTE

・The characters below can be used for the SSID.
  ・English letters (case sensitive):
    abcdefghijklmnopqrstuvwxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ
  ・Numbers: 0123456789
  ・Symbols: [-] [_]
・The characters below can be used for the security key.
  ・English letters (case sensitive):
    abcdefghijklmnopqrstuvwxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ
  ・Numbers: 0123456789
・Specify the SSID and security key if they are not NULL.
・Settings can only be specified if a wireless LAN unit is connected. If no such unit is connected, nothing is set, and the response data is 0 (indicating a normal end).

♦♦♦ 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 Name	WLS	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 256 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Frequency band (0: 2.4GHz, 1: 5GHz)	BYTE	1
2	Response data 2	DHCP 0：Invalid, 1 to 10: Allocationable number	BYTE	1
3	Response data 3	Reserved	char	2
4	Response data 4	Reserved	char	12
5	Response data 5	SSID(8 to 30 characters)	char	32
6	Response data 6	Security key(8 to 60 characters)	char	64
7	Response data 7	Wireless LAN module firmware version	char	16
8	Response data 8	2.4G wireless LAN CH setting (0 to)	BYTE	1
9	Response data 9	2.4G wireless LAN CH settable number	BYTE	1
10	Response data 10	2.4G wireless LAN CH list	BYTE	30
11	Response data 11	5G wireless LAN CH setting (0 to)	BYTE	1
12	Response data 12	5G wireless LAN CH settable number	BYTE	1
13	Response data 13	5G wireless LAN CH list	BYTE	30
14	Response data 14	Security mode 0: WPA2[AES], 1: WPA[AUTO], 2: WPA[TKIP], 3: None	BYTE	1
15	Response data 15	Country code 1: JP, 2: US, 3: TH	BYTE	1
16	Response data 16	Wireless LAN setting(in binary digit) 0: Default value, 1: Set value 0x01: Wireless LAN module IP address 0x02: DHCP starting IP address	BYTE	1
17	Response data 17	Reserved	char	13
18	Response data 18	Wireless LAN module IP address	char	16
19	Response data 19	DHCP starting IP address	char	16
20	Response data 20	Reserved	char	16
Total number of response data bytes				256

NOTE

・The wireless LAN module IP address and DHCP can be set by using the LAN command.
・To change settings other than the frequency band, SSID, and security key, use the CTRS-100A network utility software.

7-3-36 Set/load the TCP/IP information (LAN)

Sets or loads the IP address, subnet mask, default gateway, and IP operating mode of the CTRS.

- Command: LAN
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

- The number of transferred bytes: 164 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	LAN	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	CTRS-100A IP address (Example: 192.168.70.100)	char	16
4	Parameter 3	Subnet mask (Example: 255.255.255.0)	char	16
5	Parameter 4	Default gateway address (Example: 0.0.0.0)	char	16
6	Parameter 5	Reserved	char	32
7	Parameter 6	Wireless LAN module IP address (Example: 192.168.70.90)	char	16
8	Parameter 7	Reserved	char	32
9	Parameter 8	Wireless LAN setting items (in binary digit) 0x01: Wireless LAN module IP address 0x02: DHCP starting IP address 0x04: Wireless LAN DHCP	BYTE	1
10	Parameter 9	Wireless LAN DHCP 0: Invalid, 1 to 10: Allocationable number	BYTE	1
11	Parameter 10	Reserved	char	14
12	Parameter 11	DHCP starting IP address (Example: 192.168.70.120)	char	16
Total number of transferred bytes				164

- Response data: Standard type (1 byte)

MEMO

- When setting the TCP/IP information with the command, setting contents are only saved in the non-volatile memory in the CTRS. The changed contents are not immediately reflected in the CTRS.
  The changed contents are reflected when the power is started up the next time.
- Unless specified otherwise, set the wireless LAN module IP address to NULL.
  If NULL is set, the wireless LAN module IP address will be the CTRS-100A IP address - 10. However, if subtracting 10 results in a value of 0 or less, 10 will be added instead.
  Ex. 1) If the CTRS-100A IP address is 192.168.70.100, the wireless LAN module IP address will be 192.168.70.90.
  Ex. 2) If the CTRS-100A IP address is 192.168.70.9, the wireless LAN module IP address will be 192.168.70.19.
- Unless specified otherwise, set the DHCP start IP address to NULL.
  If NULL is set, the DHCP start IP address will be the CTRS-100A IP address + 20. However, if adding 20 results in a value of 246 or more, 20 will be subtracted instead.
- When setting the DHCP start IP address, make sure the value of the 4th octet is 245 or less. A value of 246 or more will cause a parameter error.
- If specific IP addresses are specified for the wireless LAN module IP address and DHCP start IP address and then only the CTRS-100A IP address is later changed, it might no longer be possible to establish a LAN connection using a wireless LAN unit.

♦♦♦ 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 Name	LAN	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 160 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	CTRS-100A IP address (Example: 192.168.70.100)	char	16
2	Response data 2	Subnet mask (Example: 255.255.255.0)	char	16
3	Response data 3	Default gateway address (Example: 0.0.0.0)	char	16
4	Response data 4	CTRS-100A MAC address (00-00-00-00-00-00)	char	32
5	Response data 5	Wireless LAN module IP address (Example: 192.168.70.90)	char	16
6	Response data 6	Wireless LAN module MAC address (00-00-00-00-00-00)	char	32
7	Response data 7	Reserved	char	1
8	Response data 8	Wireless LAN DHCP 0: Invalid, 1 to 10: Allocationable number	BYTE	1
9	Response data 9	Reserved	char	14
10	Response data 10	DHCP starting IP address (Example: 192.168.70.120)	char	16
Total number of response data bytes				160

MEMO

・If the communication interface is not set to a wireless LAN, the wireless LAN module MAC address is initialized to 0x00.

7-3-37 Load/write the TEDS information (TED)

Loads and writes the TEDS information of 32 channels at the same time.

MEMO

・For details of TEDS, see IEEE1451.4 standard.
・The target to be written is data in the TEDS user data 1.

● Command: TED
● Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

● The number of transferred bytes: 1044 bytes
● Parameter: See the table below.

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Command Name	TED		char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.		BYTE	1
3	Parameter 2	Target channel to be written (in binary digit) [Example] Suppose the target CH is CH1, CH2, and CH32. Set 0x80000003.		DWORD	4
4	Parameter 3	Reserved		char	12
5	Parameter 4	Character strings to be written in the user data 1 (for 32 channels). (Maximum 28 characters + Null code)/CH	CH1 data to be written	char	32
			CH2 data to be written	char	32
			CH3 data to be written	char	32
			.	.	.
			CH32 data to be written	char	32
Total number of transferred bytes					1044

● Response data: 32 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	Wrote result 1 byte × 32 channels = 32 bytes -1: No card or no function 0: OK 1: NG 2: OFF (not target)	char	32
Total number of response data bytes				32

♦♦♦ 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 Name	TED	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 23552 bytes

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	Template ID No. (*1)		BYTE	1
		Validity of Template ID No. (0: Invalid, 1: Valid) (*2)		BYTE	1
		Reserved		char	6
		Basic information (*3)	Unique Registration Number	INT64	8
			Manufacture ID	WORD	2
			Model Number	WORD	2
			Version Letter	char	2
			Version Number	WORD	2
			Serial Number	DWORD	4
			Reserved	char	4
		Standard information (*4)		char	104
		User data	User data 1	char	32
			User data 2	char	480
			Available size of the user data 2	DWORD	4
			Reserved	char	4
		Recommended setting value	Recommended setting value (*5) 0: Invalid(All 0 after this) 1: Valid	BYTE	1
			Editable or non-editable user data 1 (*6) (0: Non-editable, 1: Editable)	BYTE	1
			Range value valid/invalid(*7)	BYTE	1
			Mode No.	BYTE	1
			Range No.	char	1
			Low pass filter No.	BYTE	1
			Reserved	char	2
			Range value	DWORD	4
			Reserved	char	4
			Calibration coefficient	double	8
			Unit string	char	48
			Reserved	char	8
		Total number of CH1 TEDS information			736
		.			.
		Total number of CH32 TEDS information			736
Total number of response data bytes					23552

(*1) Template ID No.

・Template ID No. and Sub ID are identification numbers originally defined for the CTRS. (See the following table.)

・The following Standard Template IDs are the Template IDs defined by the IEEE1451.4 standard.

Template ID No.	Contents
0	No unit is installed or no TEDS information
1	Not applicable TEDS information
2	Standard Template ID= 0, Sub ID=0
3	Standard Template ID=24, Sub ID=0
4	Standard Template ID=25, Sub ID=0
5	Standard Template ID=25, Sub ID=1
6	Standard Template ID=30, Sub ID=0
7	Standard Template ID=30, Sub ID=1
8	Standard Template ID=33, Sub ID=0
9	Standard Template ID=36, Sub ID=0

(*2) Template ID No.
Flag to indicate whether the standard information is valid or invalid.

(*3) Basic information
Valid only when the template ID No. is 2 or more.

(*4) Standard information
Contents and the number of bytes vary with the template ID No.
(Valid only when the template ID No. is 2 or more.)
The standard information of every template ID No. is described in the following table.
(The contents are based on the IEEE1451.4 standard.)

(*5) Recommended setting value
This is set to 1 if there are recommended setting values for the current unit, and the values are applied to the recommended setting items. If there are no recommended setting values, all recommended setting items are set to 0.

(*6) Editable or non-editable user data 1
Flag to indicate whether the user data 1 is editable or non-editable (1: Editable).

(*7) Range value valid/invalid
This is set to 1 if an optional range value can be recommended from the TEDS information, and the value is set as the range value. If no optional range value can be recommended, this is set to 0, and the range value becomes invalid, so use the range number.

Template ID No.	Contents	Types of Variables	The Number of Bytes
2	Standard Template ID	BYTE	1
	Polarity (sign) (0 : Positive,1 : Negative)	BYTE	1
	Sensitivity direction (0 : X, 1 : Y, 2 : Z, 3 : N/A)	BYTE	1
	Reserved	char	1
	Calibration Date (e.g. "2005/01/01")	char	16
	Sensitivity @ reference condition [V/(m/s^2)]	float	4
	Reference frequency [Hz]	float	4
	High-pass cut-off frequency(F hp) [Hz]	float	4
	Measurement location ID (0 to 511)	WORD	2
	Reserved	char	2
	Total number of template ID No. 2		36

[From the previous page]

Template ID No.	Contents	Types of Variables	The Number of Bytes
3	Standard Template ID	BYTE	1
	Polarity (sign) (0 : Positive,1 : Negative)	BYTE	1
	Sensitivity direction (0 : X, 1 : Y, 2 : Z, 3 : N/A)	BYTE	1
	Reserved	char	1
	Sensitivity @ reference condition [V/(ms^2)]	float	4
	Reference frequency [Hz]	float	4
	High-pass cut-off frequency [Hz]	float	4
	Low-pass cut-off frequency [Hz]	float	4
	Resonance frequency (fres) [Hz]	float	4
	Quality factor at fres	float	4
	Amplitude slope (a) [%/decade]	float	4
	Temperature Coefficient (b) [%/℃]	float	4
	Reference temperature [℃]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Measurement location ID (0 to 2047)	WORD	2
	Reserved	char	2
	Total number of template ID No. 3		60
4	Standard Template ID	BYTE	1
	Sensitivity direction (0 : X, 1 : Y, 2 : Z, 3 : N/A)	BYTE	1
	Transducer Electrical Signal Type (0 : Voltage Sensor)	BYTE	1
	Mapping Method(0 : Linear)	BYTE	1
	AC or DC coupling (0 : DC, 1 : AC, 1=固定)	BYTE	1
	Polarity (sign) (0 : Positive,1 : Negative)	BYTE	1
	Reserved	char	2
	Sensitivity @ reference condition [V/(ms^2)]	float	4
	High-pass cut-off frequency [Hz]	float	4
	Transducer weight [g]	float	4
	Reference frequency [Hz]	float	4
	Reference temperature [℃]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Calibration Initials (Max 3chrs. e.g. "TK ")	char	4
	Calibration period [days]	WORD	2
	Measurement location ID (0 to 2047)	WORD	2
	Total number of template ID No. 4		52

[From the previous page]

Template ID No.	Contents	Types of Variables	The Number of Bytes
5	Standard Template ID	BYTE	1
	Sensitivity direction (0 : X, 1 : Y, 2 : Z, 3 : N/A)	BYTE	1
	Transducer Electrical Signal Type (0 : Voltage Sensor)	BYTE	1
	Mapping Method(0 : Linear)	BYTE	1
	AC or DC coupling (0 : DC, 1 : AC)	BYTE	1
	Polarity (sign) (0 : Positive,1 : Negative)	BYTE	1
	Reserved	char	2
	Sensitivity @ reference condition [V/(ms^2)]	float	4
	High-pass cut-off frequency [Hz]	float	4
	Transducer weight [g]	float	4
	Reference frequency [Hz]	float	4
	Reference temperature [℃]	float	4
	Low-pass cut-off frequency [Hz]	float	4
	Resonance frequency (fres) [Hz]	float	4
	Quality factor at fres	float	4
	Amplitude slope (a) [%/decade]	float	4
	Temperature Coefficient (b) [%/℃e]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Calibration Initials (Max 3chrs. e.g. "TK ")	char	4
	Calibration period [days]	WORD	2
	Measurement location ID (0 to2047)	WORD	2
	Total number of template ID No. 5		72
6	Standard Template ID	BYTE	1
	Physical Measurand	BYTE	1
	Transducer Electrical Signal Type (0 : Voltage Sensor)	BYTE	1
	Full-Scale Electrical Value Precision	BYTE	1
	Mapping Method(0 : Linear)	BYTE	1
	AC or DC coupling (0 : DC, 1 : AC)	BYTE	1
	Reserved	char	2
	Minimum physical value	float	4
	Maximum physical value	float	4
	Minimum voltage output [V]	float	4
	Maximum voltage output [V]	float	4
	Sensor output impedance [ohms]	float	4
	Response Time [sec]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Calibration Initials (Max 3chrs. e.g. "TK ")	char	4
	Calibration period [days]	WORD	2
	Measurement location ID (0 to 2047)	WORD	2
	Total number of template ID No. 6		56

[From the previous page]

Template ID No.	Contents	Types of Variables	The Number of Bytes
7	Standard Template ID	BYTE	1
	Physical Measurand	BYTE	1
	Power-supply type (0 : DC, 1 : Bipolar DC, 2 : AC (rms))	BYTE	1
	Transducer Electrical Signal Type (0 : Voltage Sensor)	BYTE	1
	Full-Scale Electrical Value Precision	BYTE	1
	Mapping Method(0 : Linear)	BYTE	1
	AC or DC coupling (0 : DC, 1 : AC)	BYTE	1
	Reserved	char	1
	Minimum physical value	float	4
	Maximum physical value	float	4
	Minimum voltage output [V]	float	4
	Maximum voltage output [V]	float	4
	Sensor output impedance [ohms]	float	4
	Response Time [sec]	float	4
	Power-supply level,nominal [V]	float	4
	Power-supply level,min [V]	float	4
	Power-supply level,max [V]	float	4
	Max current at nominal power level [A]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Calibration Initials (Max 3chrs. e.g. "TK ")	char	4
	Calibration period [days]	WORD	2
	Measurement location ID (0 to 2047)	WORD	2
	Total number of template ID No. 7		72
8	Standard Template ID	BYTE	1
	Physical Measurand	BYTE	1
	Transducer Electrical Signal Type (3 : Bridge Sensor)	BYTE	1
	Full-Scale Electrical Value Precision	BYTE	1
	Mapping Method(0 : Linear)	BYTE	1
	Bridge Type (0 : QUARTER, 1 : HALF, 2 : FULL)	BYTE	1
	Reserved	char	2
	Minimum physical value	float	4
	Maximum physical value	float	4
	Minimum electrical output [V/V]	float	4
	Maximum electrical output [V/V]	float	4
	Bridge element impedance [ohms]	float	4
	Response Time [sec]	float	4
	Excitation level,nominal [V]	float	4
	Excitation level,min [V]	float	4
	Excitation level,max [V]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Calibration Initials (Max 3chrs. e.g. "TK ")	char	4
	Calibration period [days]	WORD	2
	Measurement location ID (0 to 2047)	WORD	2
	Total number of template ID No. 8		68

[From the previous page]

Template ID No.	Contents	Types of Variables	The Number of Bytes
9	Standard Template ID	BYTE	1
	Transducer Electrical Signal Type (0 : Voltage Sensor)	BYTE	1
	Mapping Method (4 : Thermocouple)	BYTE	1
	Thermocouple type (0 to 8) 0 : B type, 1 : E Type, 2 : J Type, 3 : K Type 4 : N Type, 5 : R Type, 6 : S Type, 7 : T Type 8 : non-standard	BYTE	1
	Cold-junction compensation required (0 : CJC required,1 : Compensated)	BYTE	1
	Reserved	char	3
	Minimum temperature [℃]	float	4
	Maximum temperature [℃]	float	4
	Minimum voltage output [V]	float	4
	Maximum voltage output [V]	float	4
	Thermocouple resistance [ohms]	float	4
	Sensor Response Time [sec]	float	4
	Calibration Date (e.g. "2005/01/01")	char	16
	Calibration Initials (Max 3chrs. e.g. "TK ")	char	4
	Calibration period [days]	WORD	2
	Measurement location ID (0 to 2047)	WORD	2
	Total number of template ID No. 9		56

MEMO

Validity of Basic information, Standard information, and User Data information

(1) When the template ID No. = 0
- The template ID No. is always 0 (Invalid).
- The Basic information is invalid.
- The Standard information is invalid.
- The User Data information is invalid.

(2) When the template ID No. = 1
- The template ID No. is always 0 (Invalid).
- The Basic information is valid.
- The Standard information is invalid.
- The User Data information is invalid.

(3) When the template ID No. >= 2
- The Basic information is valid
- When the template ID No. is 1 (valid), the Standard information is correct data.
- When the template ID No. is 0 (invalid), the Standard information is not correct or the current sensor does not match the current unit.
- The User Data information is valid only when the Basic information's Manufacture ID is 58 (KYOWA).

7-3-38 Load/write the user data (URW)

Load and write the arbitrary user data.

- Command: URW
- Target CTRS: Stand-alone, master, and slave

♦♦♦ When setting ♦♦♦

- The number of transferred bytes: 52 bytes
- Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	URW	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Reserved	BYTE	2
4	Parameter 3	Writing No. (0 to 19)	BYTE	1
5	Parameter 4	Reserved	char	13
6	Parameter 5	User data	char	32
Total number of transferred bytes				52

- Response data: Standard type (1 byte)

♦♦♦ When loading ♦♦♦

● The number of transferred bytes: 20 bytes

● Parameter: See the table below.

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Command Name	URW	char	3
2	Parameter 1	Parameter mode (0x00: Load, 0x01: Set) Set 0x01.	BYTE	1
3	Parameter 2	Reserved	BYTE	2
4	Parameter 3	Reading No. (0 to 19)	BYTE	1
5	Parameter 4	Reserved	char	13
Total number of transferred bytes				20

● Response data: 32 bytes

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

MEMO

・No.0 writing is used in the CTRS of the device name.

・If the INI command (with 1 specified for parameter 1) is used to perform initialization, writing area No. 0 is set to the default character string "CTRS-100A-" + "serial number". 0x00 is written to all the other areas.

Ex.) If the serial number is 123456789, the writing area No. 0 default character string is "CTRS-100A-123456789".

7-3-39 Measuring/Obtaining Average Value (AVG)

Measures analog CHs of measurement target with 1 kHz sampling frequency and obtains the average value.

- Command: AVG
- Target CTRS: Stand-alone, and master

♦♦♦ 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 Name	AVG	char	3
2	Parameter 1	Average value measurement mode (0x00: Load results, 0x01: Execute) Set 0x01.	BYTE	1
3	Parameter 2	Average value obtaining time (sec) 0 to 10 Set '0' to obtain the average data of approx. 1 second.	BYTE	1
Total number of transferred bytes				5

- Response data: Standard type (1 byte)

- Remarks: After executing the AVG command, check the CTRS status is not "System running (Busy)" with the status read command. After confirming that the average value measurement is finished, read the results.

♦♦♦ 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 Name	AVG	char	3
2	Parameter 1	Average value measurement mode (0x00: Load results, 0x01: Execute) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 4 bytes×32CHs×the number of connected units
=128 to 512 bytes

No.	Name	Contents	Types of Variables	The Number of Bytes
1	Response data 1	A/D conversion average value of measured CHs Regardless of whether or not CHs are measured, measured results are output for 32 CHs ×the number of connected units. Data of not measured CH shall be '0.'	long	4 × 32CHs × the number of connected units
Total number of response data bytes				128 to 512

NOTE

- Executing this command is only available when A/D conversion is stopping in A/D conversion enabled status.
- While measuring the average value, no command other than reading the status is available.

7-3-40 Execute auto range(ATR)

Executes auto range and load result.

- Command: ATR
- Target CTRS: Stand-alone, and master

♦♦♦ When executing ♦♦♦

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

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

- Response data: Standard type (1 byte)

MEMO

・To use this command to set the range, follow the procedure below:
(1) Execute the ATR command.
(parameter 1 value of 0x01: Execute)
(2) Execute the STP command to end auto range processing.
(3) Use the ATR command to load the auto range result.
(parameter 1 value of 0x00: Load result)
(4) Use the MES command to specify settings based on the result.

♦♦♦ 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 Name	ATR	char	3
2	Parameter 1	Auto range executing mode (0x00: Load results, 0x01: Execute) Set 0x00.	BYTE	1
Total number of transferred bytes				4

● Response data: 16 bytes×32CHs×the number of connected units
=512 to 2048 bytes

No.	Name	Contents		Types of Variables	The Number of Bytes
1	Response data 1	CH1 auto range result 16バイト	Largest absolute maximum/minimum	long	4
			Optional range value validity 0: Invalid 1: Valid	BYTE	1
			Old range number -1: Use the optional range value 0 or higher: Use the range number	char	1
			New range number 0 or higher: Recommended range number	char	1
			Auto range validity 0: Invalid 1: Valid	BYTE	1
			Old optional range value	DWORD	4
			New optional range value (if the optional range value item is valid)	DWORD	4
		CH2 auto range result	・	—	16
		・	・	・	・
		CH32 auto range result	・	—	16
2	Response data 2	1st slave auto range result		—	512
3	Response data 3	2nd slave auto range result		—	512
4	Response data 4	3rd slave auto range result		—	512
Total number of response data bytes					512 to 2048

7-3-41 Load the CTRS status

Generally, since the CTRS status is stored in the header section of the response packet, the CTRS status can be obtained by executing any command and by referring to the header section of the response packet.
However, when it is required to check the CTRS status before issuing the command to the CTRS or when the next command cannot be issued unless after checking whether or not processing requiring a certain time in the CTRS is surely finished, it is required to obtain the CTRS status.
In the above cases, when only the header section of the command packet (additional data size: 0) is sent to the CTRS, the response packet only storing the header section is returned. After checking the status items of the response packet header section, the CTRS status can be obtained.

- Command: None
- Target CTRS: Stand-alone, master, and slave

- The number of transferred bytes: 0 bytes
- Parameter: None

- Response data: 0 byte

8. MEASURING CONDITION FORMAT

Measuring condition format exchanged between PC and CTRS by using the "Set/load the measuring condition (MES)" command. The measuring condition format is shown below.
Shaded portions indicate initial values.

8-1 MEASURING CONDITION FORMAT

The whole size: 40000 bytes

No.	Classification	Contents	Types of Variables	The Number of Bytes
1	General information 512 bytes	Device ID ("CTRS-100A" fixed, " " is not included.)	char	32
		Parameter format version (1 fixed)	WORD	2
		Reserved	char	2
		KS3 based language (0: Japanese, 1: English)	BYTE	1
		Reserved	char	11
		Main unit type No. (*1)	BYTE	1
		Measuring unit type No.1 (*1)	BYTE	1
		Measuring unit type No.2 (*1)	BYTE	1
		Measuring unit type No.3 (*1)	BYTE	1
		Measuring unit type No.4 (*1)	BYTE	1
		Measuring unit type No.5 (*1)	BYTE	1
		Measuring unit type No.6 (*1)	BYTE	1
		Measuring unit type No.7 (*1)	BYTE	1
		Measuring unit type No.8 (*1)	BYTE	1
		Reserved	char	7
		Expansion unit type No.1 (*1)	BYTE	1
		Expansion unit type No.2 (*1)	BYTE	1
		Expansion unit type No.3 (*1)	BYTE	1
		Expansion unit type No.4 (*1)	BYTE	1
		Expansion unit type No.5 (*1)	BYTE	1
		Reserved	char	12
		Device operation mode(Loading only) 0: Stand-alone or Master 1 to 3: Slave 1 to 3	BYTE	1
		The total number of connected devices	BYTE	1
		Reserved	char	1
		Operation (beep) sound 0: OFF, 1: ON (high pitch sound), 2: ON (low pitch sound)	BYTE	1
		Beep sound when the input data exceeded 0: OFF, 1: During the input data exceeded, 2: By executing the STOP/PAUSE operation	BYTE	1
		Non-recording beep sound (0: OFF, 1: ON) The ON setting is only valid if the beep sound when the input goes over is not 0.	BYTE	1

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
1	General information 512 bytes	Do not judge battery errors 0: Judge, 1: Do not judge	BYTE	1
		Operation when the DC power supply is off 0: Battery-powered, 1: Turn off the power supply after backing up	BYTE	1
		Automatic recording recovery 0: Invalid, 1: Valid	BYTE	1
		STOP button operation 0: Press twice , 1: Press once	BYTE	1
		BAL button operation 0: Press twice , 1: Press once	BYTE	1
		Option1 button setting 0: None, 1: Start monitoring, 2: Delete the recorded data, 3: Over reset, 4: Pause, 5: Marker, 6: Auto range, 7: CAN manual output	BYTE	1
		Option2 button setting 0: None, 1: Start monitoring, 2: Delete the recorded data, 3: Over reset, 4: Pause, 5: Marker, 6: Auto range, 7: CAN manual output	BYTE	1
		Reserved	char	18
		Time zone information (minutes) for time synchronization function [Example] Suppose the area is 9 hours ahead of the Standard Time (ST): -540 Daylight saving time is not supported	short	2
		Reserved	char	30
		Master: IP address	char	16
		Slave 1: IP address	char	16
		Slave 2: IP address	char	16
		Slave 3: IP address	char	16
		Reserved	char	304
2	File information (*2) 384 bytes	Recorded file name (maximum 60 characters) Initial value : ”TEST”	char	64
		File memo (maximum 120 characters) Initial value : ””	char	128
		File name assignment rule 0: Number, 1: Recording start time	BYTE	1
		File name duplicate check (0: Invalid, 1: Valid)	BYTE	1
		Reserved	char	2
		File No. (0 to 99,999) Initial value : 0	DWORD	4

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
2	File information (*2) 384 bytes	Number of file digits 0: 4 digits, 3 to 5: 3 to 5 digits 3 digits: Up to 999, 5 digits: Up to 99,999	BYTE	1
		Reserved	char	183
3	Measuring condition (Common) 96 bytes	Sampling frequency (1 to 100,000Hz) Initial value: 1000	DWORD	4
		Sampling frequency type (*3) 0: Internal, 1: External	BYTE	1
		Unpositioned NMEA cut mode Valid only when "1: NMEA measurement valid" is selected for "GPS data measurement". 0: Not cut, 1: Cutting	BYTE	1
		CAN data measurement (0: Invalid, 1: Valid)	BYTE	1
		GPS data measurement (*4) 0: Invalid, 1: NMEA measurement valid, 2: Only time adjustment valid	BYTE	1
		Reserved	char	1
		A/D operation upon disconnecting the PC 0: Stop, 1: Continue	BYTE	1
		Clock output division ratio (0 to 65,534 Hz) Initial value: 1 0: Internally operate with a value of 1	WORD	2
		Reserved	char	6
		Number of recording channels (0 to 32)	WORD	2
		Measuring mode -1: PC recording mode(*5), 0: Manual 1: Interval, 2: Analog trigger, 3: External trigger 4: Manual trigger, 5: Complex trigger, 6: CAN trigger, 7 to 10: Reserved	char	1
		PAUSE function (0: Invalid, 1: Valid)	BYTE	1
		Reserved	char	1
		Counter assignment to measurement data 0: Invalid, 1: Valid (*6)	BYTE	1
		Standard balance value 1 to 500: Value of 0.1 to 50% * 10 Initial value:50	WORD	2
		Default value of the CH No. (*7)	WORD	2
		Reserved	char	4
		After recording, restart the A/D conversion 0: Invalid, 1: Valid	BYTE	1

[From the previous page]

No.	Classification	Contents		Types of Variables	The Number of Bytes
3	Measuring condition (Common) 96 bytes	Output Clock Mode 0: Output upon starting up, 1: Inverted output upon starting up, 2: Output during recording, 3: Inverted output during recording, 4: Do not output		BYTE	1
		Reserved		char	1
		Reference junction compensation 0: Internal, 1: External		BYTE	1
		Internal sampling frequency of the CTA unit 0: 2Hz, 1: 0.5Hz		BYTE	1
		Check upon balance execution (bit) Only valid during remote-control balance adjustment execution Specify what to execute at the same time as balancing. 0x00: Invalid, 0x01: Input resistance check, 0x02: Burnout check		BYTE	1
		Reserved		char	1
		Settable range during auto range 0: 70%, 50 to 100: 50% to 100%		BYTE	1
		Reserved		char	56
4	Measuring condition (*2) (Manual) 32 bytes	The number of manual recording data (*8) Initial value: 0		INT64	8
		Manual start time (*9)	Year (2019 to 2099) Initial value: 0	WORD	2
			Month (1 to 12) Initial value: 0	BYTE	1
			Day (1 to 31) Initial value: 0	BYTE	1
			Hour (0 to 23) Initial value: 0	BYTE	1
			Minute (0 to 59) Initial value: 0	BYTE	1
			Second (0 to 59) Initial value: 0	BYTE	1
			Reserved	char	1
		The number of repeat times 0: Infinite 1 to the maximum number of file digits specified Initial value: 1		DWORD	4
		GPS use (0: Not used, 1: Used)		BYTE	1
		Reserved		char	11

[From the previous page]

No.	Classification	Contents		Types of Variables	The Number of Bytes
5	Measuring condition (*2) (Interval) 32 bytes	The number of interval recording data Initial value: 1		INT64	8
		interval start time (*9)	Year (2019 to 2099) Initial value: 0	WORD	2
			Month (1 to 12) Initial value: 0	BYTE	1
			Day (1 to 31) Initial value: 0	BYTE	1
			Hour (0 to 23) Initial value: 0	BYTE	1
			Minute (0 to 59) Initial value: 0	BYTE	1
			Second (0 to 59) Initial value: 0	BYTE	1
			Reserved	char	1
		Interval (*10) Initial value: 0		DWORD	4
		The number of interval times 0: Infinite 1 to the maximum number of file digits specified		DWORD	4
		GPS use (0: Not used, 1: Used)		BYTE	1
		Reserved		char	7
6	Measuring condition (*2) (Common for trigger) 32 bytes	The number of trigger recording data Initial value: 2		INT64	8
		The number of predata (0 to 524,288) (*11) Initial value: 0		DWORD	4
		The number of postdata (0 to 524,288) (*11) Initial value: 0		DWORD	4
		The number of trigger repeat times 0: Infinite 1 to the maximum number of file digits specified		DWORD	4
		End trigger (0: OFF, 1: ON)		BYTE	1
		Number of chattering decisions (*12) 0: Operates as 4 internally, 1 to 4		BYTE	1
		Reserved		char	2
		Chattering decision frequency (*12) 0: Operates as 100 internally, 1 to 100000		DWORD	4
		Reserved		char	4

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
7	Measuring condition (*2) (Analog trigger) 128 bytes	Start trigger CH (1 to 32) Initial value: 1	BYTE	1
		Start trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	2
		Start trigger level (AD) (±8192000) (*13) Initial value: 0	long	4
		Reserved	char	8
		Start trigger level (Physical quantity) Initial value: ""	char	28
		Reserved	char	20
		End trigger CH (1 to 32) Initial value: 1	BYTE	1
		End trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	2
		End trigger level (AD) (±8192000) (*13) Initial value: 0	long	4
		Reserved	char	8
		End trigger level (Physical quantity) Initial value: ""	char	28
		Reserved	char	20
8	Reserved	Reserved	char	16
9	Measuring condition (*2) (External trigger) 16 bytes	Start trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	7
		End trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	7
10	Reserved	Reserved	char	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
11	Measuring condition (*2) (Common for start complex trigger) 32 bytes	Start AND/OR setting 1 (0: OR, 1: AND) Set AND/OR settings of start analog trigger CH1 and CH2.	BYTE	1
		Start AND/OR setting 2 (0: OR, 1: AND) Set AND/OR settings of start analog trigger CH3 and CH4.	BYTE	1
		Start AND/OR setting 3 (0: OR, 1: AND) Set AND/OR settings of start AND/OR setting 1 and start AND/OR setting 2.	BYTE	1
		Reserved	char	29
12	Measuring condition (*2) (No.1 for start complex trigger) 32 bytes	Condition of the start trigger 0: None, 1 : Analog	BYTE	1
		Start trigger CH (1 to 32) Initial value: 1	BYTE	1
		Start trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	1
		Start trigger level (Analog) (±8192000) (*13) Initial value : 0	long	4
		Reserved	char	24
13	Measuring condition (*2) (No.2 for start complex trigger) 32 bytes	Same as above	---	32
14	Measuring condition (*2) (No.3 for start complex trigger) 32 bytes	Same as above	---	32
15	Measuring condition (*2) (No.4 for start complex trigger) 32 bytes	Same as above	---	32
16	Measuring condition (*2) (External trigger for start complex trigger) 8 bytes	External trigger (0: Invalid, 1: Valid)	BYTE	1
		Start trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	6

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
17	Measuring condition (*2) (Manual trigger for start complex trigger) 8 bytes	Manual trigger (0: Invalid, 1: Valid)	BYTE	1
		Reserved	char	7
18	Measuring condition (*2) (Start complex trigger)	Reserved	char	416
19	Measuring condition (*2) (Common for end complex trigger) 32 bytes	End AND/OR setting 1 (0: OR, 1: AND) Set AND/OR settings of end analog trigger CH1 and CH2.	BYTE	1
		End AND/OR setting 2 (0: OR, 1: AND) Set AND/OR settings of end analog trigger CH3 and CH4.	BYTE	1
		End AND/OR setting 3 (0: OR, 1: AND) Set AND/OR settings of end AND/OR setting 1 and end AND/OR setting 2.	BYTE	1
		Reserved	char	29
20	Measuring condition (*2) (No.1 for end complex trigger) 32 bytes	Condition of the end trigger 0: None, 1 : Analog	BYTE	1
		End trigger CH (1 to 32) Initial value: 1	BYTE	1
		End trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	1
		End trigger level(Analog) (±8192000) (*13) Initial value : 0	long	4
		Reserved	char	24
21	Measuring condition (*2) (No.2 for end complex trigger) 32 bytes	Same as above	---	32
22	Measuring condition (*2) (No.3 for end complex trigger) 32 bytes	Same as above	---	32

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
23	Measuring condition (*2) (No.4 for end complex trigger) 32 bytes	Same as above	---	32
24	Measuring condition (*2) (External trigger for end complex trigger) 8 bytes	External trigger (0: Invalid, 1: Valid)	BYTE	1
		End trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	6
25	Measuring condition (*2) (Manual trigger for end complex trigger) 8 bytes	Manual trigger (0: Invalid, 1: Valid)	BYTE	1
		Reserved	char	7
26	Measuring condition (*2) (End complex trigger)	Reserved	char	416
27	Marker condition (*2) 1296 bytes	Number of markers (10 fixed)	BYTE	1
		Reserved	char	15
		Marker name 1 Initial value : ""	char	128
		Marker name 2 Initial value : ""	char	128
		・	・	・
		Marker name 9 Initial value : ""	char	128
		Marker name 10 Initial value : ""	char	128
28	Optional test information (*2) 1280 バイト	Optional test information 1 Initial value : ""	char	128
		Optional test information 2 Initial value : ""	char	128
		・	・	・
		Optional test information 9 Initial value : ""	char	128
		Optional test information 10 Initial value : ""	char	128

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
29	CH condition 1(*14) 544 bytes ※17408 bytes for 32 channels	Measurement -1: No channel 0: Not to be measured 1: To be measured	char	1
		Mode No.	BYTE	1
		Range No. -1: Use range value instead of range number	char	1
		High pass filter No. (0 to)	BYTE	1
		Low pass filter No. (0 to)	BYTE	1
		Balance ON/OFF (0: OFF, 1: ON, 2: NONE)	BYTE	1
		Input check 0x00: OFF, 0x02: Input resistance, 0x04: Burnout	BYTE	1
		Offset zero ON/OFF (0: OFF, 1: ON)	BYTE	1
		Range value Initial value: 0	DWORD	4
		Reserved	char	4
		Rated capacity Initial value: ""	char	28
		Rated output (Sensor output) Initial value: ""	char	28
		Rated output (mV/V) Initial value: ""	char	28
		Calibration coefficient Initial value: "1"	char	28
		Offset Initial value:"0"	char	28
		Offset zero value Initial value: "0"	char	28
		Cable coefficient Initial value: "1"	char	28
		The number of digits after decimal point -1: Auto, 0 to 8	char	1
		Rated capacity and rated output information validity Always indicated if the rated capacity and rated output are used. 0: Information invalid, 1: Rated capacity + rated output (sensor output), 2: Rated capacity + rated output (sensor output) + rated output (mV/V)	BYTE	1
		Reserved	char	10
		Unit string (maximum 31 characters)	char	32
		Channel name 1 (maximum 127 characters) Initial value: ""	char	128
		Channel name 2 (maximum 31 characters) Initial value: ""	char	32
		Upper limit check value (-100 to 100%) Initial value: 100	char	1
		Lower limit check value (-100 to 100%) Initial value: -100	char	1
		Reserved	char	6

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
29	CH condition 1(*14) 544 bytes ※17408 bytes for 32 channels	TEDS user data Initial value: ""	char	32
		Sensor serial number Initial value: ""	char	16
		Sensor model name Initial value: ""	char	32
		TEDS ROMID Initial value: 0	INT64	8
		Reserved	char	32
	CH condition 2(*14)	Same as above	---	544
	CH condition 3(*14)	Same as above	---	544
	・	・	・	・
	CH condition 32(*14)	Same as above	---	544
30	Wireless LAN condition (*15) 256 bytes	Frequency band (0: 2.4GHz, 1: 5GHz)	BYTE	1
		DHCP 0：Invalid, 1 to 10: Allocationable number	BYTE	1
		Reserved	char	14
		SSID (8 to 30 characters)	char	32
		Security key (8 to 60 characters)	char	64
		Wireless LAN module firmware version	char	16
		2.4G wireless LAN CH setting (0 to)	BYTE	1
		2.4G wireless LAN CH settable number	BYTE	1
		2.4G wireless LAN CH list	BYTE	30
		5G wireless LAN CH setting (0 to)	BYTE	1
		5G wireless LAN CH settable number	BYTE	1
		5G wireless LAN CH list	BYTE	30
		Security mode 0: WPA2[AES], 1: WPA[AUTO], 2: WPA[TKIP], 3: None	BYTE	1
		Country code 1: JP, 2: US, 3: TH	BYTE	1
		Wireless LAN setting (in binary digit) 0: Default value, 1: Set value 0x01: Wireless LAN module IP address 0x02: DHCP starting IP address	BYTE	1
		Reserved	char	13
		Wireless LAN module IP address	char	16
		DHCP starting IP address	char	16
		Reserved	char	16
31	Reserved	Reserved	char	5376
32	Control software information 64 bytes	Model name Initial value: ""	char	32
		Version Initial value: ""	char	32
33	Reserved	Reserved	char	11824

(*1) For details, see "8-4 UNIT TYPE NO."
To be error if it differs with the actual unit configuration.

(*2) Slaves ignore the settings.

(*3) For details of the external-clock-input function, see “IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware”.

(*4) When set to "1: NMEA measurement valid", time adjustment by GPS is also enabled.
When set to "2: Only time adjustment valid", NMEA measurement is not performed.
GPS time adjustment is performed approximately once every hour, and only when the GPS status is in the process of positioning.
When the master adjusts the time, the master's time is set to the slave's time.

(*5) The measurement mode in which A/D can be started even without an SD card.
In the CTRS monitoring status, perform data recording and similar operations by using a PC.

(*6) If CAN data measurement is enabled, set the measurement condition of the master to "1: Enable". When multiple units are synchronized, set the measurement condition of the master to "1: Valid" if even one of the devices is enabled for CAN data measurement.

(*7) Set the first CTRS analog channel number.
- Values are counted starting from 0.
- The initial channel number value is always 0 for the master CTRS, and 32 is added to the value of the second and subsequent units.

(*8) If the number of recorded data items is 0, recording is continued until an STP command is received.
Values that can be set as the number of recorded data items differ depending on the manual number of recording.
- If the number of recording is 1:
  0 or a higher value can be set as the number of recorded data items.
- If the number of recording is not 1:
  The number of items recorded in 5 seconds or a higher value can be set as the number of recorded data items.

(*9) If all the manual or interval start time values are set to 0, the operation below is performed.
- Manual: Recording is executed immediately after the CTRS receives a REC command.
- Interval: Recording is executed for the first time within about 10 seconds after the CTRS receives a REC command.

(*10) Specify the recording time, calculated from the number of interval recorded data, + α (sec). (For the stand-alone, α is 10 or more. For the synchronous operation, α is 30 or more.)

(*11) The settable number of pre- and post-data items differs depending on the number of channels for which measurement is set to ON as well as the free SD card space. This number is calculated by using the equation below.
However, if "Counter assignment to measurement data" is set to "1: Valid", perform the calculation assuming that the number of analog CHs has increased by two.

Settable number of predata and postdata = (1024×1024×2)
/ (4×[the number of analog channels to be measured])

(*12) When a trigger is recorded, if the sampling frequency is higher than the chattering decision frequency, the trigger occurs when the start/end trigger conditions are met for the number of chattering thresholds in succession.
For example, in the case of an analog trigger with a chattering decision frequency of 100, number of chattering dedisions of 4, a sampling frequency of 1 kHz, a start trigger slope of UP, and a start trigger level of 50000, The start trigger occurs when the A/D conversion value becomes 50000 or more for 4 consecutive data after the A/D conversion value is less than 50000.

(*13) Trigger level is a threshold value with analog CH set as a trigger source and is set with A/D conversion value.
The full scale of the A/D conversion value of analog CH is 8192000.
For example, with the strain range of 1000 μm/m, when 500 μm/m relevant strain is input, the A/D conversion value is 4096000.

(*14) Available range of the analog channel conditions vary with the installed unit. For items other than Measurement, if there is no setting item or if the item is invalid, set '0.'

(*15) This can be loaded by using the MES command.
To specify this setting, either use the CTRS-100A network utility software or execute the WLS or LAN command.

MEMO

- Initialize the area indicated as "Reserved" or unused area with '0.'
- For the values of measuring unit, see "8-5 VALUES OF MEASURING UNITS"

8-2 CAN MEASUREMENT BY CAN UNIT

8-2-1 Outline

When measuring CAN by using the CAN unit, be aware of the following points.

- The CTRS-CAG010A must be connected.
- Set the measuring conditions and CAN conditions by using the MES command.
- PAUSE function is not allowed while recording operation.

8-2-2 Details of parameters

(1) CAN data measurement - No.3 Measuring condition (Common)
Set "1: Valid".

(2) Counter assignment to measurement data - No.3 Measuring condition (Common)
Set "1: Valid". When multiple units are synchronized, set the measurement condition of the master to "1: Valid" if even one of the devices is enabled for CAN data measurement.

(3) CAN conditions
For details, see "9 CAN CONDITION FORMAT".

8-3 MEASUREMENT BY GPS UNIT

When measuring by using the GPS unit, mount the CTRS-CAG011A. To operate multiple units synchronously, mount CTRS-CAG011A on the master.

8-3-1 Point zero measurement

A point zero measurement is a measurement that starts recording at the time when the milliseconds of the set time becomes zero. A GPS sensor is used to acquire the time.
When the measurement mode is Manual or Interval, point zero measurement using GPS can be performed. When you perform a point zero measurement, please note the following points.

・The external-clock-input function is not allowed.
・PAUSE function is not allowed while recording operation.

The parameter settings are shown below. (1) and (2) are common settings, but (3) through (5) differ depending on the measurement mode.

・Common setting

(1) Time zone information - No.1 General information
Set the time zone information of the pre-set area.

[Example]
When setting the measuring conditions at the area, where 9 hours ahead of the Standard Time (ST), set "-540 (minutes)".
When the time zone information is "-540 (minutes)" and the interval start time is "2022/12/17 09:20:46", the CTRS starts recording data at 2022/12/17 00:20:46 (in UTC).

(2) GPS data measurement - No.3 Measuring condition (Common)
Set "1: NMEA measurement valid" or "2: Only time adjustment valid".

・For manual

(3) Measuring mode - No.3 Measuring condition (Common)
Set "0: Manual".

(4) GPS use – No.4 Measuring condition (Manual)
Set "1: Used".

(5) No.4 Measuring condition (Manual)
Set the manual conditions.

・For interval

(3) Measuring mode - No.3 Measuring condition (Common)
Set "1: Interval".

(4) GPS use – No.5 Measuring condition (Interval)
Set "1: Used".

(5) No.5 Measuring condition (Interval)
Set the interval conditions.

8-3-2 Recording GPS data

GPS data can be recorded using a GPS unit. The recorded GPS data file are saved in NMEA format.

The parameter settings are shown below.

(1) GPS data measurement - No.3 Measuring condition (Common)
Set "1: NMEA measurement valid".

(2) Unpositioned NMEA cut mode – No.3 Measuring condition (Common)
Set "0: Not cut" or "1: Cutting" as needed.
When set to "1: Cutting", the data when the GPS status is not positioned will not be recorded.

8-3-3 CTRS time adjustment

Regardless of whether GPS data is collected or not, and regardless of the measurement mode, the time acquired from GPS can be used for CTRS time adjustment. GPS time adjustment is performed approximately once every hour, and only when the GPS status is in the process of positioning. If the time adjustment has been successfully performed, the CTRS status "Time adjustment status by GPS" is set. If the GPS status is set to not positioned for an extended period of time and the time has not been set for more than one hour, the CTRS status "Time adjustment status by GPS" is cleared.

The parameter settings are shown below.

(1) GPS data measurement - No.3 Measuring condition (Common)
Set "1: NMEA measurement valid" or "2: Only time adjustment valid".

8-4 UNIT TYPE NO.

The unit type no. and class no. used in the command and measuring condition are described below.

Unit type	Class No.	Type No.	Group No.	Unit name	Remarks
Main	0	0	0	CTRS-100A	
Measuring	1	0	0	No unit	
	1	1	0	Unknown unit	
	1	2	0	CTRS-100A	Built-in strain/voltage measuring unit
	1	3	0	CTRS-CDV010A	
	1	4	0	CTRS-CTA010A	
	1	5	0	CTRS-CVPS010A	
	1	6	0	CTRS-IEPE010A	
Expansion	2	0	0	No unit	
	2	1	0	Unknown unit	
	2	2	0	CTRS-BATT010A	
	2	3	0	CTRS-SYNC010A	
	2	4	1	CTRS-WLAN010A	
	2	5	1	CTRS-WLAN011A	
	2	6	1	CTRS-WLAN012A	
	2	7	2	CTRS-CAG010A	
	2	8	2	CTRS-CAG011A	
Remote control	3	0	0	No unit	
	3	1	0	Unknown unit	
	3	2	0	CTRS-RCU010A	

8-5 VALUES OF MEASURING UNITS

Values of measuring units are as follows.
(Shaded portions indicate initial values.)

Unit type	Unit type No.	2: CTRS-100A 3: CTRS-CDV010A		4: CTRS-CTA010A
Mode		Strain(2V) Strain(5V)	Voltage Voltage (2V) Voltage (5V)	TC/K TC/T TC/J TC/N
Range		1kum/m 2kum/m 5kum/m 10kum/m 20kum/m 50kum/m OFF	1.0V 2.0V 5.0V 10.0V 20.0V 50.0V OFF	Range vary by mode. TC/K: 1370degC TC/T: 400degC TC/J: 1200degC TC/N: 1300degC
Low pass filter		AUTO FLAT 10kHz 5kHz 2kHz 1kHz 500Hz 200Hz 100Hz 50Hz 20Hz 10Hz		***
High pass filter		OFF 0.2Hz 1Hz		***
Balance		OFF ON NONE		***

Unit type	Unit type No.	5: CTRS-CVPS010A	6: CTRS-IEPE010A	
Mode		Voltage Voltage (5V) Voltage (10V)	Acc.	Voltage
Range		0.2V 0.5V 1.0V 2.0V 5.0V 10.0V 20.0V 50.0V OFF	100mV 200mV 500mV 1000mV 2000mV 5000mV OFF	1.0V 2.0V 5.0V 10.0V OFF
Low pass filter		AUTO FLAT 10kHz 5kHz 2kHz 1kHz 500Hz 200Hz 100Hz 50Hz 20Hz 10Hz	AUTO FLAT 10kHz 5kHz 2kHz 1kHz 500Hz 200Hz 100Hz 50Hz 20Hz 10Hz	
High pass filter		OFF 0.2Hz 1Hz	***	OFF 0.2Hz 1Hz
Balance		OFF ON NONE	***	OFF ON NONE

9. CAN CONDITION FORMAT

CAN conditions format by using the "Set/load the measuring condition (MES)" command between the PC and CTRS. The CAN conditions format is required for the CAN measurement by using CAN unit. The format of the CAN conditions is described as follows.

MEMO

To perform CAN measurement using the CAN unit, "CAN data measurement" in "No.3 Measuring condition (Common)" of the measuring condition must be set to "1: Valid". Also, if there is a CTRS that is valid for CAN measurement in the synchronization, "Counter assignment to measurement data" must be set to "1: Valid".

9-1 CAN CONDITION FORMAT

The whole size: 400000 bytes

No.	Classification	Contents	Types of Variables	The Number of Bytes
1	General information 112 bytes	Device ID ("CTRS-100A" fixed, " " is not included.)	char	32
		Parameter format version (1 fixed)	WORD	2
		CAN unit type No. Initial value: 7	BYTE	1
		Device operation mode (Loading only) 0: Stand-alone or Master 1 to 3: Slave 1 to 3	BYTE	1
		Stop recording when CAN overflow occurs 0: OFF, 1: ON	BYTE	1
		Reserved	char	11
		Number of measurement Messages (0 to 1024) Initial value: 0	WORD	2
		Reserved	char	46
		CAN measuring mode(*1) 0: Simultaneous recording with analog data, 1: Manual trigger, 2: Analog trigger, 3: Digital trigger, 4: Complex trigger	BYTE	1
		End trigger (0: OFF, 1: ON)(*1)	BYTE	1
		Post data recording time (sec)(*1) Valid only when end trigger is ON 0: 1 sec, 1 to	WORD	2
		CAN data recording time (sec)(*1) Valid only when end trigger is OFF Initial value: 10 1 to	DWORD	4
		The number of repeat times (*1) 0: Infinite 1 to the maximum number of file digits specified Initial value: 1	DWORD	4
		Reserved	char	4

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
2	Analog trigger condition 64 bytes (*1)(*2)	Start trigger CH (1 to 1024)	WORD	2
		Start trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	1
		Start trigger level (physical value)	char	28
		End trigger CH (1 to 1024)	WORD	2
		End trigger slope (0: UP, 1: DOWN)	BYTE	1
		Reserved	char	1
		End trigger level (physical value)	char	28
3	Digital trigger condition 16 bytes (*1)(*2)	Start trigger CH (1 to 1024)	WORD	2
		Start trigger bit (1 to 64)	WORD	2
		Start trigger level (0 or 1)	BYTE	1
		Start trigger slope (0: UP, 1: DOWN, 2: Level)	BYTE	1
		Reserved	char	2
		End trigger CH (1 to 1024)	WORD	2
		End trigger bit (1 to 64)	WORD	2
		End trigger level (0 or 1)	BYTE	1
		End trigger slope (0: UP, 1: DOWN, 2: Level)	BYTE	1
		Reserved	char	2
4	Start complex trigger general condition (*1)(*2) 16 bytes	Number of start trigger conditions (1 to 8)	BYTE	1
		Start trigger AND/OR (0: OR, 1: AND)	BYTE	1
		Reserved	char	14
5	Start complex trigger condition 1(*1)(*2) 64 bytes	Start trigger condition 0: None, 1: Analog, 2: Digital	BYTE	1
		Start analog trigger slope (0: UP, 1: DOWN)	BYTE	1
		Start digital trigger slope 0: UP, 1: DOWN, 2: Level	BYTE	1
		Start digital trigger level (0 or 1)	BYTE	1
		Start trigger CH (1 to 1024)	WORD	2
		Start digital trigger bit (1 to 64)	WORD	2
		Reserved	char	8
		Start analog trigger level (physical value)	char	28
		Reserved	char	20
6	Start complex trigger condition 2(*1)(*2) 64 bytes	Same as above	---	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
7	Start complex trigger condition 3**(*1)(*2)** 64 bytes	Same as above	---	64
8	Start complex trigger condition 4**(*1)(*2)** 64 bytes	Same as above	---	64
9	Start complex trigger condition 5**(*1)(*2)** 64 bytes	Same as above	---	64
10	Start complex trigger condition 6**(*1)(*2)** 64 bytes	Same as above	---	64
11	Start complex trigger condition 7**(*1)(*2)** 64 bytes	Same as above	---	64
12	Start complex trigger condition 8**(*1)(*2)** 64 bytes	Same as above	---	64
13	End complex trigger general condition **(*1)(*2)** 16 bytes	Number of end trigger conditions (1 to 8)	BYTE	1
		End trigger AND/OR (0: OR, 1: AND)	BYTE	1
		Reserved	char	14

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
14	End complex trigger condition 1(*1)(*2) 64 bytes	End trigger condition 0: None, 1: Analog, 2: Digital	BYTE	1
		End analog trigger slope (0: UP, 1: DOWN)	BYTE	1
		End digital trigger slope 0: UP, 1: DOWN, 2: Level	BYTE	1
		End digital trigger level (0 or 1)	BYTE	1
		End trigger CH (1 to 1024)	WORD	2
		End digital trigger bit (1 to 64)	WORD	2
		Reserved	char	8
		End analog trigger level (physical value)	char	28
		Reserved	char	20
15	End complex trigger condition 2(*1)(*2) 64 bytes	Same as above	---	64
16	End complex trigger condition 3(*1)(*2) 64 bytes	Same as above	---	64
17	End complex trigger condition 4(*1)(*2) 64 bytes	Same as above	---	64
18	End complex trigger condition 5(*1)(*2) 64 bytes	Same as above	---	64
19	End complex trigger condition 6(*1)(*2) 64 bytes	Same as above	---	64
20	End complex trigger condition 7(*1)(*2) 64 bytes	Same as above	---	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
21	End complex trigger condition 8(*1)(*2) 64 bytes	Same as above	---	64
22	Optional test information (*2) 1280 bytes	Optional test information 1	char	128
		Optional test information 2	char	128
		・	・	・
		Optional test information 9	char	128
		Optional test information 10	char	128
23	Communication condition 1 (port 1) 32 bytes	CAN data recording mode 0: Designated ID mode, 1: All ID mode	BYTE	1
		Termination resistor (0: OFF, 1: ON)	BYTE	1
		Liste only mode (0: OFF, 1: ON)	BYTE	1
		Reserved	char	5
		Communication speed (kbps) 0: 1000, 1: 800, 2: 500, 3: 250, 4: 125 5: 100, 6: 83.3, 7: 62.5, 8: 50, 9: 33.3 10: 25, 11: 20, 12: 10	BYTE	1
		CAN FD data bit rate (Mbps) 0: 5Mbps, 1: 4Mbps, 2: 2Mbps, 3: 1Mbps 4: 0.5Mbps, 5: OFF	BYTE	1
		Reserved	char	22
	Communication condition 2 (port 2) 32 bytes	Same as above	---	32
24	Reserved	Reserved	char	64
25	Node information No.0 48 bytes ※49152 bytes for 1024Nodes	Node name (maximum 32 characters) Initial value: ""	char	36
		Reserved	char	12
	Node information No.1	Same as above	---	48
	Node information No.2	Same as above	---	48
	・	・	・	・
	Node information No.1023	Same as above	---	48

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
26	Message condition No.0 64 bytes ※65536 bytes for 1024 Messages	Measurement ON/OFF (0: OFF, 1: ON)	BYTE	1
		ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Data length 0 to 8: 0 to 8 byte, 9: 12byte, 10: 16 byte 11: 20 byte, 12: 24 byte, 13: 32 byte 14: 48byte, 15: 64byte Initial value: 8	BYTE	1
		Port No. (0: Port 1, 1: Port 2)	BYTE	1
		Reserved	char	4
		Node information No. (-1 : None, 0 to 1023)	short	2
		Reserved	char	2
		Message ID Standard: 11 bits, Extended: 29 bits Initial value: 0	DWORD	4
		Message name (maximum 32 characters) Initial value: ""	char	36
		Reserved	char	12
	Message condition No.1	Same as above	---	64
	Message condition No.2	Same as above	---	64
	.	.	.	.
	Message condition No.1023	Same as above	---	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
27	Signal condition CH1 240 bytes ※245760 byte for 1024 CHs	Measurement ON/OFF (0: OFF, 1: ON)	BYTE	1
		Bit length (1 to 64) Initial value: 16	BYTE	1
		Data type 0: Signed, 1: Unsigned, 2: Float, 3: Double	BYTE	1
		Endian (0: Little, 1: Big)	BYTE	1
		The number of digits after decimal point -1: Auto, 0 to 8	char	1
		CAN zero value ON/OFF (0: OFF, 1: ON)	char	1
		Reserved	char	2
		Start bit (0 to 511) Initial value: 0	WORD	2
		Message condition No. (0 to 1023) Initial value: 0	short	2
		Reserved	char	12
		Calibration coefficient Initial value: ”1.0”	char	28
		Offset Initial value: ”0.0”	char	28
		Maximum value Initial value: ”0.0”	char	28
		Minimum value Initial value: ”0.0”	char	28
		CAN zero value Initial value: ”0”	char	28
		Unit character string Initial value: ””	char	36
		Signal name (maximum 32 characters) Initial value: ””	char	36
		Reserved	char	4
	Signal condition CH2	Same as above	---	240
	Signal condition CH3	Same as above	---	240
	・	・	・	・
	Signal condition CH1024	Same as above	---	240

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
28	CAN output condition (General condition) 32 bytes	CAN output mode (in binary digit) 0x00: None, 0x01: Output at start 0x02: Output at stop, 0x04: Interval output 0x08: Manual output	BYTE	1
		Reserved	char	3
		Output at start, the number of IDs(0 to 32) Initial value: 0	WORD	2
		Output at stop, the number of IDs(0 to 32) Initial value: 0	WORD	2
		Interval output, the number of IDs(0 to 32) Initial value: 0	WORD	2
		Manual output, the number of IDs(0 to 32) Initial value: 0	WORD	2
		Reserved	char	4
		Interval output, pitch (msec) 100 to 100000(every 100msec) Initial value: 100	DWORD	4
		Reserved	char	12

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
29	CAN output condition (Output at start condition No.1) 96 bytes ※3136 bytes for 32 conditions + Reserved	Output ON/OFF (0: OFF, 1: ON)	BYTE	1
		Output ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Output data length 0 to 8: 0 to 8 byte, 9: 12byte, 10: 16 byte 11: 20 byte, 12: 24 byte, 13: 32 byte 14: 48byte, 15: 64byte Initial value: 2	BYTE	1
		Output port No. (0: Port 1, 1: Port 2)	BYTE	1
		Response confirmation ON/OFF (0: OFF, 1: ON)	BYTE	1
		Reserved	char	3
		Timeout period (msec) 0：10, 10 to 1000(every 10msec) Initial value: 10	WORD	2
		Interval until next output (msec) 0: No waiting time, 10 to 1000(every10msec) Initial value: 10	WORD	2
		Output Message ID Initial value: 0	DWORD	4
		Output data Initial value: ”00 00”	BYTE	64
		Received ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Received port No. (0: Port 1, 1: Port 2)	BYTE	1
		Reserved	char	2
		Received Message ID Initial value: 0	DWORD	4
		Reserved	char	8
	CAN output condition (Output at start condition No.2)	Same as above	---	96
	CAN output condition (Output at start condition No.3)	Same as above	---	96
	・	・	・	・
	CAN output condition (Output at start condition No.32)	Same as above	---	96
	Reserved	Reserved	char	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
30	CAN output condition (Output at stop condition No.1) 96 bytes ※3136 bytes for 32 conditions + Reserved	Output ON/OFF (0: OFF, 1: ON)	BYTE	1
		Output ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Output data length 0 to 8: 0 to 8 byte, 9: 12byte, 10: 16 byte 11: 20 byte, 12: 24 byte, 13: 32 byte 14: 48byte, 15: 64byte Initial value: 2	BYTE	1
		Output port No. (0: Port 1, 1: Port 2)	BYTE	1
		Response confirmation ON/OFF (0: OFF, 1: ON)	BYTE	1
		Reserved	char	3
		Timeout period (msec) 0：10, 10 to 1000(every 10msec) Initial value: 10	WORD	2
		Interval until next output (msec) 0: No waiting time, 10 to 1000(every10msec) Initial value: 10	WORD	2
		Output Message ID Initial value: 0	DWORD	4
		Output data Initial value: ”00 00”	BYTE	64
		Received ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Received port No. (0: Port 1, 1: Port 2)	BYTE	1
		Reserved	char	2
		Received Message ID Initial value: 0	DWORD	4
		Reserved	char	8
	CAN output condition (Output at stop condition No.2)	Same as above	---	96
	CAN output condition (Output at stop condition No.3)	Same as above	---	96
	・	・	・	・
	CAN output condition (Output at stop condition No.32)	Same as above	---	96
	Reserved	Reserved	char	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
31	CAN output condition (Interval output condition No.1) 96 bytes ※3136 bytes for 32 conditions + Reserved	Output ON/OFF (0: OFF, 1: ON)	BYTE	1
		Output ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Output data length 0 to 8: 0 to 8 byte, 9: 12byte, 10: 16 byte 11: 20 byte, 12: 24 byte, 13: 32 byte 14: 48byte, 15: 64byte Initial value: 2	BYTE	1
		Output port No. (0: Port 1, 1: Port 2)	BYTE	1
		Response confirmation ON/OFF (0: OFF, 1: ON)	BYTE	1
		Reserved	char	3
		Timeout period (msec) 0：10, 10 to 1000(every 10msec) Initial value: 10	WORD	2
		Interval until next output (msec) 0: No waiting time, 10 to 1000(every10msec) Initial value: 10	WORD	2
		Output Message ID Initial value: 0	DWORD	4
		Output data Initial value: ”00 00”	BYTE	64
		Received ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Received port No. (0: Port 1, 1: Port 2)	BYTE	1
		Reserved	char	2
		Received Message ID Initial value: 0	DWORD	4
		Reserved	char	8
	CAN output condition (Interval output condition No.2)	Same as above	---	96
	CAN output condition (Interval output condition No.3)	Same as above	---	96
	・	・	・	・
	CAN output condition (Interval output condition No.32)	Same as above	---	96
	Reserved	Reserved	char	64

[From the previous page]

No.	Classification	Contents	Types of Variables	The Number of Bytes
32	CAN output condition (Manual output condition No.1) 96 bytes ※3136 bytes for 32 conditions + Reserved	Output ON/OFF (0: OFF, 1: ON)	BYTE	1
		Output ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Output data length 0 to 8: 0 to 8 byte, 9: 12byte, 10: 16 byte 11: 20 byte, 12: 24 byte, 13: 32 byte 14: 48byte, 15: 64byte Initial value: 2	BYTE	1
		Output port No. (0: Port 1, 1: Port 2)	BYTE	1
		Response confirmation ON/OFF (0: OFF, 1: ON)	BYTE	1
		Reserved	char	3
		Timeout period (msec) 0：10, 10 to 1000(every 10msec) Initial value: 10	WORD	2
		Interval until next output (msec) 0: No waiting time, 10 to 1000(every10msec) Initial value: 10	WORD	2
		Output Message ID Initial value: 0	DWORD	4
		Output data Initial value: ”00 00”	BYTE	64
		Received ID format 0: CAN standard, 1: CAN extension 2: CAN FD standard, 3: CAN FD extension	BYTE	1
		Received port No. (0: Port 1, 1: Port 2)	BYTE	1
		Reserved	char	2
		Received Message ID Initial value: 0	DWORD	4
		Reserved	char	8
	CAN output condition (Manual output condition No.2)	Same as above	---	96
	CAN output condition (Manual output condition No.3)	Same as above	---	96
	・	・	・	・
	CAN output condition (Manual output condition No.32)	Same as above	---	96
	Reserved	Reserved	char	64
33	Reserved	Reserved	char	24320

(*1) Slaves ignore the settings.

(*2) When initializing the measurement conditions, all of them are cleared by 0x00.

9-2 SUPPLEMENT OF SETTING CAN CONDITIONS

9-2-1 General information

(1) CAN unit type No.

Set the type No. of the connected CAN unit. For detail about the type No. , see ”8-4 UNIT TYPE NO.”

(2) Stop recording when CAN overflow occurs

This setting is valid only while waiting for interval measurement, trigger measurement, or recording. When set to "0: OFF", the recording operation is continued even if CAN data overflow occurs. Set the same value from the master to the slave.

(3) Number of measurement Messages

Set the total number of Messages to be measured. The total number range is 0 to 1024. Set 0 if no CAN measurement is to be performed. When the CAN data collection mode of all ports is set to "1: All ID mode", the number of measurement Messages is set to 0.

This value must be equal to the number of Messages set to "1: ON" in the measurement ON/OFF of the Message condition (No.0 to No.1023).

(4) CAN measuring mode

If the "Measuring mode" of "No.3 Measurement condition (Common)" in ”8-1 MEASURING CONDITION FORMAT” is other than "6: CAN trigger", set "0: Simultaneous recording with analog data". If the "Measuring mode" is "6: CAN trigger", set one of 1 to 4.

(5) End trigger

This function is available only when "6: CAN trigger" is selected for "Measuring mode" in "No.3 Measurement condition (common)" of "8-1 MEASURING CONDITION FORMAT".

(6) Post data recording time (sec)

Valid only when the end trigger is ON. When simultaneously recording with analog CH, the maximum value that can be set is the time taken to record at the set sampling frequency for the maximum number of post data calculated in (*10) of "8-1 MEASURING CONDITION FORMAT". If the value is set to 0, post data for 1 second will be recorded.

(7) CAN data recording time (sec)

Valid only when the end trigger is OFF. When simultaneously recording with analog channels, the maximum value that can be set is the recording time calculated from the number of analog channels, sampling frequency, and the number of bytes that can be recorded.

(8) The number of repeat times

This function is available only when "6: CAN trigger" is selected for "Measuring mode" in "No.3 Measurement condition (common)" of "8-1 MEASURING CONDITION FORMAT".

9-2-2 Analog trigger conditions

This is valid only when the CAN measuring mode in the general information is "2: Analog trigger".

(1) Start/End trigger level (physical value)
Set the physical value of the start/end trigger level as a character string.

9-2-3 Digital trigger conditions

This is valid only when the CAN measuring mode in the general information is "3: Digital trigger".

(1) Start/End trigger level
Valid only when the start/end trigger slope setting is "2: Level".

9-2-4 Start/Stop complex trigger general conditions

This is valid only when the CAN measuring mode in the general information is "4: Complex trigger".

(1) Number of start/end trigger conditions
Set the number of conditions for which the start/end trigger condition is not "0: None" respectively.

(2) Start/End trigger AND / OR
When set to "0:OR", the trigger is applied when any one of up to eight start/end trigger conditions is satisfied.
When set to "1: AND", the trigger is applied when all up to 8 start/end trigger conditions are satisfied.

9-2-5 Start/Stop complex trigger conditions 1 to 8

This is valid only when the CAN measuring mode in the general information is "4: Complex trigger".

(1) Start/End trigger condition
Set the trigger condition for the start/end trigger. For conditions where the trigger is not used, set to "0: None".

(2) Start/End analog trigger slope
Valid only when the start/end trigger condition is "1: Analog".

(3) Start/End digital trigger slope
Valid only when the start/end trigger condition is "2: Digital".

(4) Start/End digital trigger level
Valid only when the start/end trigger condition is "2: digital" and the start/end digital trigger slope is "2: level".

(5) Start/End analog trigger level

Valid only when the start/end trigger condition is "1: Analog". Set the physical value of the start/end trigger level as a character string.

9-2-6 Communication conditions 1 to 2

Sets the communication conditions for CAN. Communication condition 1 corresponds to CAN port 1, and communication condition 2 corresponds to CAN port 2.

(1) CAN data recording mode

When set to "0: Designated ID mode", the ID format and Message ID for which measurement is enabled in the Message condition are recorded.
When set to "1: All ID mode", all received CAN data is recorded, regardless of ID format or Message ID.

(2) Termination resistor

When set to "1: ON", a 120Ω termination reisistor is inserted. To place the CAN unit at the end of the CAN bus, set it to "1: ON".

(3) Listern only mode

When set to "1: ON", the CAN output from the port is completely disabled and the operation to output ACK or error frames is not performed.

(4) Communication speed (kbps)

Set the communication speed of the CAN bus.

(5) CAN FD data bit rate (Mbps)

Sets the bit rate of the data phase for CAN FD data.
If you do not want to change the bit rate of the data phase from the normal communication speed even for CAN FD data, set "5: OFF".
There are combinations of speeds that can be set for (3) communication speed and (4) CAN FD data bit rate. The combinations are as follows.

Commmunication speed[kbps]	CAN FD data bit rate[Mbps]
1000, 800	2, 1, OFF
500, 250	5, 4, 2, 1, 0.5, OFF
125	2, 1, 0.5, OFF
100, 83.3, 62.5	1, 0.5, OFF
50, 33.3	0.5, OFF
25, 20, 10	OFF

9-2-7 Node information (No.0 to No.1023)

There are 1024 Node informations. Each Node information is assigned a number from No.0 to No.1023 in order from the top, and is used in the Node information number in the Message condition that follows.

(1) Node name

Set the Node name within 32 characters (optional).
When not in use, clear with 0x00.

9-2-8 Message conditions (No.0 to No.1023)

There are 1024 Message conditions. Each Message condition is assigned a number from No.0 to No.1023 in order from the top, and is used in the Message condition No. in the subsequent Signal condition.
The CAN unit records data in packet units called data frames.

(1) Measurement ON/OFF

Set whether the Message is to be measured or not to be measured.

(2) ID format

Sets the format of the Message ID.
For the CAN standard or CAN FD standard, the message ID is set as an 11-bit number (0 to 7FFh).
For CAN extension or CAN FD extension, set the Message ID as a 29-bit number (0 to 1FFFFFFFh).
Please match the setting of the CAN data output device.

(3) Data length

Set the valid data length of the data frame. Please match the setting of the CAN data output device.
For Messages with measurement ON, CTRS records or monitors the received data frames with the data length as it is, regardless of the data length setting. Even if CAN data with less than the set data length is received, no processing is performed to fill the missing data with 0.

(4) Port No.

Set the port number to be used.

(5) Node information No.

Set the No. of the Node information, used in the Message.
The setting value is -1, 0 to 1023. If you do not want to use Node information, set the value to -1.

(6) Message ID

Set the Message ID.
The range of the set value depends on the ID format setting.

NOTE

Make sure the Message ID will not overlap. However, overlapping Message ID is available under the following conditions.

- Having different port No.
- Having different ID format.

(7) Message name

Set the Message name within 32 characters (optional).
When not in use, clear with 0x00.

9-2-9 Signal consitions (CH1 to CH1024)

There are 1024 Signal conditions. With CAN unit, one data frame is divided (cutout) into multiple data. CH numbers are allocated to the divided data for management. The Signal conditions are for setting the cutout conditions of a data frame. You can display the cutout data in physical quantity by multiplying coefficients. You can also treat the divided data as well as analog CH data.

(1) Measurement ON/OFF
Set whether Signal condition is valid or invalid.

(2) Bit length
Sets the cutout-data size in bits. The setting value is 1 to 64.

(3) Data type
Sets the cutout-data type. The setting value is 0 to 3.

No.	Notation	Details
0	Sigened	Signed integer
1	Unsigened	Unsigned integer
2	Float	Single precision floating-point number (bit length: 32 bits)
3	Double	Double precision floating-point number (bit length: 64 bits)

(4) Endian
Sets the data frame assignment. The setting value is 0 (Little) or 1 (Big).
Please match the setting of the CAN data output device.

(5) The number of digits after decimal poin
The data is recorded in the recorded data file (extension: KC3) and used for data playback.
The setting value is -1 (Auto), 0 to 8.
For details about the recorded data files, see ”IM-A-1319 Instruction manual for Kyowa standard format 3”.

(6) CAN zero value ON/OFF
Sets whether or not the CAN zero value is added as an offset.

(7) Start bit
Sets the cutout-start position in bits. The setting value is 0 to 511.

(8) Message condition No.
Set the Message condition No. to be used with this Signal condition. The setting value is 0 to 1023.
For the Message condition, see "9-2-8 Message conditions (No.0 to No.1023)”.

(9) Calibration coefficient/offset
Sets multiplier (Calibration coefficient: A) and additional value (Offset: B) for converting the cutout data into physical value.
Sets A and B in the double precision floating decimal point variable (Double).
Suppose the cutout data is X.
The physical value to be converted (Y) is $Y = AX + B$.

(10) Maximum value/Minimum value
You can set the maximum/minimum value, which is the value listed in the CANdb file.

(11) CAN zero value
This value is added as an offset when the CAN zero value ON/OFF is "1: ON". Let the calibration coefficient be (A), the offset be (B), the CAN zero value be (C), and the cutout data be (X). The physical value to be converted (Y) is Y = AX+B+C.

(12) Unit character string
Sets an arbitrary unit string.

(13) Signal name
Set the Signal name within 32 characters (optional).
When not in use, clear with 0x00.

9-2-10 CAN output conditions (General conditions)

For setting the general conditions of the CAN output.
For details about the can output, see ”IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware”.

(1) CAN output mode
Set the CAN output mode.
Set a bit applicable to the target mode.
Note that you can set multiple modes at the same time.

Values	Mode
0x01	Output at start
0x02	Output at stop
0x04	Interval output
0x08	Manual output

(2) Output at start, the number of IDs
Set the number of conditions for which output ON/OFF is set to "1: ON" in ”9-2-11 CAN output conditions (Output at start conditions) (No.1 to No.32)”. The setting value is 0 to 32.

(3) Output at stop, the number of IDs
Set the number of conditions for which output ON/OFF is set to "1: ON" in ”9-2-12 CAN output conditions (Output at stop conditions) (No.1 to No.32)”. The setting value is 0 to 32.

(4) Interval output, the number of IDs
Set the number of conditions for which output ON/OFF is set to "1: ON" in ”9-2-13 CAN output conditions (Interval output conditions) (No.1 to No.32)”. The setting value is 0 to 32.

(5) Manual output, the number of IDs
Set the number of conditions for which output ON/OFF is set to "1: ON" in ”9-2-14 CAN output conditions (Manual output conditions) (No.1 to No.32)”. The setting value is 0 to 32.

(6) Interval output, pitch
Set the interval output cycle. The setting value is 100 to 100000[msec], set by every 100[msec].

9-2-11 CAN output conditions (Output at start conditions) (No.1 to No.32)

The "Output at start" transfers the CAN data frame when starting the A/D conversion.
Capable of setting maximum 32 conditions.

(1) Output ON/OFF

Sets the output ON/OFF for each condition.

(2) Output ID format

Set the ID format of the CAN data to be output.

(3) Response confirmation ON/OFF

Confirm if there is a response after sending a data frame. This is valid only when the CAN output test is executed.

MEMO

- The response confirmation is a function to check if the CAN data set in the receive ID format, receive port No., and receive Message ID is received as a response.
- The CAN data to be received in response confirmation is optional.

(4) Timeout period

Set the time to wait for a response when "(3)Response confirmation ON/OFF" is set to "1: ON". This is valid only when the CAN output test is executed.
When there is no response, the CTRS waits for the timeout period and goes to the next output condition.
The setting value is 0 or 10 to 1000[msec], set by every 10[msec]. If it is set to 0, the operation is the same as when it is set to 10.

(5) Interval until next output

Set the interval between the end of the current output and the start of the next output when there are multiple conditions under which the output is valid.
The setting value is 0 or 10 to 1000[msec], set by every 10[msec]. If it is set to 0, the next output starts immediately.

(6) Received ID format/Received port No./ Received Message ID

Set the conditions for receiving a response when "(3)Response confirmation ON/OFF" is set to "1: ON". This is valid only when the CAN output test is executed.

9-2-12 CAN output conditions (Output at stop conditions) (No.1 to No.32)

The "Output at stop" transfers the CAN data frame when stopping the A/D conversion.
Capable of setting maximum 32 conditions. The setting items are the same as the ”9-2-11 CAN output conditions (Output at start conditions) (No.1 to No.32)”.

9-2-13 CAN output conditions (Interval output conditions) (No.1 to No.32)

The "Interval output" transfers the CAN data frames at the interval set in "9-2-10 (6) Interval output, pitch" during AD conversion operation.
Capable of setting maximum 32 conditions. The setting items are the same as the ”9-2-11 CAN output conditions (Output at start conditions) (No.1 to No.32)”.

9-2-14 CAN output conditions (Manual output conditions) (No.1 to No.32)

The "Manual output" transfers the CAN data frames using the execute manual CAN output (ECO) command.
Capable of setting maximum 32 conditions. The setting items are the same as the ”9-2-11 CAN output conditions (Output at start conditions) (No.1 to No.32)”.

MEMO

For details of the operation, see ”IM-A-1283 CTRS-100A Compact Recorder Instruction Manual for Hardware”.