DXAdvanced™

Contents

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Foreword

This TI provides an overview and description of functions for the DAQSTATION DXAdvanced (DX1000/DX2000). DXAdvanced comes equipped with a variety of convenient and enhanced functions that were not available with the conventional DX series instruments. We welcome you to read this TI in order to take full advantage of the powerful functions of DXAdvanced.

1   Overview of DXAdvanced

The new DX series instrument, DXAdvanced, is a next-generation network data acquisition station with a variety of greatly enhanced measurement, display, memory, networking, and other functions that respond to the demands coming from fields around the world.
Its main features are:

Advanced Performance   - High Input Capacity and Fast Measurement Speed
- ✓   Up to 48 channels of input (DX2000 alone)
- ✓   High degree of expandability through Modbus/TCP (up to 348 channels when connected to external I/O)
- ✓   High speed (up to 25 ms) measurement (on the DX1002, DX1004, DX2004, or DX2008 when in fast sampling mode)

Advanced Memory   - High Capacity Memory
- ✓   Uses a 200-MB (maximum) flash memory for internal memory
- ✓   Uses a large capacity, highly reliable CompactFlash memory card as an external storage medium
- ✓   With the USB interface (option), you can save measured data to USB flash drive.

Advanced User Functions   - Easy Setup and Display Navigation
- ✓   Easy operation and entry of settings with a USB keyboard and remote control unit.
- ✓   An even wider variety of display variations
- ✓   Jump immediately to a desired screen using the "Favorite" key

Advanced Connectivity   - Advanced Networking Technology
- ✓   Comes standard with an Ethernet interface.
- ✓   In addition to standard Web server and e-mail functions, DXAdvanced includes network time synchronization (SNTP), automatic network settings (DHCP), and other features.

Advanced Reliability   - Enhanced Reliability
- ✓   Dust-proof and waterproof front panel (conforms to IEC529-IP65)
- ✓   Provides security with a locked front panel and login function

2 Input Section
2.1 Input: Basic Specifications

* **Bolded** items represent changes or additions to the conventional DX.

Inputs and Measuring Intervals

Model		Number of Inputs	Measurement Interval	
			Normal Mode	**Fast Sampling Mode**
DX1000	DX1002	2	Select 125 ms or 250 ms	**25 ms**
	DX1004	4		
	DX1006	6	Select 1*, 2, or 5 sec.	**125 ms**
	DX1012	12		
DX2000	DX2004	4	Select 125 ms/250 ms	**25 ms**
	DX2008	8		
	DX2010	10	Select 1*, 2, or **5 sec**.	**125 ms**
	DX2020	20		
	DX2030	30		
	DX2040	**40**		
	DX2048	**48**		

* A measurement interval of 1 second cannot be selected when the A/D integral time is 100 ms.

Input Type
- DCV: DC voltage
- TC: Thermocouple
- RTD: RTD
- DI: ON/OFF (contact) input, voltage input
- DCA: DC current (with the external shunt resistor (10 Ω, 100 Ω, or 250 Ω))

Measuring Range
- DCV: 20 mV, 60 mV, 200 mV, 2 V, **1-5 V**, 6 V, 20 V,or 50 V
- TC: R, S, B, K, E, J, T, N, W, L, U, **WRe**
- RTD: Pt100, JPt100
- DI: Voltage input: OFF at less than 2.4 V and ON at 2.4 V or greater
  Contact input: Contact ON/OFF

A/D Resolution: 16 or equivalent

A/D Resolution

Model		Measurement mode	A/D Resolution		
			1.67 ms	16.7 ms/ 20 ms/AUTO*	100 ms
DX1000	DX1002 DX1004	Normal mode	×	○	×
		Fast sampling mode	○	×	×
	DX1006 DX1012	Normal mode	×	○	○
		Fast sampling mode	○	×	×
DX2000	DX2004 DX2008	Normal mode	×	○	×
		Fast sampling mode	○	×	×
	DX2010 DX2020 DX2030 DX2040 DX2048	Normal mode	×	○	○
		Fast sampling mode	○	×	×

* AUTO: Automatically selects 20 ms or 16.7 ms depending on the power supply frequency.

○: Can be set
×: Cannot be set

Function: Burnout: Burnout (detection or disconnection) is possible with
                                     thermocouple input and **1-5 V input**
                                     In the 1-5 V range, burnout is detected when the signal exceeds
                                     +10% of the set span or falls below -5%.

                   Reference junction compensation:
                                     With thermocouple (TC) input, each channel can switch between
                                     using or not using the internal compensation circuit to perform
                                     reference junction compensation.

                   Moving average function:
                                     A moving average function can be used. You can select 2-400
                                     data to be averaged.

2.2   Input MATH Functions

* Bolded items represent changes or additions to the conventional DX.

Standard MATH Specifications
  Difference computation
        You can perform difference between channel computations with arbitrary channels.
        Computable ranges: DC voltage (DCV), thermocouple (TC), resistance temperature
                                detector (RTD), and event recording (DI)

  Linear scaling
        Computable ranges: DC voltage (DCV), thermocouple (TC), resistance temperature
                                detector (RTD), and event recording (DI)
        Possible scope for scaling:
                                -30000–30000
                                **You can select to save as an OVER value when ± 5% of the
                                scaling range is exceeded.**
        Decimal place: Can be set arbitrarily
        Units of scaling value: Can be set arbitrarily (max 6 characters)

  Square-root scaling
        You can compute the square root of the measurement channel and perform scaling.
        Computable ranges: DC voltage (DCV)
        Possible scope for scaling:
                                -30000–30000
                                **You can select to save as an OVER value when ± 5% of the
                                scaling range is exceeded.**
        Decimal place: Can be set arbitrarily
        Units of scaling value: Can be set arbitrarily (max 6 characters)
        Low cut function: Can be set using 0.0–5.0% of the low cut point span

  1-5 V linear scaling
        Computable ranges: DC voltage (1-5 V)
        Span setting range: 0.800–5.200
        Possible scope for scaling:
                                -30000–30000
                                **You can select to save as an over value when ± 5% of the
                                scaling range is exceeded.**
        Decimal place: Can be set arbitrarily
        Units of scaling value: Can be set arbitrarily (max 6 characters)
        Low cut function: Low cut point fixed to lower limit value of set span

2.3　Notes on Measuring in Fast Sampling Mode

DXAdvanced comes with a new fast sampling mode, achieving a measurement interval of up to 25 ms (or up to 125 ms depending on the model). Using Fast sampling mode allows you to capture and record high speed phenomena that the conventional DX instruments could not completely capture. However, it is different from Normal mode in that performance may differ is such aspects as measurement accuracy depending on factors such as a shortened A/D integral time. When using Fast sampling mode, please be aware of the following points regarding performance.

■ Measurement Accuracy
Measurement accuracy in Normal mode and Fast sampling mode differ as follows:

Input	Range	Measurement Accuracy (Numerical Display)		Display Resolution
		Normal Mode (Integral Time: 16.7 ms or more)	**Fast Sampling Mode (Integral Time: 1.67 ms)**	
DCV	20 mV	±(0.05% of rdg + 12digits)	±(0.1% of rdg + **40 digits**)	1 µV
	60 mV	±(0.05% of rdg + 3digits)	±(0.1% of rdg + **15 digits**)	10 µV
	200 mV			10 µV
	2 V	±(0.05% of rdg + 12digits)	±(0.1% of rdg + **40 digits**)	100 µV
	6 V	±(0.05% of rdg + 3digits)	±(0.1% of rdg + **15 digits**)	1 mV
	1-5 V			1 mV
	20 V			1 mV
	50 V			10 mV
TC	R	±(0.15% of rdg + 1 °C) R and S are as follows: 0–100 °C : ±3.7 °C 100–300 °C: ±1.5 °C B is as follows: 400–600 °C : ±2 °C Accuracy not guaranteed at less than 400 °C	±(0.2% of rdg + **4 °C**) R and S are as follows: 0–100 °C : **±10 °C** 100–300 °C: **±5 °C** B is as follows: 400–600 °C : **±7 °C** Accuracy not guaranteed at less than 400 °C	0.1 °C
	S			
	B			
	K	±(0.15% of rdg + 0.7 °C) -200– -100 °C : ±(0.15% of rdg + 1 °C)	±(0.2% of rdg+**3.5 °C**) -200– -100 °C : ±(0.15% of rdg + **6 °C**)	
	E	±(0.15% of rdg+0.5 °C) -200– -100 °C: ±(0.15% of rdg + 0.7 °C)	±(0.2% of rdg+**2.5 °C**) -200– -100 °C : ±(0.2% of rdg + **5 °C**)	
	J			
	T			
	N	±(0.15% of rdg + 0.7 °C)	±(0.3% of rdg + **3.5 °C**)	
	W	±(0.15% of rdg + 1 °C)	±(0.3% of rdg + **7 °C**)	
	L	±(0.15% of rdg + 0.5 °C) -200– -100 °C : ±(0.15% of rdg + 0.7 °C)	±(0.2% of rdg + **2.5 °C**) -200– -100 °C : ±(0.2% of rdg + **5 °C**)	
	U			
	WRe	±(0.2% of rdg + 2.5 °C) 0–200 °C: ±4.0 °C	±(0.3% of rdg + **10 °C** 0–200 °C: ±**18.0 °C**)	
RTD	Pt100	±(0.15% of rdg + 0.3 °C)	±(0.3% of rdg + **1.5 °C**)	
	JPt100			

■ Precautions on Using Fast sampling mode
During measurement in fast sampling mode (integral time: 1.67 ms), power supply frequency noise can influence the signal causing instabilities in the measured values. In such cases, measurement should be performed in Normal mode (integral time of 16.7 ms or 20 ms).

3　Alarm Functions
3.1　Alarms: Basic Specifications

　　* **Bolded** items represent changes or additions to the conventional DX.

3.1.1　Number and Type of Alarms

■ Number and Type of Alarms
Up to four levels of alarms can be set on each channel.
The following are the alarm types.

Alarm Type	Display Symbol	Description
High limit alarm	H	Generates an alarm when the measured value exceeds the alarm value.
Low limit alarm	L	Generates an alarm when the measured value falls below the alarm value.
Differential High limit alarm	h	Generates an alarm when the difference between the measured values of two channels exceeds the differential High limit alarm value.
Differential Low limit alarm	l	Generates an alarm when the difference between the measured values of two channels falls below the differential Low limit alarm value.
High limit on rate of change Alarm	R	The amount of change of the measured values is checked over the specified interval. An alarm occurs if the amount of change of the measured value in the rising direction exceeds the specified value.
Low limit on rate of change Alarm	r	The amount of change of the measured values is checked over the specified interval. An alarm occurs if the amount of change of the measured value in the falling direction exceeds the specified value.
Delay High alarm	T	Generates an alarm when the measured value exceeds the alarm value for the specified delay alarm time.
Delay Low alarm	t	Generates an alarm when the measured value falls below the alarm value for the specified delay alarm time.

■ Alarm Types That Can Be Set by Channel Type
The alarm types that can be set differ depending on the channel type.

Channel Type	Range	Available Alarm Types
Measurement channels	Diff. between channels	High/low limit, delay high/low, high/low limit on rate of change, differential high/low limit
	Other than above	High/low limit, delay high/low, high/low limit on rate of change
MATH channels	-	High/low limit, delay high/low
External channels	-	High/low limit, delay high/low

3.1.2　Delay Alarm Time

The delay alarm time can be set channel by channel.
The delay alarm time settings are as follows:

Delay Alarm Time Setting	Selection Items (Setting Range)	Description
Channel number	No. of channel numbers varies depending on model	The number of specified channels (measurement, MATH, external channels)
Delay alarm time	1–3600 sec.	Delay time setting for delay high/low alarms

3.1.3 Intervals for Rate of Change Alarms

You can set the number of samples used to determine the interval for calculating the rate of change when using rate of change alarms (interval = measurement interval * sampling iterations).

The setting is the same for all channels.

The rate of change alarm interval settings are as follows:

Rate of Change Alarm Setting	Selection Items (Setting Range)	Description
High alarm	1–32	Number of samples for determining the interval for the high limit on rate-of-change alarm
Low alarm	1–32	Number of samples for determining the interval for the low limit on rate-of-change alarm

3.1.4 Alarm Hysteresis

You can set a hysteresis width to the setting values used to activate and release alarms.

The hysteresis can be set for each channel type (measurement, MATH, and external channels).

The alarm type and hysteresis setting are as follows.

Channel Type	Alarm Type Valid for Hysteresis	Hysteresis Setting Range
Measurement channels	Hi/Lo limit	**0.0–5.0%** of the set span (or scale width for scaling)
	Diff. H/L lim	**0.0–5.0%** of the set span (or scale width for scaling)
MATH channels	Hi/Lo limit	**0.0–5.0%** of the set span (or scale width for scaling)
External channels	Hi/Lo limit	**0.0–5.0%** of the set span (or scale width for scaling)

3.1.5 Alarm Display

When an alarm occurs, it is displayed for each channel in the numerical display section.

Common alarm indication is in the status display.

The display action can be switched between Hold and Non-hold.

The alarm display settings are as follows.

Alarm Display Setting	Selection Items (Setting Range)	Description
Alarm display Hold/Non-hold	Hold/Non-Hold	Alarm display Hold/Non-Hold settings Hold: Alarm display held until alarm ACK operation is performed Non-Hold: Alarm display is cancelled when the alarm is cleared

3.2 Alarm Output Relays

* **Bolded** items represent changes or additions to the conventional DX.

3.2.1 Overview of Alarm Output Relays

Internal switch and output really (optional) can be selected as the alarm output destination.
The following are the numbers and actions of each.

Relay Type	Number	Name	Action			
			Energize/ De-energize	Hold/ Non-Hold	AND/OR	Reflash
Internal switch	**30**	**S01–S30**	**✕**	**✕**	○	**✕**
Output relay (optional)	2, 4, 6 (DX1000)	I01–I06	○	○	○	○
	2, 4, 6, 12, 22, 24 (DX2000)	I01–I06 I11–I16 I21–I26 I31–I36	○	○	○	○

○: Can be set
✕: Cannot be set

3.2.2 Alarm No Logging Function

■ You can have output occur only on relays upon occurrence of alarms (can be turned ON/OFF).
■ When an alarm occurs, it is neither displayed nor recorded in the alarm summary.
■ You can combine the Event action function and the Alarm No Logging function to use input channels, MATH channels and external channels as remote input.

4 Memory Function

4.1 Internal Memory: Basic Specifications

* **Bolded** items represent changes or additions to the conventional DX.

Medium:	Flash memory
Memory size:	**80 MB or 200 MB (select when ordering)**
No. of savable data files:	
	Max. 400 (total of display data files and event data files)
FIFO operation:	If the number of savable data files or the size of savable area on the medium exceeds the stipulated value, the oldest files are overwritten by the newest ones.

4.2 External Storage Medium: Basic Specifications

* **Bolded** items represent changes or additions to the conventional DX.

Medium:	CompactFlash memory card (CF card)
Maximum supported capacity:	
	2 GB (it is recommended to use only genuine Yokogawa accessory CF cards)
Formatting:	**FAT32 or FAT16**
	When formatting under 512 MB on DXAdvanced: FAT16
	When formatting 512 MB or over: FAT32

4.3   Overview of Data Saving

DXAdvanced

Memory sampling (SRAM)

Internal flash memory data area

Sample data

Save timing

to file

Internal flash memory file area

Data file A

Data file B

Data file C

Data file D

Auto save

Copy

Manual save

File select, copy

External storage medium (CF card)

Data file A

Data file A
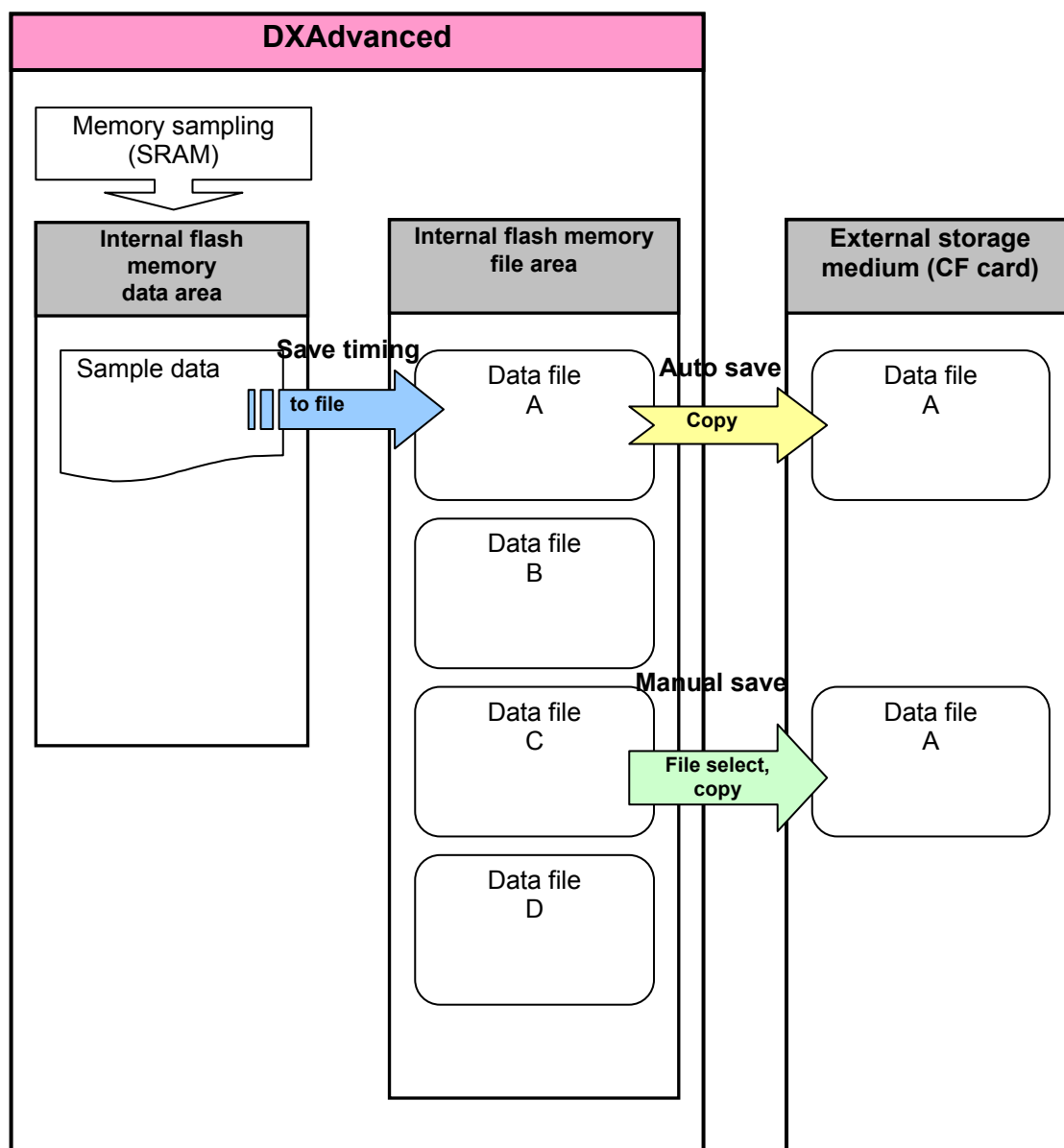
4.4   Types of Saved Data

* **Bolded** items represent changes or additions to the conventional DX.

4.4.1   Types of Saved Data and File Header Information

■ Types of Saved Data

Data Type	Description	Data Format
Display data	Waveform data from measurement, MATH, and external channels displayed in the trend display (max. and min. values within the waveform update interval).	Binary
Event data	Instantaneous values of the data sampled from measurement, MATH, and external channels at the specified sampling interval.	Binary
Manually sampled data	Instantaneous values of the data sampled from the specified measurement, MATH, and external channels.	ASCII
Report data	Hourly, daily, weekly, and monthly data from the specified measurement, MATH, and external channels.	ASCII
Snapshot data	Image data displayed on the screen	PNG

■ Data Files and Added File Header Information

File Header Contents	Data Types			
	Display Data	Event Data	Manually Sampled Data	Report Data
Instrument serial number	Yes	Yes	Yes	Yes
Header comment (user specified string)	Yes	Yes	Yes	Yes
Sampling start information (day/time, user name)	Yes	Yes	No	No
Sampling stop information (day/time, user name)	Yes	Yes	No	No
Batch name (batch number + lot number)	Yes	Yes	No	No
Comment information (user specified string, day/time, user name)	Yes	Yes	No	No

4.4.2   Saved Data Settings and Maximum Size of Data

Saved Data Setting	Description	Max. Data Size per File (Including Time Data)
Display data only	Saves display data only	8 MB
Event data only	Saves event data only	8 MB
Display data + event data	Saves both display data and event data * Memory start/stop is common to display and event data	8 MB (each display data and event data)

4.4.3   Display Data

■ Overview of Display Data Files

Display data is measured data used to display waveforms.

Waveform display data is saved as dots, consisting of the maximum and minimum values within the data measured at the measurement interval during the time that is equivalent to 1 dot on the time axis.

As data can be saved over a long period of time using a relatively slow sampling interval (0.5 sec to 20 min.), it is equivalent to a file from a conventional chart recorder.
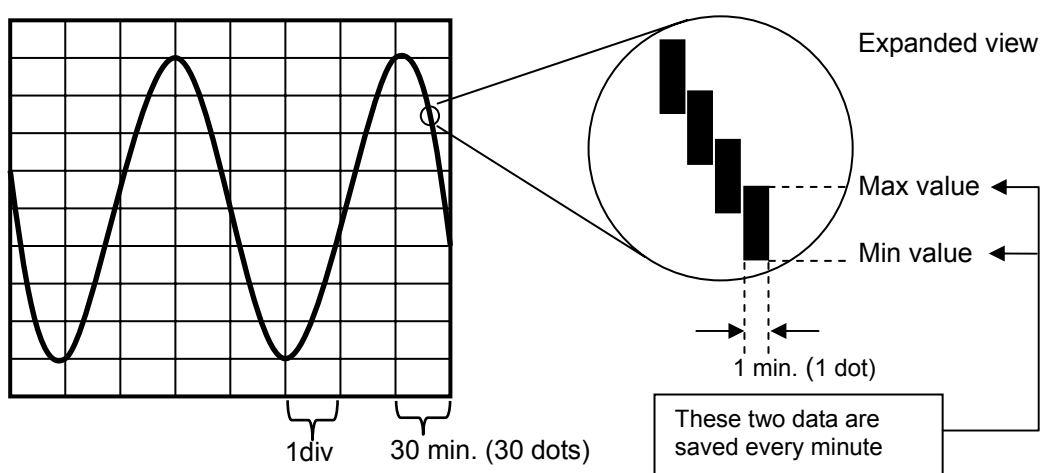
Display data file overview diagram (given a waveform update rate of 30 min./div)

In the example in the overview diagram above, the waveform display is updated one dot at a time every minute.

With the DX1002/1004/2004/2008, measurements are taken at a maximum of once every 125 ms when in Normal mode for a total of 480 measurements per minute.

With the DX1006/1012/2010/2020/2030/2040/2048, measurements are taken at a maximum of once per second when in Normal mode for a total of 60 measurements per minute.

The maximum and minimum values (2 data) from the data measured (480 data on the DX1002/1004/2004/2008 or 60 data on the DX1006/1012/2010/2020/2030/2040/2048) in 1 minute (the time it takes to update 1 dot on the display) are saved in the display data file.

In other words, even if a rapid change occurs over the duration of a minute, the DX series instrument can solidly capture that peak value.

The relationship between the waveform display update interval (time equaling approximately 1 div on the time axis), data save interval, and data save period is shown in the table below.

Waveform Display Update Interval	Data Save Interval	Display Speed (Estimate)
15 sec/div[*]	0.5 sec	2460.0 mm/h
30 sec/div	1 sec	1230.0 mm/h
1 min/div	2 sec	615.0 mm/h
2 min/div	4 sec	307.5 mm/h
5 min/div	10 sec	123.0 mm/h
10 min/div	20 sec	61.5 mm/h
20 min/div	40 sec	30.7 mm/h
30 min/div	1 min	20.5 mm/h
1 hrs/div	2 min	10.2 mm/h
2 hrs/div	4 min	5.1 mm/h
4 hrs/div	8 min	2.5 mm/h
10 hrs/div	20 min	1.0 mm/h

*15 sec/div can only be set on the DX1002/1004/2004/2008

■ Display Data File Creation Timing
  ✓ Upon memory stop
  ✓ Every file save interval
  ✓ Manual saving using keys
  ✓ Upon restart during power recovery etc.

■ File Save Interval
The file save interval can be set along with the trend update interval.
File save interval: Select 10, 20, 30 minutes, or 1, 2, 3, 4, 6, 8, or 12 hours, or 1, 2, 3, 5, 7, 10, 14, or 31 days.
The range of file save intervals that can be selected is determined by the trend update interval.

4.4.4 Event Data
■ Overview of Event Data Files
Event data files are for saving data at a specified sample rate for detailed analysis on a PC. They are used for saving data when trouble occurs, especially when you want to analyze it in detail.

■ Event Data Sampling Interval
DX series instruments load data to A/D at the measurement intervals below.
The interval at which these data are saved is called the *sampling interval*.
If you set the sampling interval the same as the measurement interval, all data loaded into A/D is saved to memory. However, the sampling interval cannot be set shorter than the measurement interval.

Model		Measurement Interval	Event Data Sampling Interval
DX1000	DX1002	Normal mode: 125/250 ms **Fast sampling mode: 25 ms**	**25**/125/250/500 ms Select 1/2/5/10/30/60/120/300/600 sec * An interval shorter than the measurement interval cannot be set
	DX1004		
	DX1006	Normal mode: 1/2/5 sec **Fast sampling mode: 125 ms**	**125/250/500 ms** Select 1/2/5/10/30/60/120/300/600 sec * An interval shorter than the measurement interval cannot be set
	DX1012		
DX2000	DX2004	Normal mode: 125/250 ms **Fast sampling mode: 25 ms**	**25**/125/250/500 ms Select 1/2/5/10/30/60/120/300/600 sec * An interval shorter than the measurement interval cannot be set
	DX2008		
	DX2010 DX2020 DX2030 DX2040 DX2048	Normal mode: 1/2/5 sec **Fast sampling mode: 125 ms**	**125/250/500 ms** Select 1/2/5/10/30/60/120/300/600 sec * An interval shorter than the measurement interval cannot be set

■ Event Data Save Method (Mode)
There are three methods (modes) for saving event data: Free mode, Single-shot mode, and Repeat trigger mode.
The following is a description of the three modes.

Event Data Save Method (Mode)	Description
Free mode	Data saving starts upon execution of memory start, and writing of data stops on memory stop.
Single-shot trigger mode	The instrument enters the trigger wait state upon execution of memory start. After the trigger activates and the specified time of data (data length) is written, data writing stops.
Repeat trigger mode	The instrument enters the trigger wait state upon execution of memory start. After the trigger activates and the specified time of data (data length) is written, data writing stops. When data writing stops the instrument enters trigger wait state again, and this process repeats until memory stop is executed.

■ Timing of File Creation in Free Mode
  ✓ Upon memory stop
  ✓ When acquisition of data of the specified data length stops
  ✓ Manual saving using keys
  ✓ Upon restart during power recovery etc.

■ Timing of File Creation in Single-Shot and Repeat Trigger Mode
  ✓ Upon memory stop
  ✓ When acquisition of data of the specified data length stops
  ✓ Upon restart during power recovery, etc.. Instrument enters trigger wait state after file creation

■ Data Length
Data length can be set when in Single-shot or Repeat trigger mode.
Data length: Select 10, 20, 30 minutes, or 1, 2, 3, 4, 6, 8, or 12 hours, or 1, 2, 3, 5, 7, 10, 14, or 31 days.

■ Pretrigger
When setting the trigger, you can set it so that data prior to activation of the trigger is written (the total samples written are within the specified number).
Pretrigger: Select 0, 5, 25, 50, 75, 95, or 100 %

■ Trigger Source
When setting triggers, you can turn the following triggers ON and OFF. If any of the conditions that you turned ON are true, the trigger activates.
  ✓ Key trigger
  ✓ Event action

4.4.5 Report Data

■ Overview of Report Data

When the MATH option is included, every time reports are created, you can write report computation results data from the specified channels to the internal memory and external storage medium (CF card only).

No. of report data: Up to 100 instances worth (if 100 is exceeded, the oldest data is overwritten by the newest data)

Save format: ASCII

■ Timing of the Report Data File Creation

Report Type		File Creation Method and File Division Timing
Hourly	-	File created when the first hourly report times up. Hourly data is added every time the hourly report times up thereafter. File divided at the specified time (when adding of hourly data to a file is complete, a new file is used). This processes repeats. The date and time of the file name is the date and time that the first hourly report timed up.
Daily	-	File created when the first daily report times up. Daily data is added every time the daily report times up thereafter. File divided at the specified date and time (when adding of daily data to a file is complete, a new file is used). This processes repeats. The date and time of the file name is the date and time that the first daily report timed up.
Hourly + Daily	1 file	File created when the first hourly report times up. Data is added every time the hourly report times up thereafter. Daily data is added when the daily report times up. File divided at the specified date and time (when adding of data to a file is complete, a new file is used). This processes repeats. The date and time of the file name is the date and time that the first hourly report timed up.
	Division (hourly)	Same as when report type is Hourly.
	Division (daily)	File created every time daily report times up.
Daily + Weekly	1 file	File created when the first daily report times up. Data is added every time the daily report times up thereafter. Weekly data is added when the weekly report times up. File divided at the specified week and time (when adding of data to a file is complete, a new file is used). This processes repeats. The date and time of the file name is the date and time that the first daily report timed up.
	Division (daily)	Same as when report type is Daily
	Division (weekly)	File created every time weekly report times up. The date and time of the file name is the date and time that the weekly report times up.
Daily + Monthly	1 file	File created when the first daily report times up. Data is added every time the daily report times up thereafter. Monthly data is added when the monthly report times up. File divided at the specified date and time (when adding of data to a file is complete, a new file is used). This processes repeats. The date and time of the file name is the date and time that the first daily report timed up.
	Division (daily)	Same as when report type is Daily
	Division (monthly)	File created every time monthly report times up. The date and time of the file name is the date and time that the monthly report times up.

* File creation stops upon memory stop regardless of the report type.

4.4.6 Manually Sampled Data

■ Overview of Manual Sampling Data

You can write data from measurement, MATH, and external channels to the internal and external storage medium (CF card only) at an arbitrary timing.

Number of Manually Sampled Data:

Up to 400 instances worth (if 400 is exceeded, the oldest data is overwritten by the newest data)

■ Executing Manual Sampling
- ✓ Using main unit keys: FUNC key -> Manual sample
- ✓ Execute using communication commands
- ✓ Execute using the event action function

4.5   Saving Data to an External Medium

* Bolded items represent changes or additions to the conventional DX.

4.5.1   Overview of Saving Data to an External Medium

■ Saving Data to an External Storage Medium

You can save data from internal memory as files on an external storage medium.

The following table describes the two ways to save data to an external storage medium, Automatic and Manual.

Method of Saving Data to an External Storage Medium	Description
Auto save	Saves sampled data to an external storage medium at the same time that it is saved to files in internal memory (can be turned ON and OFF)
Manual save	Data files are manually saved from internal memory to an external storage medium.

4.5.2   Auto Save

■ Types of Data Saved
  ✓ Display data and event data
  ✓ Manually sampled data
  ✓ Report data (requires MATH option)

■ Destination Drive

With Auto save, data can only be saved to the CF card.

Data cannot be saved to the USB memory connected to the main unit.

■ File Save Interval

You can select the file save interval within the maximum possible recording time.

Display data file (file save interval)

: Select 10, 20, 30 minutes, or 1, 2, 3, 4, 6, 8, or 12 hours, or 1, 2, 3, 5, 7, 10, 14, or 31 days.

Event file (data length)

: Select 10, 20, 30 minutes, or 1, 2, 3, 4, 6, 8, or 12 hours, or 1, 2, 3, 5, 7, 10, 14, or 31 days.

The auto save interval that can be selected depends on the waveform update rate, combination of files, and the number of channels loaded into internal memory.

4.5.3 Manual Save
■ Manual Saving Methods
The following table describes the three ways to save data manually: All, Selected, or All Unsaved Data.

Manual Save Method		Description	Saved Data Files
All data saving	All data	Saves all data from internal memory to files.	Display data and event data
			Manually sampled data
			Report data
	Manually sampled data	Saves all manually sampled data from internal memory to files.	Manually sampled data
	Report data	Saves all report data from internal memory to files.	Report data
Selected data saving	-	Saves the specified data from internal memory to files.	Display data and event data
All unsaved data	-	Saves all data from internal memory that has not been saved to files (only when automatic saving to external storage medium is OFF).	Display data and event data
			Manually sampled data
			Report data

■ Destination Drive
For a manual save, you can save data to a CF card and the USB memory (optional) connected to the main unit.

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4.5.4 Saving Snapshot Data

■ Overview of Snapshot Data
You can save displayed screen image data to an external storage medium (CF card only).

■ Snapshot Execution Method
- ✓ Using main unit keys: FUNC key -> Snapshot
- ✓ Execute using communication commands
- ✓ Executed using an Event action function

4.5.5 Data File Name

■ Data File Name
You can select from the following three file name formats.
- ✓ **User specified string + Date**
- ✓ **User specified string + Serial number**
- ✓ **Batch name (can only be selected when using batch function)**

■ Data File Name Structure
The structure of file names for each file name format is as follows:

(1)   For User specified string + Date (except report data)
ABCDEFGHIJKLMNOP YYMMDD_HHMMSS X . xxx

- Extension (3 chars)
- Identifier (1 char)
- Data start date (13 char)
- User set string (up to 16 char)
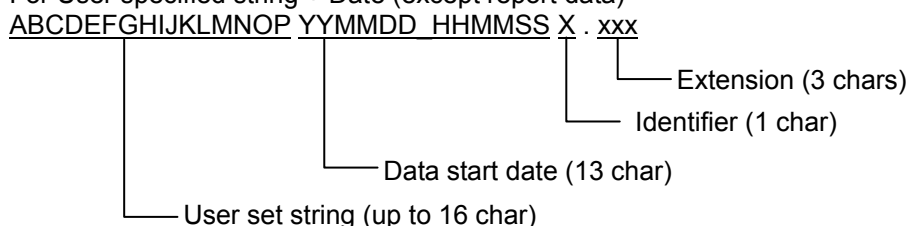
(2)   For User specified string + Date (report data)
ABCDEFGHIJKLMNOP YYMMDD_HHMMSS XX X . xxx

- Extension (3 chars)
- Identifier (1 char)
- Report type (2 char)
- Data start date (13 char)
- User set string (up to 16 char)
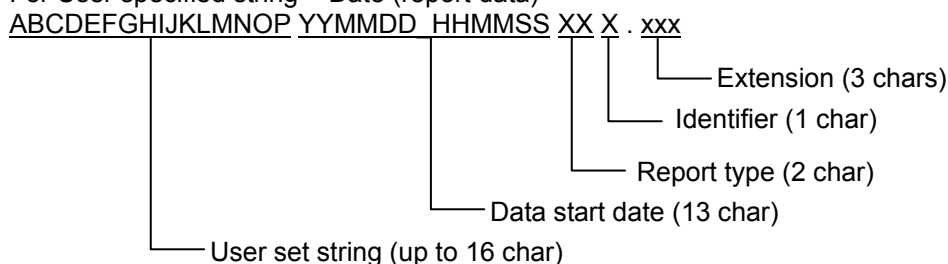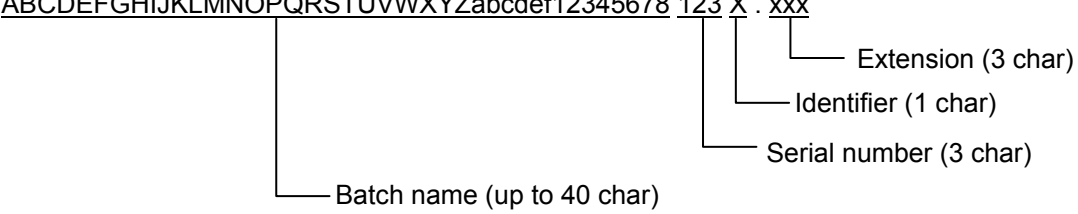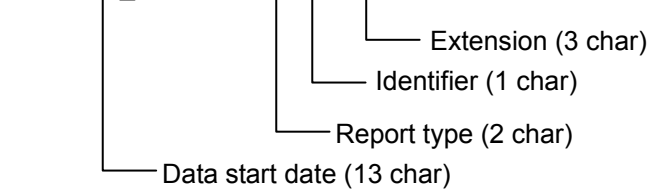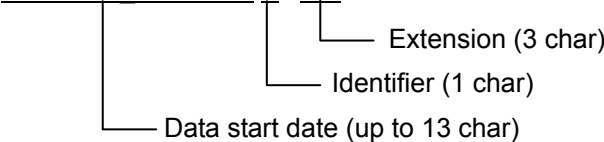
(3)   For User specified string + Serial number (except report data)
ABCDEFGHIJKLMNOP 12345678 X . xxx

- Extension (3 char)
- Identifier (1 char)
- Serial number (8 char)
- User set string (up to 16 char)
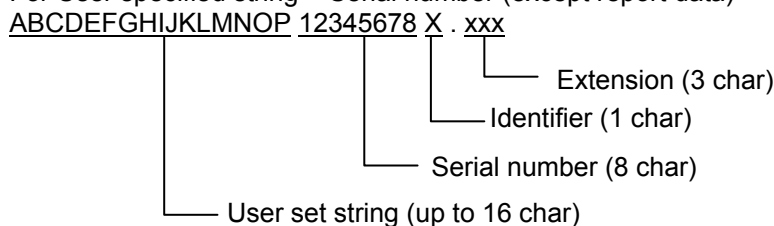
(4)   For User specified string + Serial number (report data)
ABCDEFGHIJKLMNOP 12345678 XX X . xxx

- Extension (3 char)
- Identifier (1 char)
- Report type (2 char)
- Serial number (8 char)
- User set string (up to 16 char)
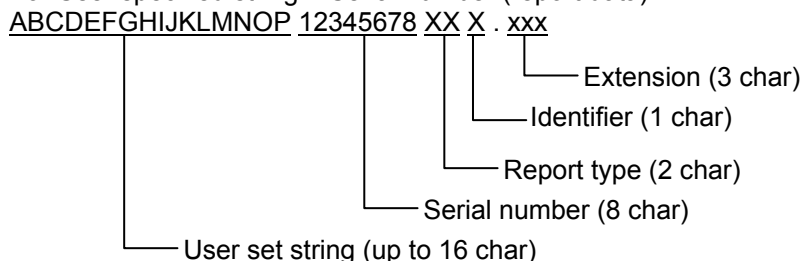
(5)   For batch name (display and event data)

<u>ABCDEFGHIJKLMNOPQRSTUVWXYZabcdef12345678</u> <u>123</u> <u>X</u> . <u>xxx</u>

                       └── Extension (3 char)

                  └── Identifier (1 char)

              └── Serial number (3 char)

        └── Batch name (up to 40 char)

(5)   For batch name (report data)

<u>YYMMDD_HHMMSS</u> <u>XX</u> <u>X</u> . <u>xxx</u>

            └── Extension (3 char)

         └── Identifier (1 char)

      └── Report type (2 char)

    └── Data start date (13 char)

(6)   For batch name (manual and snapshot data)

<u>YYMMDD_HHMMSS</u> <u>X</u> . <u>xxx</u>

          └── Extension (3 char)

        └── Identifier (1 char)

    └── Data start date (up to 13 char)

■ Contents of File Names
The following are the contents of the file names for each format.

Contents	Description	Details (Format)
Data start date	Date of first data stored in file If manually sampled, the date of the first sample For snapshot, the date of creation	YYMMDD_HHMMSS YY : Year (2 chars.) MM : Month (2 chars) DD : Day (2 chars) _ : Delimiter (1 character) HH : Hour (2 chars) MM : Minutes (2 chars) SS : Seconds (2 chars)

Serial number	Automatically incremented when a data file is created	With 8 characters
		  00000001–99999999
		  Reverts when 99999999 is exceeded
		With 3 characters
		  001–999
		  Reverts when 999 is exceeded

Identifier	Identifying number when file name is duplicated Automatically added	1 character 0–9, A–Z

Report type	Report type	2 characters
		  H : Hourly report
		  D_ : Daily report
		  W_ : Weekly report
		  M_ : Monthly report
		  DH : Hourly + Daily (1 file)
		  DW : Daily + Weekly (1 file)
		  DM : Daily + Monthly (1 file)

■ Name of Settings Data File
You can save the settings of DXAdvanced as an ASCII file to the external storage medium (CF card or USB memory).
Name of Settings Data File: Up to 32 characters (alphanumeric or symbols)

■ Extension
The following are extensions for each file type.

Data File Type	Extension	Description
Display data file	dad	Waveform data displayed in the trend display
Event data file	dae	Instantaneous values of the measurement, MATH, and expansion data sampled at the specified sampling interval.
Report data file	dar	Hourly, daily, weekly, and monthly data from the specified channels.
Manually sampled data file	dam	All measured/computed data at an arbitrary point in time (instantaneous value)
Snapshot data file	png	Image data displayed on the screen
Settings data file	pdl	General and basic settings data Current monitor display condition, registered display data for display auto return function, registered display data for favorite key

4.6   Summary Data and Log Data
* **Bolded** items represent changes or additions to the conventional DX.

4.6.1 Summary Data
■ Summary Data Types
The following are the summary data types and maximum number of data that can be saved on DXAdvanced.

Summary Data Types	Maximum no. of saves	Summary Data	
		Description	Data Saved
Alarm summary	1,000	Latest alarm information	Time and alarm type
Message summary	400	Written message information	Time, message string, and user name
Memory summary	400	Data information from the internal memory	Start/stop time, no. of data, and start/stop causes

4.6.2 Log Data
■ Log Data Types
The following are the log data types and maximum number of data that can be saved on DXAdvanced.

Log Data Type	Maximum no. of saves	Log Data	
		Description	Data Saved
Login log	50	Login/logout	Saves time, login/logout information, and time change
Error log	50	Error Messages	Saves time, error code, and error message
Communication log	200	Executed communication commands	Saves the time and input/output communication command string
FTP log	50	File transfer using the FTP client function	Saves time, destination, and file name.
Web log	50	Web operation	Saves time and operation
E-mail log	50	E-mail transmission	Saves time, cause, and destination
SNTP log	**50**	**Access to SNTP server**	**Saves time and results**
DHCP log	**50**	**Access to DHCP server**	**Time and receive destination**
Modbus log	**200**	**Modbus master, client**	**Saves time and error cause**

4.7   Loading Data Files
* **Bolded** items represent changes or additions to the conventional DX.

4.7.1 Loading Measured Data Files
You can load data files saved (display data files or event data files) to the external storage medium **or connected USB flash drive (when USB interface option is installed)** and display them in the historical trend screen.

4.7.2 Loading Settings Data Files
You can load settings data files (general and basic settings data) saved to the external memory medium **or connected USB flash drive (when USB interface option is installed)** and edit the settings.

4.8   Sample Time (Maximum Recording Time)

4.8.1 Data Size

■ Maximum Data Size per File
The maximum data size per one display data or event data file is as follows:
Maximum data size per file: 8,000,000 bytes (8 MB)

■ Data Size per Channel
The data size of one sampling on one channel is as follows:
Display Data: Measured data…4 bytes per data
                    Computed data…8 bytes per data
                    External channel data…4 bytes per data
Event Data: Measured data…2 bytes per data
                    Computed data…4 bytes per data
                    External channel data…2 bytes per data
 * Every instance of sampling, date and time data common to each channel is added in addition to
   the above measured data. (8 bytes per data)

4.8.2 Sample Time

■ Sample Time
The sample time per file (8 MB) is determined using the expression *no. of data per channel* x
data storage interval. The following provides more detail.
Display data file only:
(When the no. of meas. ch = 30; no. of MATH ch = 10; and display update rate = 30 min./div
(data save interval of 60 sec.))
No. of data per ch = 8,000,000 bytes/(8 bytes (date/time data) + 30 x 4 bytes + 10 x 8 bytes) =
38,462 data
Sample time per file = 38.462 x 60 sec = 2,307,720 sec = approximately 26 days
Event file only:
(When the no. of meas. ch = 30; no. of MATH ch = 10; and data save interval = 1 sec.)
No. of data per ch = 8,000,000 bytes/(8 bytes (date/time data) + +30 x 2 bytes + 10 x 4 bytes =
74,074 data
Sample time per file = 74,074 x 1 sec = 74,074 sec = approximately 20 hours
Display data file + event file is calculated as:
Display data file data size = 8,000,000 bytes
Event data file data size = 8,000,000 bytes
The calculation method is the same as above.

(Addendum)
Since the maximum length of the file save interval (display data) and data length (event data) is
31 days, the file is divided if the sample time exceeds 31 days.
Multiple instances of the above files are saved to the internal memory and external storage
medium (the number of files stored depends on the size of internal memory and medium).

4.8.3 Sample Time Examples

■ Examples of the sample time per file (8 MB) are given below.
* If the sample time exceeds 31 days, the file is divided.

For the DX1000:
When the no. of meas. ch = 4 and no. of MATH ch = 0
Display data file

Display Update (time/div)	15 sec.	30 sec.	1 min.	2 min.	5 min.	10 min.
Save Interval	0.5 sec.	1 sec.	2 sec.	4 sec.	10 sec.	20 sec.
Sample time (approx)	46.3 hours	3 days	7 days	15 days	38 days	77 days

Event data file

Save Interval	25 ms	125 ms	0.5 sec.	1 sec.	2 sec.	5 sec.	10 sec.
Sample time (approx)	3.5 hours	17.4 hours	2 days	5 days	11 days	28 days	57 days

When the no. of meas. ch = 12 and no. of MATH ch = 24
Display data file

Display Update (time/div)	15 sec.	1 min.	5 min.	10 min.	20 min.	30 min.	1 hours
Save Interval	Cannot be set	2 sec.	10 sec.	20 sec.	40 sec.	1 min.	2 min.
Sample time (approx)	Cannot be set	17.9 hours	3 days	7 days	14 days	22 days	44 days

Event data file

Save Interval	25 ms	125 ms	0.5 sec.	1 sec.	10 sec.	30 sec.	1 min.
Sample time (approx)	Cannot be set	2.2 hours	8.7 hours	17.4 hours	7.2 days	21 days	43 days

DX2000:
When the no. of meas. ch = 8 and no. of MATH ch = 0
Display data file

Display Update (time/div)	15 sec.	30 sec.	1 min.	2 min.	5 min.	10 min.
Save interval	0.5 sec.	1 sec.	2 sec.	4 sec.	10 sec.	20 sec.
Sample Time (approx)	27.8 hours	2 days	4 days	9 days	23 days	46 days

Event data file

Save Interval	25 ms	125 ms	0.5 sec.	1 sec.	2 sec.	5 sec.	10 sec.
Sample time (approx)	2.3 hours	11.6 hours	46.3 hours	3 days	7 days	19 days	38 days

When the no. of meas. ch = 48 and no. of MATH ch = 60
Display data file

Display Update (time/div)	15 sec.	1 min.	5 min.	10 min.	20 min.	30 min.	1 hours	2 hours
Save Interval	Cannot be set	2 sec.	10 sec.	20 sec.	40 sec.	1 min.	2 min.	4 min.
Sample Time (approx)	Cannot be set	6.5 hours	32.7 hours	2 days	5 days	8 days	16 days	32 days

Event data file

Save Interval	25 ms	125 ms	0.5 sec.	1 sec.	10 sec.	30 sec.	1 min.	2 min.
Sample Time (approx)	Cannot be set	0.8 hours	3.2 hours	6.5 hours	2 days	8 days	16 days	32 days

5 Display Function
5.1 Display: Basic Specifications
* **Bolded** items represent changes or additions to the conventional DX.

5.1.1 Display Specifications
Display: DX1000: 5.5-inch TFT color LCD (320 x 240 dots)
DX2000: 10.4-inch TFT color LCD (640 x 480 dots)
Background color:
Choose white or black
Waveform display color:
You can select from the following **24 colors** for each of the channels on both the trends and bar graphs.
Red, green, blue, lavender, brown, orange, pea green, light blue, magenta, gray, lime, cyan, navy blue, yellow, light gray, purple, **black, pink, light brown, light green, dark gray, olive, dark cyan, young green**.
LCD saver: Turns **OFF** or dims the LCD backlight when a key is not pressed for a specified amount of time (1, 2, 5, 10, 30, or 60 minutes). Pressing a key or the occurrence of an alarm restores the LCD to its usual brightness.
Backlight brightness:
DX1000: Select in 8 stages
DX2000: Select in **6** stages
Display Auto Return Function :
If a key is not pressed for a specified amount of time, the screen returns to a specified standard screen.

5.1.2 Display Groups
Display groups are set ahead of time in Set mode. Arbitrary measurement, MATH, or **external channels** can be assigned in any order to each group.
Group names: Up to 16
No. of groups: DX1000: **10** groups (10 screens)
DX2000: **36** groups (36 screens)
No. of display channels:
DX1000: Maximum of 6 channels per group (1 screen)
DX2000: Maximum of 10 channels per group (1 screen)
Automatic display group switching:
For trend, numeric, and bar graph displays, the display group can be switched automatically at specified time intervals.
You can select a scroll interval of 5, 10, 20, or 30 sec., or 1 min.
Display Group Switching per Event Action:
For trend, numeric, and bar graph displays, the displayed group can be switched automatically when an event is detected.

5.1.3 Tag Name Display
Tag names can be displayed in trend, numeric, and other displays.
You can select channel and tag name display.
No. of displayable characters: Up to 16 (alphanumeric)
Displayable characters: Alphanumeric

5.2 Data Display Screen

 * **Bolded** items represent changes or additions to the conventional DX.

5.2.1 Data Display Screen Types

The data display's display screen types are as follows.

Display Type	Display Contents	Display Units	Remarks
Trend display	Waveform + numerical values	Group	Data from measurement, MATH, and external channels are displayed as waveforms T-Y or circular display (only DX2000) can be selected
Numerical display	Numerical values	Group	Data from measurement, MATH, and external channels are displayed as numerical values
Bar graph display	Bar graph + numerical values	Group	Data from measurement, MATH, and external channels are displayed as bar graphs
Overview display	Numerical values	All channels	Data from all channels (measurement, MATH, and expansion) and alarm statuses are displayed in a list
Historical trend display	Waveform + numerical values	Group	Waveform display of past display and event data
Information display	Alarm summary	-	Displays list of alarm occurrences and cancellations
	Message summary	-	Displays list of written messages
	Memory summary	-	Display of display data files and event data information
	Report	-	Displays report data
	Relay status	**-**	**Displays status of internal switch and alarm output relay (option)**
	Modbus master status	**-**	**Operational status of Modbus master function**
	Modbus client status	**-**	**Operational status of Modbus client function**
Log display	Login log	-	Displays logins and logouts
	Error log	-	Displays log of error occurrences
	Communication log	-	Displays log of executed communication commands
	FTP log	-	Displays log or file transfers using the FTP client function
	Web log	-	Displays log of Web operations
	E-mail log	-	Displays log of e-mail transmissions
	SNTP log	**-**	**Displays log of accesses to SNTP server**
	DHCP log	**-**	**Displays log of accesses to DHCP server**
	Modbus status log	**-**	**Displays log of accesses of Modbus master and client**
4 screens	Display divided into 4 sections	-	DX2000 only Scale display allowed

5.2.2 Trend Display

■ Overview of Trend Display

Trend display types:

T-Y (normal trend display) or circular display can be selected (circular display only available on the DX2000)

T-Y display update rate (/div):

Select 15/30 seconds, or 1, 2, 5, 10, 15, 20, or 30 minutes, or 1, 2, 4, or 10 hours. 15 sec/div can only be selected on the DX1002, DX1004, DX2004, and DX2008.

Circular display update interval (1 time around):

Select 20 or 30 minutes, or 1, 2, 6, 8, 12 or 16 hours, or 1 or 2 days. or 1, 2 or 4 weeks. 20 min can only be selected on the DX1002, DX1004, DX2004, and DX2008.

T-Y display type:

Select Vertical, horizontal, landscape, or **horizontal split** (common to all groups)

Line thickness: Select 1, 2, or 3 dots (common to all groups)

Grid: Select 4-12, or Auto (common to all groups)

For Auto, a grid is displayed with the same number of divisions as the number of scale divisions assigned to the top of the scale.

Time information:

Displaying the time on the grid

Message display:

Displays the message input using keys, communication or event action.

Scale: Displays the recording span

The DX1000 can display up to 6 scales, and the DX2000 up to 10.

Power failure time display:

If a power failure occurs during memory start, the recovery time can be displayed as a message.

Trend margin:

You can plot the trend display plot start position 30 dots away from the scale display.

Other functions:

Zone recording and a partial compression/expansion function are available.

Display update rate switching function:

During memory start, you can switch the display update rate using keys or through event actions (T-Y display only). The sampling interval of the displayed data is fixed.

■ **Horizontal Split Display**

You can divide the horizontal waveform trend display from left to right.

The function is restricted in the following aspects.

- ✓ Up to three scales can be displayed for DX1000, up to five scales can be displayed for DX2000.
- ✓ Up to 2 channels of numerical values can be displayed for DX1000, up to 4 channels of numerical values can be displayed for DX2000.
- ✓ The number of displayable message characters is limited (must fit in the time axis)
- ✓ Historical trend screen only displays 1 specified group which is displayed on left side.

■ Message Display

You can display the written message

No. of displayable characters:

Up to 32 (alphanumeric)

Displayable characters:

Alphanumeric

Message display methods:

Normal: marks and messages are displayed, and can be scrolled.

List: Marks are separate, and the most recent 8 messages are displayed in the upper left part of the screen.

Message string display direction:

You can select vertical or horizontal (vertical cannot be selected in case that display direction is vertical)

■ Zone Display
Each channel is displayed in a separate area of the screen with no overlapping of analog waveforms, making each easier to read.
Span width: 5% or more (waveform display width)
Specified steps: 1%(0–100%)
Display example)

Abnormal screen   Zone display
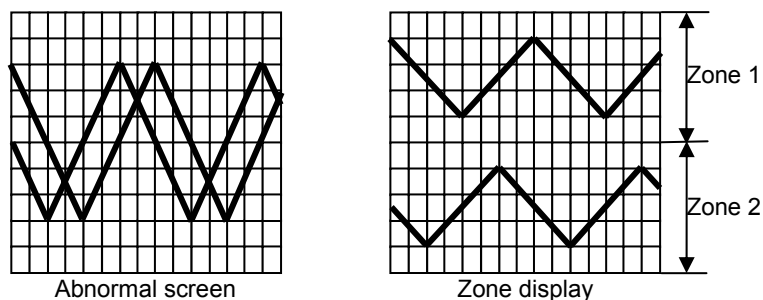
■ Partial Expansion/Compression Display
You can compress a portion of the display range allowing you to separate the portion of the analog waveform that you wish to view in detail from the portion of which you only need an overview.

Partial Expansion/Compression Border : 1–99%
Partial expansion/compression border value: Within the recording span
Display example)

Normal display   Partially compressed display
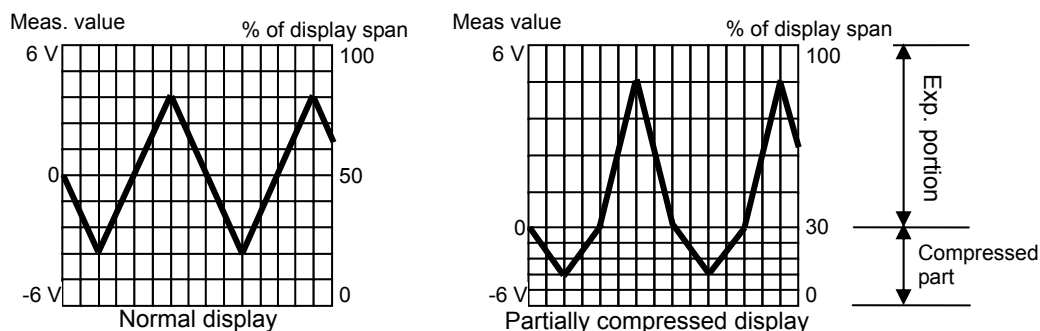
The figure above is an example in which the compression border value (0 V) is displayed on 30% (compression border position) of the screen. The area beneath the border (30% of the height of the screen) corresponds to -6–0 V, whereas the area above the border (70% of the height of the screen) corresponds to 0–6 V.

■ Scale Display
In the trend display and historical display, you can display a scale suitable for the signal under test.
You can also display a **bar graph and green band area, and set alarm marks in the scale area.**
The settings of the scale display are as follows.

(Common Settings)

Scale Display Setting	Selection Items (Setting Range)	Description
Scale display digits	Normal/Fine	Number of digits of numbers on the scale Normal: 3 digits excluding the minus symbol Fine: 4 digits excluding the minus symbol
Current value display	Mark/Bargraph	Current value indicator ticks Mark : Display the scale with marks (indicating ticks) Bargraph: Scale displayed using bar graphs

(Common Settings)

Scale Display Setting	Selection Items (Setting Range)	Description
Channel number	-	The specified channel numbers (measurement, MATH, external channels)
Scale display position	1–6(DX1000) 1–10(DX2000)	Display position when displaying a scale
No. of scale divisions	4–12/C10	Setting for the number of scale divisions. The scale is divided evenly, and the main scale marks are displayed at the divisions. 4–12: No. of scale divisions 4–12 C10: Scale is divided into 10 main scale marks, and scale numbers are displayed at the 0, 30, 50, 70, and 100% positions.

5.2.3 Numerical Display

■ Overview of Numerical Display

Measured values are displayed numerically using large fonts. This is useful when you wish to monitor measured values accurately. At a glance, you can confirm the current measured data value or alarm information for each channel.

No. of display channels:
    DX1000: Maximum of 6 channels per screen (1 group)
    DX2000: Maximum of 10 channels per screen (1 group)
Display update interval: 1 sec.

■ Numerical Display Screen

DX1000   DX2000

(1)   Measured value: Displays in red when alarms are occurring
(2)   Channel number/tag display
(3)   Units
(4)   Alarm status display: Displays each set alarm and status
H   High limit alarm
L   Low limit alarm
R   High limit on rate of change alarm
r   Low limit on rate of change alarm
h   Differential high limit alarm
l   Differential low limit alarm
T   Delay high alarm
t   Delay low alarm

Green-filled rectangle: Alarm reset
Red-filled rectangle: Alarm occurrence
When alarm display hold is selected, blinks until alarm ACK is executed.

5.2.4 Bar Graph Display

■ Overview of Bar Graph Display

Displays measured values in an easy-to-see bar graph. At a glance, you can confirm the current measured data value or alarm information for each channel.

No. of display channels:
    DX1000: Maximum of 6 channels per screen (1 group)
    DX2000: Maximum of 10 channels per screen (1 group)
Scale: Choose from 4–12 for each channel
Waveform display direction: Vertical or horizontal (common to all groups)
Standard position: Standard (edge) or Center (can be selected for each channel)
Display update interval: 1 sec.

■ Bar Graph Display Screen
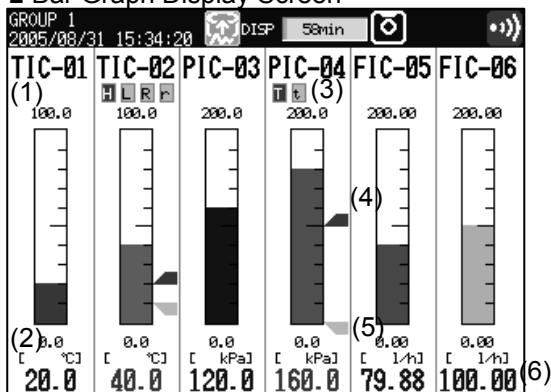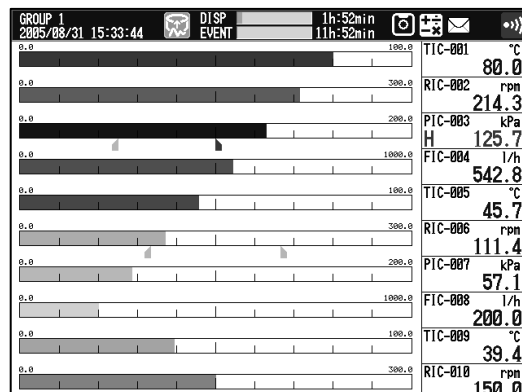
DX1000 (vertical)   DX2000 (horizontal)

(1)   Scale high limit value
(2)   Scale low limit value
(3)   Alarm status display: Displays each set alarm type and status
H   High limit alarm
L   Low limit alarm
R   High limit on rate of change alarm
r   Low limit on rate of change alarm
h   Differential high limit alarm
l   Differential low limit alarm
T   Delay high alarm
t   Delay low alarm
Green-filled rectangle: Alarm reset
Red-filled rectangle: Alarm occurrence
When alarm display hold is selected, blinks until alarm ACK is executed.
(4)   High limit alarm point: Displays in green when alarm cleared, and in red when alarm is occurring (depends on alarm mark display setting)
(5)   Low limit alarm point: Displays in green when alarm cleared, and in red when alarms are occurring (depends on alarm mark display setting)
(6)   Measured value: Displays in red when alarms are occurring

5.2.5 Overview Display

■ Overview of Overview Display
Lists the current values and alarm statuses in one screen.
No. of screens: 1
Display update interval: 1 sec.

Display contents:	Displays the channel number or tag name and current value in the display area of each channel.
Functions:	When alarms are occurring, the display areas for the channels on which an alarm is occurring turn from green to red.
	When alarm display hold is selected, blinks until alarm ACK is executed.
	You can select channels with the cursor, and display trends or bar graphs including those channels.

■ Overview Display

DX1000

DX2000

(1)   Cursor
(2)   Channel number/tag name
(3)   Current value
(4)   Alarm type

5.2.6 Historical Trend Display

■ Overview of Historical Trend Display

You can display data measured in the past that was written to the internal memory or external storage medium.

You can display that data with the current waveform, allowing you to compare the two.

You can also display the alarm and message information included with the loaded display data and event data.

■ Display Function

Display data:

The alarm information and message information attached to the display data file/event data file and data

Scroll :You can scroll the displayed waveform with the cursor keys.

Time axis zoom:

You can zoom in or out on the time axis

■ Display Methods

Displaying from alarm summaries:

Displays the data when alarms specified in the alarm summary occurred were cleared, or when ACK was executed.

Displaying from message summaries:

Displays data when messages specified in the message summary were written

Displaying from memo summaries:

Displays files specified in the memo summary

Display from screen menu:

Display from the operation screen menu

Display from external storage medium:

Loads display data files or event data files saved to the external memory medium and displays them.

Easy Historical Trend Display:

You can easily change to historical trend display by pressing the UP cursor key during the 1/4 circular display.

(Diagram of Easy Historical Trend Display)

Trend display

Cursor key [DOWN]   Cursor key [UP]   Easy reference waveform display

Cursor key [DOWN]   Cursor key [UP]   Cursor key [UP]   Cursor key [DOWN]

Cursor key [UP]

Cursor key [DOWN]
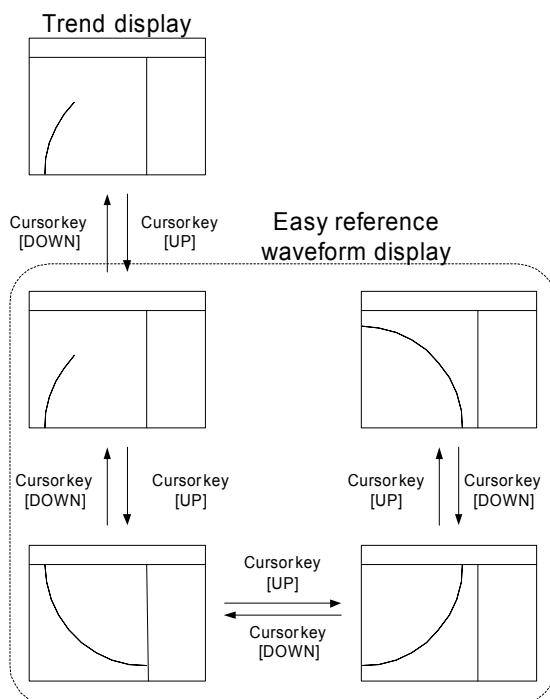
■ **Automatic File Search Function**

When loading from internal memory, you can automatically search for the continuation of the loaded file and display it.

5.2.7 Alarm Mark Display

■ Overview of Alarm Mark Display
You can mark points where alarms are set in the scale or bar graph display.
These can be set for each measurement, MATH, and external channel.
Displayable alarm types:
High limit alarm (H),Low limit alarm (L),Delay high alarm (T),Delay low alarm (t)
In case of delta mode, only delta high (h) and delta low (l) can be displayed.

■ Alarm Mark Types
The following are the alarm mark types.

Alarm Mark Types	Description
Alarm mark	Displays in red when alarms are occurring and otherwise green (common for alarm levels 1–4)
Fixed mark	The display color can be set for each alarm level. The display color is fixed regardless of the alarm status. Select from 24 display colors: Red, green, blue, lavender, brown, orange, pea green, light blue, magenta, gray, lime, cyan, navy blue, yellow, light gray, purple, black, pink, light brown, light green, dark gray, olive, dark cyan, young leaf.

5.2.8 Green Band Area Display

■ Overview of Green Band Area Display
You can display a green band area in a specified color on the scale or bar graph display.
This can be set for each measurement, MATH, and external channel.
Green band display color: Select from 24 colors:
Red, green, blue, lavender, brown, orange, pea green, light blue, magenta, gray, lime, cyan, navy blue, yellow, light gray, purple, black, pink, light brown, light green, dark gray, olive, dark cyan, young green.
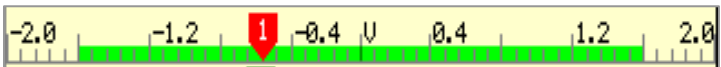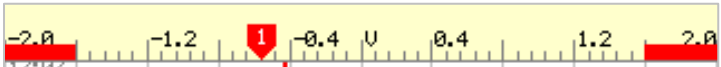
■ Green Band Types
The green band area display types are as follows.

Green Band Area	Example
Inside	
Outside	

5.2.9 Information Display

■ Alarm Summary Display
You can display the latest alarm information in a list.
You can select any alarm information and call up the historical trend display of the display or event data included in that alarm information.
You can sort by channel number or alarm time.
Maximum no. of displays: Up to 1000 can be displayed

■ Message Summary Display
You can display the messages written to the trend display and the times they were written in a list.
You can select any message information and call up the historical trend display of the display or event data included in that message information.
You can sort by message, time, display group written to the message, or user name (when using the login function).
Maximum no. of displays: Up to 500 can be displayed

■ Displaying Memory Summaries
You can display data information from the internal memory.
The display contents are as follows.

Display items	Description
Manually sampled data	"No. of data in the internal memory/max. no. of data written to the internal memory" and "last data write time" from the manual summary data
Report data	"No. of data in the internal memory/max. no. of data written to the internal memory" and "last data write time" from the report data
Sampled data	Currently displayed data, and select display data or event data.
Data information	Data start time/data stop time, cause of data write stop, batch name (when using the batch function), file name (displayed instead of the time information)

You can select display data or event data and call up the corresponding historical trend display.

■ Report Display
You can display report data from the internal memory.

5.2.10 Status Display
■ Relay Status Display
You can display the ON/OFF status of internal switches and contact relay (optional).

■ Modbus Master/Client Status Display
You can display all statuses of 16 commands.

5.2.11 Log Display
The following types of log display are available.
Login log, error log, communication log, FTP log, Web log, e-mail log, SNTP log, DHCP log, and Modbus status log

5.2.12 4 Screen Display (DX2000 Only)
■ Overview of Four Screen Display
The screen is divided into four sections, and you can display arbitrary display types and groups from measurement data display or information display in each of their respective display areas. You can also store and recall display screen combinations.

■ Screen Storage Function
You can also store display screen combinations.
No. stored: Maximum of 4
Screen name: Up to 16 characters (alphanumeric or Japanese Katakana)
Storage method: Store by pressing a soft key in operation mode (in the operation screen)
Recall: Select using operation keys

5.2.13 Display Screen Registration Function
■ Overview of the Display Screen Registration Function
You can register the currently displayed screen under a screen name.
The registered display screens can be displayed directly using the Favorite key.
Max registered screens : Up to 8
No. of screen name characters: Up to 16 (alphanumeric)
Registered screen display method:
Scroll through registered screens by pressing the "Favorite" key repeatedly.

5.2.14 Menu Customization Function

■ Screen Menu Customization Function
You can change the layout of screen menus as desired (display order, show/hide).

■ FUNC Screen Customization Function
You can change the layout of the FUNC screen as desired (display order, show/hide).

■ Example of Customizing a Screen Menu

Before customization

After customization
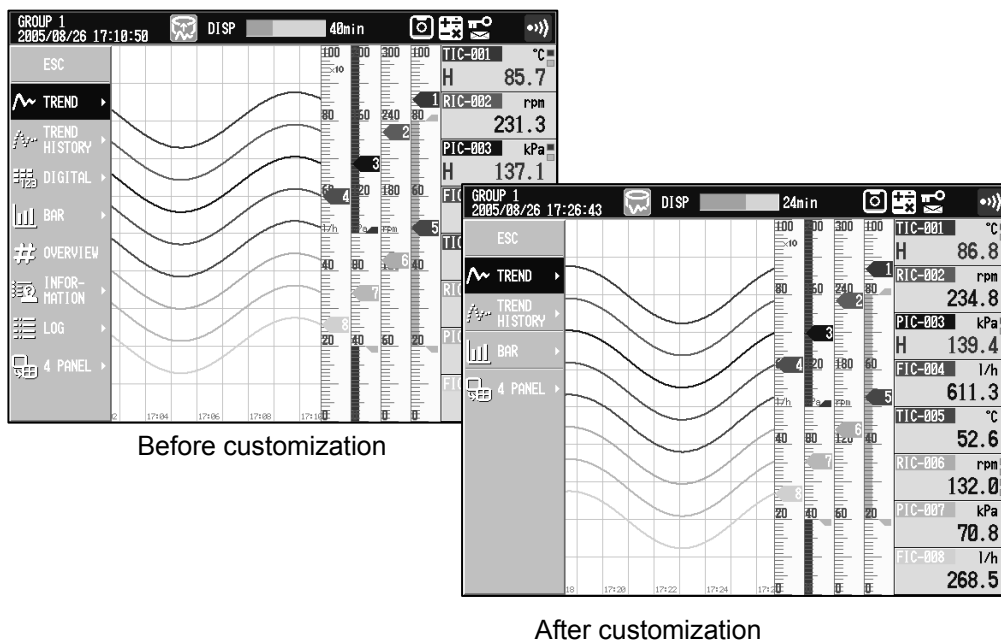
6 Message Function

6.1 Overview of the Message Function

* **Bolded** items represent changes or additions to the conventional DX.

You can write messages to data and display screens.
No. of messages :   **100**
* String entry is possible with 10 of the messages when writing.
No. of message characters:
Up to 32 (alphanumeric)
Allowed characters: Alphanumeric

6.2 Writing Messages

* **Bolded** items represent changes or additions to the conventional DX.

6.2.1 Writing Messages

The following three methods can be used to write messages
   (1)   Using operation keys on the instrument
     • **Allows you to write to all display groups or specified display groups**
   (2)   Using the event action function
     • **Allows you to write to all display groups or specified display groups**
   (3)   Using communication commands
     • **Allows you to write to all display groups or specified display groups**

6.2.2 Automatic Writing of Messages

You can have the instrument write messages automatically depending on its status.
The following two methods can be used to write messages automatically
   (1)   Automatically write messages after recovery from power failure during memory start
   (2)   Automatically write messages when the display update rate is switched during memory start

6.2.3 Writing Appended Messages

■ Overview of Writing Appended Messages
In the historical trend screen, up to 50 messages can be appended to an arbitrary time of the trend display waveform.
Only data within the range of data being displayed in historical trends (data before conversion to file in internal memory) can be appended to.
Appending of messages is only possible during memory sampling.
The time of appended message data is the time of writing.
Appended messages can be written to data loaded from external storage media.

7 Event Action Function

7.1 Overview of the Event Action Function

* The Event action function is a newly-added function for DXAdvanced.

■ This function performs "actions" when certain "events" occur.
■ Remote settings, internal switch settings, and USER key settings are unified in the Event action function.
■ Up to 40 actions can be set.

7.2 Events

The events that can be selected are as follows.
Whether an event is a level event or an edge event is automatically determined based on the selected action.

Events	Level/Edge	Description
Remote (1–8)	Level/Edge	Action executed when remote control signal is input (remote control is optional)
Relay (*1)	Level/Edge	Action executed when relay operates (relay output is optional)
Internal switch (S01–S30)	Level/Edge	Action executed when internal switch operates
Alarm	Level/Edge	Action executed when at least one alarm occurs
Timer (1–4)	Edge:	Action executed when timer times up
Match time (1–4)	Edge:	Action executed when match time timer times up
USER key	Edge	Action executed when USER key pressed

*1: I01–I06(DX1000),I01–I06/I11–I16/I21–I26/I31–I36(DX2000)

7.3   Actions

The actions that can be selected are as follows.

Actions	Level/Edge	Description
Memory start/stop	Level	Performs the memory start and memory stop actions
Memory start	Edge	Performs the memory start action
Memory stop	Edge	Performs the memory stop action
Event trigger	Edge*	Starts writing of event data
Alarm ACK	Edge	Performs the alarm ACK action
Computation start/stop	Edge	Performs the computation start and computation stop actions
Computation start	Edge	Performs the computation start action
Computation stop	Edge	Performs the computation stop action
Computation reset	Edge	Performs the computation reset action
Manual sampling	Edge	Manually samples
Snapshot	Edge	Creates screen image data and saves to external medium
Writing messages (message number)	Edge	Writes messages
Display rate 1/ display rate 2	Level	Switches between display update rates (standard and 2nd)
Display data save	Edge	Saves currently sampled display data to internal memory as a file
Event data save	Edge	Saves currently sampled event data to internal memory as a file
Relative timer reset (timer number)	Edge	Resets the relative timer.
Display group switch	Edge	Switches to the specified display group when in the trend display, numerical display, or bar graph display screens.
Time synchronization	Edge	Synchronizes the time to the nearest hour-on-the-hour
Flag (1–8)	Level	Normal: 0 When event occurs: 1
Load settings file (1-3)	Edge	Loads and allows for editing of settings files saved to the external memory medium.

* This will be level action in case that the event is "alarm", "relay" or "internal switch".

7.3.1 Event Action Actions

Event action actions are processed in order from the smallest event action number (1).
The action according to whether the event and action are level or edge is as follows.

Event	Action	Action
Level	Level	Detects rising and falling, and repeats level actions alternately
Edge*	Level*	Detects rising, and repeats level actions alternately
Edge	Edge	Detects rising, and performs Edge action.

* Such as when the event is Timer and the action is Memory start/stop.

7.4 Action Restrictions by Events

There are actions that cannot be set depending on the event.
The restrictions on event-action combinations are as follows.

Actions	Events						
	Remote	Relay	Internal switch	Alarm	Timer	Match time	USER key
Alarm ACK	○	✖	✖	✖	○	○	○
Relative timer reset	○	○	○	○	✖	○	○
Time synchronization	○	✖	✖	✖	✖	✖	✖
Settings file load	○	✖	✖	✖	✖	✖	✖

○: Can be set
×: Cannot be set

7.5 Timers

The maximum number of timers that can be set is four.
The following are the timer types.

Timer Type	Description
Off	Timer not used.
Absolute timer	Repeats the time up every time determined from the specified reference time (on the hour) and interval.
Relative timer	Starts timing from the moment the timer is set, and repeats the time up every interval. Timer stops upon a power failure, and timing does not progress.

The following are the timer Settings.
■ Absolute timer

Absolute timer setting	Selection Items (Setting Range)	Description
Interval	1-6/10/12/15/20/30 min. 1-6/8/12/24 hrs.	Timer interval setting Selects the time until the interval is complete
Reference time	00-23	Reference time setting Specified on the hour (00-23)

■ Relative timer

Relative timer setting	Selection Items (Setting Range)	Description
Interval	00:01-24:00	Timer interval setting Sets the time until the interval is complete [hours:minutes]
Reset on computation start	On/Off	Relative timer is reset or not reset on computation start Off: not reset On: reset * In case that MATH option is not equipped, this is fixed to "Off"

7.6 Match Time Timer

The maximum number of match time timers that can be set is four.
The following are the match time timer types.

Match Time Timer Type	Description
Off	Match time timer not used.
Month	Times up on the specified date and time
Week	Times up on the specified time of the specified week
Day	Times up on the specified time

The match time timer settings are as follows.

Setting Item	Match Time Timer Type			Description
	Month	Week	Day	
Day	1–28	-	-	Setting of the day of the month match timer
Day of the week	-	Sun–Sat	-	Setting of the day of the week of the week match timer
Hours and minutes	00: 00–23: 59			Setting of the time
Mode	Singles hot/continuous			Specification of the time up action Single-shot: Time up the first specified time. Continuous: Time up on every specified time

7.7 Internal Switches

An *internal switch* is a software switch used only for internal processes of the instrument and is not output externally.
Internal switches have the following uses.

Setting	Description
Alarm settings (measurement, MATH and external channels)	You can select internal switches for the alarm relay output destination
Event action setting	You can select internal switches as events

8 Security Functions
8.1 Overview of the Security Functions

■ You can set up security for the instrument per key operation and communication operations.
■ The following types of security can be implemented.

Security Type		Description
Key operation	Key lock	Apply a key lock to operation from the main instrument keys.
	Login	Secure with login requirement for operation from main instrument keys.
Communication connection	Login	Secure with login requirement for communication connection*

* When connected via Ethernet, only valid when using the various functions of the setting/measurement server, maintenance/diagnostics server, and FTP server.

8.2 Key Lock Function
8.2.1 Overview of the Key Lock Function

■ You can prohibit key operation, access to external storage media, and operation of the main unit from the FUNC screen.
■ The key lock can be cleared by entering a password.

8.2.2 Key Lock Settings

The following are the contents of the key lock settings.

User Restriction Setting	Selection Items (Setting Range)	Description
Password	Up to 8 chars	Sets password for clearing the key lock
Key operation restriction	START key STOP key MENU key USER key DISP/ENTER key Favorite key	Sets whether to allow key operation Choose Free or Lock for each key
External media access restriction	-	Sets whether to allow access to external storage media Choose Free or Lock Access operations that can be restricted: •Manual data saving (all or selected data saving) •Loading of display/event data files •Saving/loading settings data files •Formatting •File list •File deletion
Functional restrictions	Alarm ACK Message/batch Computation Data saving E-mail/FTP Time setting Display function	Sets whether to allow instrument actions Choose Free or Lock for each operation

8.3 Login Function

8.3.1 Overview of the Login Function

■ You secure the instrument with a login function that uses a user name and password.
■ You can specify operations available upon login for each individual user.
■ Users can log out using a main unit key operation, using a communication command, or by using auto logout (automatically logs out when no operation is performed over a specified duration).

8.3.2 Flow of Login

■ Flow when logging in from the main unit

```
        ┌──────────────┐
        │     FUNC     │
        └──────────────┘
                │
                ▼
    ┌───────────────────┐     ┌────────────────────────────────────┐
    │                   │     │ Registered user information is     │
    │   User name       │─────│ displayed.                         │
    │   selection screen│     │ Select user name.                  │
    │                   │     │ Password entry screen opens.       │
    └───────────────────┘     └────────────────────────────────────┘
                │
                ▼
    ┌───────────────────┐     ┌────────────────────────────────────┐
    │                   │     │ Enter password.                    │
    │   Password        │─────│ Logged in if password matches.     │
    │   entry screen    │     │ If password fails three times,     │
    │                   │     │ returns to operation screen        │
    └───────────────────┘     │ (reselect user name).              │
                │             └────────────────────────────────────┘
                ▼
        ┌──────────────┐
        │ Login complete│
        └──────────────┘
```
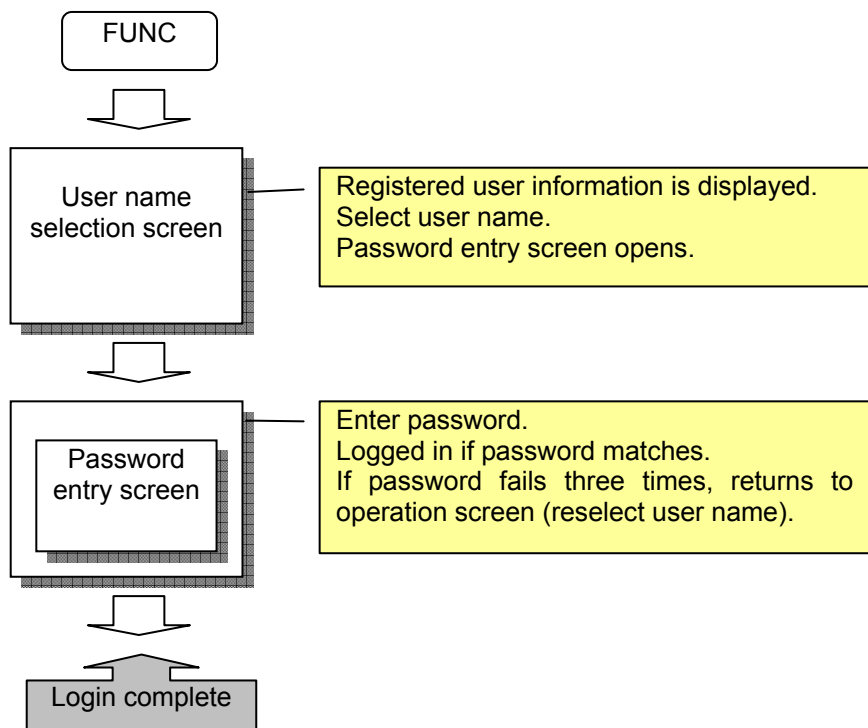
■ Flow When Logging in Using Communications

(1) Logging in to a settings/measurement server or maintenance/diagnostic server.

```
                    ┌──────────────────┐
                    │  Comm. connect   │
                    └──────────────────┘
                             │
                             ▼                        Error
                    ┌──────────────────┐ ─────────────────────────────────┐
                    │ Enter user name  │                                   │
                    └──────────────────┘ ◄────────────────┐               │
                             │                             │               │
                             ▼            Error        ╱───────╲    No     │
                    ┌──────────────────┐ ────────────►   3 tries  ────────►│
                    │ Enter password   │             ╲───────╱            │
                    └──────────────────┘                                   │
                             │                                             ▼
                             ▼                                   ┌──────────────────┐
                    ┌──────────────────┐                         │   Comm. cut      │
                    │ Login complete   │                         └──────────────────┘
                    └──────────────────┘
```
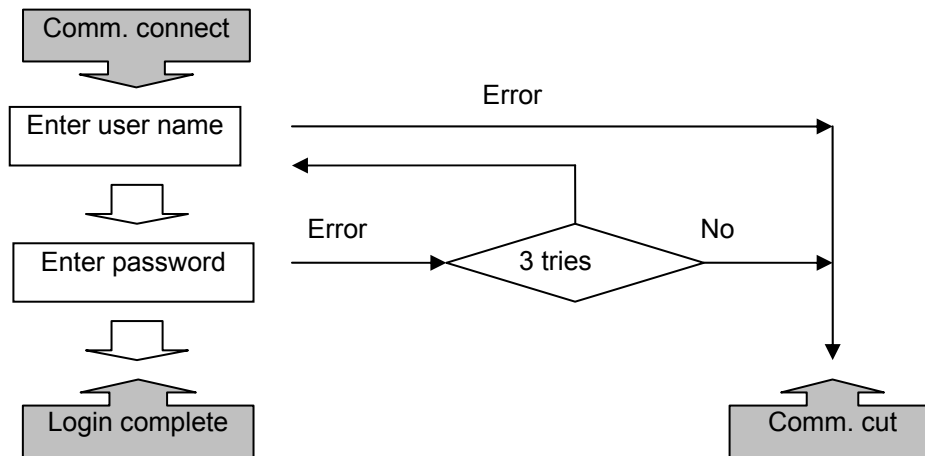
(2) Logging in to an FTP server.

```
                    ┌──────────────────┐
                    │  Comm. connect   │
                    └──────────────────┘
                             │
                             ▼                  Error
                    ┌──────────────────┐ ────────────────────┐
                    │ Enter user name  │                      │
                    └──────────────────┘                      │
                             │                                │
                             ▼                  Error         │
                    ┌──────────────────┐ ────────────────────┤
                    │ Enter password   │                      │
                    └──────────────────┘                      │
                             │                                ▼
                             ▼                      ┌──────────────────┐
                    ┌──────────────────┐            │   Comm. cut      │
                    │ Login complete   │            └──────────────────┘
                    └──────────────────┘
```
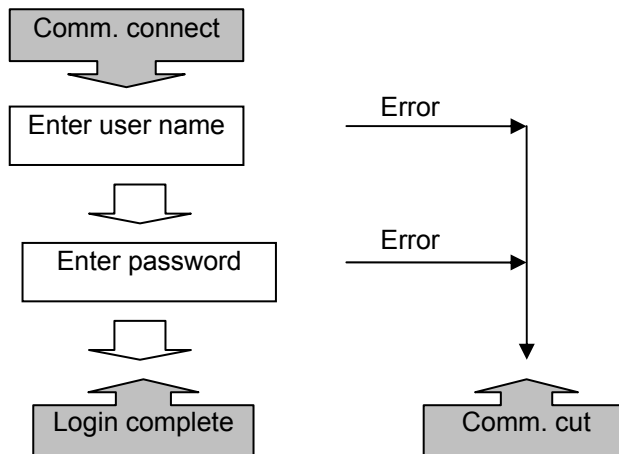
8.3.3 User Levels and Access Restrictions

■ The following are user levels and the number of users that can be set.

User Level	No. of Users	Description
System admin.	5	All operations allowed including basic settings and user registration. Allows logging in via communications for use of setting functions and monitor functions.
General user	30	Operation possible within the operable contents (basic settings and user registration not allowed). Allows logging in via communications for use of the monitor function only.

■ The access restrictions by user level are as follows.

Setting Item			User Level	
			System admin.	General user
Setting	Basic setting mode	-	○	×
	General setting mode	Time	○	R
		User registration	○	×
		Other	○	R
	Custom screen setting	Screen menu	○	×
		FUNC menu	○	×
Communications	Setting connection	-	○	×
	Monitor connection	-	○	○

○: Allowed
R: Allowed per user restrictions
×: Not allowed

8.3.4 System Administrator Settings

The settings available to system administrators are as follows.

System Administrator Setting	Selection Items (Setting Range)	Description
Registration number	1–5	Registration number assigned to the system administrator
Registration mode	Off/Key/Comm /Key+Comm /Web	Sets whether to register as a user that can log in Off: User not registered Key: Registers users who can only log in from keys Comm: Registers users who can only log in from communications (including Web) Key+Comm: Registers users who can only log in from keys and communications Web: Registers users who can only log in from Web client
User name	Up to 20 chars	User name setting Duplicate names cannot be registered The user names cannot be "quit," or " " (white space only).
Password	Up to 8 chars	Enter the Password The password is displayed as "********" when entered by the user. The user names cannot be "quit," or " " (white space only).

8.3.5 General User Settings

The following are the settings for general users.

General User Setting	Selection Items (Setting Range)	Description
Registration number	1–30	Registration number assigned to general users
Registration mode	Off/Key/Comm /Key+Comm/ Web	Sets whether to register as a user that can log in Off: User not registered Key: Registers users who only can log in from keys Comm: Registers users who only can log in from communications (including Web) Key+Comm: Registers users who only can log in from keys and communications Web: Registers users who only can log in from the Web client
User name	Up to 20 chars	User name setting Duplicate names cannot be registered The user names cannot be "quit," or " " (white space only).
Password	Up to 8 chars	Enter the Password The password is displayed as "*********" when entered by the user. The user names cannot be "quit," or " " (white space only).
User restriction	Off/1–10	User restriction settings Off: User restriction not performed 1–10: Apply user restriction settings 1–10

8.3.6 User Restriction Settings

Ten user restriction settings are available.
The user restriction settings are as follows.

User Restriction Setting	Selection Items (Setting Range)	Description
User restriction number	1–10	Number for setting user restrictions
Key operation restriction	START key STOP key MENU key USER key DISP/ENTER key Favorite key	Sets whether to allow key operation Choose Free or Lock for each key
External media access restriction	-	Sets whether to allow access to external storage media Choose Free or Lock Free: Access allowed Lock: Access not allowed
Functional restrictions	Alarm ACK Message/batch Computation Data saving E-mail/FTP Time setting Display function	Select Free or Lock for each setting action that allows or does not allow operation of the instrument.

9 Communication Functions
9.1 Communication Protocols
* **Bolded** items represent changes or additions to the conventional DX.

■ The installed communication protocols are shown below.
■ Serial communications are optional.
■ **DHCP (dynamic host configuration protocol)** is supported in the network address settings.

	Communication Functions								
Application	Modbus master/slave	Setting/ Measurement server	Maintenance/ diagnostics server	Web server	FTP server/ client	E-mail client	Modbus server/ client	Instrument information server	**SNTP client/ server**
		Login (user verification)							
Upstream protocol	Modbus Protocol	DX specific protocol		HTTP	FTP	SMTP	Modbus Protocol		
Downstream protocol		Serial Commu nications	TCP						UDP
			IP						
Interface	Serial RS-232 RS-422A/485	Ethernet 10base-T							

9.2 Communication Function Using the Ethernet Interface
* **Bolded** items represent changes or additions to the conventional DX.

9.2.1 Basic Specifications
Electrical and mechanical specifications: Conforms to IEEE802.3 (Ethernet frames is DIX specification)
Transmission media type: 10Base-T
Protocols : TCP, IP, UDP, ICMP, ARP

9.2.2 Communication Resources (Server Function)
The port numbers and maximum number of simultaneous connections for each service are as follows.

Service	Port	Maximum No. of Simultaneous Allowed		Maximum Number of Simultaneous Connections
		System Admin.	General User	
Setting/measurement	34260/tcp	1	2	3
Maintenance diagnostics	34261/tcp	1	1	1
Instrument information	34264/udp	-	-	-
FTP server	21/tcp	2	2	2
Web server	80/tcp	-	-	-
SNTP server	123/udp	-	-	-
Modbus server	502/tcp	-	-	2

9.2.3 FTP Function

■ FTP Server Function
You can access files, manipulate them, and perform other operations on the main instrument from a computer on the network using the FTP protocol.
Access can be controlled using the login function.
Accessible drives:
> Internal memory (file area), external storage medium (CF card)

Common allowable drive operations:
> Drive and directory manipulation, file list output, and file download

Operations allowed on the external storage medium only:
> File transfers, deletions

■ FTP Client Function
You can transfer files from the instrument to an FTP server.
Location of connection:
> You can specify primary or secondary server. If the primary FTP server is down, files are transferred to the secondary FTP server.

Automatically transferred files:
> • Display data files and event data files
> • Report files
> • Screen image data files (snapshots)

Timing of Automatic Transfers:

File Type	Origin of File Data	Transfer Timing	
		Cause	Details
Display data file	Internal memory data	File creation time	Auto save interval
			Display data save
Event data file	Internal memory data	File creation time	Interval specified by the data length.
			Event data save
Report files	Internal memory data	Report creation time	-
Snapshot file	External storage media	Snapshot execution time	-

9.2.4 Web Server Function

■ Overview of Web Server Function
Using a browser (Microsoft Internet Explorer), you can monitor the status of the instrument over the network.

■ Page Type
The following are the page types and contents.

Page Type	Access Verification	Description
Operator	Yes	Allows you to display the screen displayed on the instrument You can enter messages and change the displayed screen
Monitor	Yes	Allows you to display the screen displayed on the instrument

Other display screens: Alarm summary display, all-channel numerical display, log display

9.2.5 E-Mail Transmission Function

■ Overview of the E-Mail Transmission Function
You can have an e-mail sent automatically from the instrument to a specified destination. Up to two groups of destinations can be set, and you can specify the destination group for each e-mail type.

■ E-Mail Types
The following are the e-mail types, transmission timing, and contents.

Type	Transmission Timing	Description
Alarm e-mail	When an alarm is activated or cleared	Alarm information Instantaneous value data (arbitrary)
System e-mail	Upon recovery from power failure	Time power failure occurs and time of recovery from power failure
	Upon memory end detection	Memory end detection
	When media related error occurs	Error code and message
	When FTP client related error occurs	Error code and message
Set time e-mail	When a specified time is reached	Time of transmission Instantaneous value data (arbitrary)
Report e-mail	Upon creation of a report	Report result

9.2.6 SNTP* Function

* Simple Network Time Protocol (protocol for synchronizing time between server and client over the network)

■ SNTP Server Function
You can run the instrument as an SNTP server.
Time resolution as the SNTP server: 5 ms

■ SNTP Client Function
You can synchronize the time to that of an SNTP server.
Querying the time on an SNTP server:
      (1) Periodic queries
         • Queries the time on the SNTP server at predetermined time intervals.
         • If the difference in time relative to the SNTP server is more than ± 10 minutes, it is not corrected.
      (2) Manual queries
         • Queries the time on the SNTP server per key operation.
      (3) Memory start queries
         • Queries the time on the SNTP server when sampling starts.
         • If no response is made from the SNTP server within two seconds, memory starts regardless of whether the query made to the SNTP server succeeded or failed.

9.2.7 Settings/Measurement Server Functions

■ Settings/Measurement Server Functions
You can enter instrument settings, operate the instrument, and output various kinds of data.
Settings/Measurement Server Functions:
- (1) Instrument settings
- (2) Instrument operation
  - Enables the same operations possible using the instrument's keys.
- (3) Output data from the instrument
  - Output of measurement, MATH, and expansion data (in binary or ASCII)
  - Output of log data
  - Outputs setting data
  - Screen image data displayed by the instrument (snapshots)
  - Outputs the status of login to the instrument
  - Outputs the status of the instrument (status information)
  - Outputs the data from the external storage medium

The access restrictions by login are as follows.

Description		Login User	
		System Admin.	General user
Setting	General setting mode	○	×
	Basic setting mode	○	×
Operation	-	○	×
Data output	Measurement, MATH and expansion data	○	○
	Log data	○	○
	Settings data	○	○
	Screen image data	○	○
	Login status data	○	○
	Status information	○	○
	External storage media data	○	×

○: Allowed
×: Not allowed

9.2.8 Maintenance/Diagnostic Server Function

■ Maintenance/Diagnostic Server Function
Outputs connection information and network statistics.
The commands of the maintenance/diagnostic server are as follows.

Command	Function	Authorized Users
close	Close connection with other instrument	System admin. only
con	Output connection information	All users
eth	Output Ethernet statistics	All users
help	Output help	All users
net	Output network statistics	All users
quit	Close connections with operating instruments	All users

9.2.9 Instrument Information Server Function

■ Instrument Information Server Function
Outputs the instrument's serial number, model name, and other information.
One UDP packet is interpreted as a single command, and a response to the command is returned (instrument information) using one packet.
The instrument information server commands are shown below.
The parameters for information that you wish to output is together with packets sent as commands.

Parameters	Description
serial	Outputs the serial number
host	Outputs the host name set on the instrument
ip	Outputs the IP address set on the instrument

9.2.10 Modbus Function

■ Modbus Client (Modbus Master) Function
The following access is available to the registers of the server (slave) instrument.
    (1)   Hold registers or input registers are periodically loaded to communication input channels (mathematical function option) or external channels (external channel option).
    (2)   Measured data is periodically written to hold registers.
    (3)   Computed data is periodically written to hold registers.
The following is a list of supported functions.

Function Code	Function	Description
3	Read hold registers (4xxxx)	Main instrument writes data from the hold register of the server (slave) instrument to the communication input data or external channels.
4	Read input register (3xxxx)	Main instrument writes data from the input register of the server (slave) instrument to the communication input data or external channels.
16	Write to hold register (4xxxx)	The instrument writes measured or computed data to the hold registers of the server (slave) instrument.

■ Modbus Server (Modbus Slave) Specifications
The Modbus server (Modbus Slave) basic specifications are as follows.

Installed Protocols	Physical Layer	Specification
Modbus/RTU slave	Serial I/F	Slave : 1–99
Modbus/TCP slave	**Ethernet I/F**	**Port number: 502 (Well-known)** **No. of simultaneous connections: 2** **Command wait time out: 1 min.** **(however, the time out time from starting to receive a command once until the command is completely received is fixed at 10 seconds.)** **Unit number specification: Any** **"transaction identifier" : Any** **"protocol identifier" : Any**

■ Modbus Server (Modbus Slave) Functions
The functions offered to the client (master) instrument are as follows.
    (1)   Reading measured data
    (2)   Reading computed data
    (3)   Reading/writing communication input data
    (4)   Reading/writing external channel data
    (5)   Reading alarm information
The following is a list of supported functions.

Function Code	Function	Description
3	Read hold registers (4xxxx)	Client (master) instrument reads communication input data.
4	Read input register (3xxxx)	Client (master) instrument reads the instrument's measured, computed, and external channel data.
6	Write to hold register (4xxxx) once	Client (master) instrument writes to the instrument's communication input data and external channel data.
8	Loop Back Test	Client (master) instrument performs the loop back test of the instrument.
16	Write to hold register (4xxxx)	Client (master) instrument writes to the instrument's communication input data and external channel data.

■ Notes
Precautions regarding the Modbus function are as follows.
    (1)   The Modbus master and Modbus slave cannot be used at the same time.
    (2)   The Modbus master/slave, Modbus server, and Modbus client can perform actions independently.

9.3 Communication Functions Using the Serial Interface (Optional)
   * **Bolded** items represent changes or additions to the conventional DX.

9.3.1 Basic Specifications

■ RS-232 (/C2) Basic Specifications
Electrical and mechanical specifications:

	Conforms to EIA RS-232 (9 pin)
Protocol:	Yokogawa original or Modbus protocol
Connection method:	Point-to-point
Communication mode:	Half-duplex
Synchronization method:	Start-stop synchronization
Control method:	Choose from CS-RS, Xon/Xoff, Xon-RS, and None
Data length:	7,8 [bit]
Data rate:	Select from 1200, 2400, 4800, 9600, 19200,and 38400 bps
Start bit:	1 [bit]
Stop bit:	1 [bit]
Parity:	Select ODD, EVEN, or NONE
Communication data format:	Measured data; select Binary or ASCII
	Setting, control; ASCII

■ RS-422A/485 (/C3) Basic Specifications
Electrical and mechanical specifications:

	Conforms to EIA RS-422A
Protocol :	Yokogawa original or Modbus protocol
Connection method:	Multidrop (1:N(N1–32))
Communication mode:	4-wire, half-duplex
Synchronization method:	Start-stop synchronization
Control method:	None
Data length:	7,8 [bit]
Data rate:	Select from 1200, 2400, 4800, 9600, 19200, and 38400 bps
Start bit:	1 [bit]
Stop bit:	1 [bit]
Parity:	Select ODD, EVEN, or NONE
Allowed communication distance:	
	1.2 km maximum
Communication data format:	Measured data; select Binary or ASCII
	Setting, control; ASCII

9.3.2 Basic Functions

■ Settings/Measurement Server Functions
For settings/measurement server functions, see section 9.2.7, "Settings/Measurement Server Function."
Note that the login function may not be used.

■ Modbus Master/Modbus Slave Functions
For Modbus master/Modbus slave functions, see section 9.2.10, "Modbus Functions."
When loading measured data from other instruments, the MATH or external channel option is required.

10 Batch Functions

10.1 Overview of Batch Functions

*   * **Bolded** items represent changes or additions to the conventional DX.

10.1.1 Batch Management Functions

The following is a list of batch management functions.

Function	Description
Display data/event data management function using batch names (batch number and lot number)	Batch name (batch number and lot number) data is added
	You can save data file names by batch name (batch number and lot number)
	The batch name is displayed in the status display and memory stop screen.
Text field function	Text field input character screen display
	Text field input characters are added to display data/event data
Batch comment character string input function	Written once during the memory sampling
	Comment input information (input date/time, user name) is added to the display data/event data

10.1.2 Batch Settings

The following is a list of the settings of the batch management function.

Batch Management Settings	Selection Items	Description
Batch management	On/Off	Sets whether to use/not use the batch management function 　On :　Use batch management 　Off:　Do not use batch management
Number of lot number digits	Off/4/6/8	Sets whether to use lot numbers 　4/6/8:　Use 4, 6, or 8 digits for the lot number. 　Off　:　Do not use lot numbers.
Auto increment	On/Off	Sets whether to automatically increment lot numbers (by +1) 　On :　Automatically increment lot numbers 　Off:　Do not automatically increment lot numbers * Available only when using lot numbers

10.1.3 Header Information When Using the Batch Function

When using the batch management function, header information for adding to the data is added.
The following is a list of the header information when using the batch management function.

Header Information	Batch Management Function	
	Used	Not Used
Instrument serial number	Yes	Yes
File header	Yes	Yes
Batch name (batch number and lot number)	Yes	No
Start information (day/time, user name*)	Yes	Yes
Stop information (day/time, user name*)	Yes	Yes
Comment information 1–3 (Day/time, user name*, comment string)	Yes	No
Text field 1–8	Yes	No

* Only when using the login function

10.2 Batch Name
* **Bolded** items represent changes or additions to the conventional DX.

A batch name consists of a batch number and lot number, and allows you to assign a file name to display data and event data.
The structure of batch names is as follows.

Batch Name	No. of Chars	Supported Characters
Batch number	**Up to 32**	English capital letters, numbers, and some symbols
Lot number	**Up to 8**	Numbers * Available only when using lot numbers

10.3 Text Fields
* The Text Field function is a newly-added function for DXAdvanced.

When using the batch management function, you can display text fields in dedicated display screens. Up to eight fields can be set.
The text field settings are as follows.

Text Field Settings	Selection Items (Setting Range)	Description
Field number	1–8	Specified field number
Field title	Up to 20 chars	Set string for the text field's field title. Supported Characters: Alphanumeric and symbols
Field string	Up to 30 chars	Set field string for the text field. Supported Characters: Alphanumeric and symbols

10.4 Inputting Batch Comments
* **Bolded** items represent changes or additions to the conventional DX.

When using the batch management function, you can write up to three batch comments.
Batch comments can be written only once during memory sampling.
The structure of batch comments is as follows.

No. of Comments	No. of Chars	Supported Characters
3	**Up to 50**	Alphanumeric and symbols

11 Time Related Settings/Functions

11.1 Setting the Time

* **Bolded** items represent changes or additions to the conventional DX.

11.1.1 Setting the Time

You can set the time on the instrument using one of the following procedures.

(1) Setting the time using keys
(2) Setting the time using communication commands
(3) Setting the time using an event action function
(4) Setting the time using the SNTP Client Function

11.1.2 **Setting the Time during Memory Sampling**

By gradually adjusting the time every 40 ms over a period of 1 second, you can change the time even during memory sampling without influencing the measurement interval.
Time correction is performed gradually within the time correction limiting value (the difference between the time and the adjustment time). If the limiting value is exceeded, the time is not corrected gradually, and changes all at once.
The following are the settings of the limiting value.

Limiting Value Setting	Selection Items (Setting Range)	Description
Gradual correction limiting value	Off/10s/20s/30s/ 1min–5min	Value limiting gradual correction in the time setting during memory sampling. Off: Do not gradually correct time. 10 s: Gradual time correction within a time difference of 10 s 20 s: Gradual time correction within a time difference of 20 s 30 s: Gradual time correction within a time difference of 30 s 1min–5min: Gradual time correction within a time difference of 1–5 min.

11.1.3 Setting the Time during Memory Stop

The time is changed all at once during memory stop.

11.2 Time Zone

* **Bolded** items represent changes or additions to the conventional DX.

The following are the contents of the time zone settings.

Time Zone Setting	Selection Items (Setting Range)	Description
Time Zone	-1300–1300	Setting of difference from Greenwich standard time Top 2 digits : hr Bottom 2 digits : min

11.3 Date Format
* **Bolded** items represent changes or additions to the conventional DX.

You can select one of four date formats for display on the instrument.
The following are the settings of the date format.

Date Format Setting	Selection Items (Setting Range)	Description
Date format	YrMoDy MoDyYr DyMoYr1 DyMoYr2	Date Format Setting YrMoDy : Set date format to YYYY/MM/DD MoDyYr : Set date format to MM/DD/YYYY DyMoYr1 : Set date format to DD/MM/YYYY DyMoYr2 : Set date format to DD.MM.YYYY *YYYY: year, MM: month,DD: day

11.4 DST Function
* **Bolded** items represent changes or additions to the conventional DX.

The time when summer time changes to winter time is automatically calculated based on the specified winter/summer time, and set.
The DST settings are as follows.

DST Setting		Selection Items (Setting Range)	Description
DST function	-	Use/Not	Sets whether or not to use daylight saving time Use: Use DST Not: Do not use DST
Summer time start	Month	Jan/Feb/Mar/Apr/May/Jun/Jul/Aug/Sep/Oct/Nov/Dec	Sets the month for the start of summer time
	Week of the month	1st/2nd/3rd/4th/last	Sets on which week of the month summer time starts 1st–4th: First week–fourth week Last : Last week
	Day of the week	Sunday–Saturday	Sets the day of the week on which summer time starts
	Time	0–23	Sets the time at which summer time starts 0–23: 12 am–11 pm
Summer time stop	Month	Jan/Feb/Mar/Apr/May/Jun/Jul/Aug/Sep/Oct/Nov/Dec	Sets the month for the end of summer time
	Week of the month	1st/2nd/3rd/4th/last	Sets on which week of the month summer time ends 1st–4th: First week–fourth week Last week : Last week
	Day of the week	Sunday–Saturday	Sets the day of the week for the end of summer time
	Time	0–23	Sets the time for the end of summer time 0–23: 12 am–11 pm

12 MATH/Report Function (Optional)
12.1 MATH Functions
* **Bolded** items represent changes or additions to the conventional DX.

12.1.1 MATH Function Basic Specification
You can perform computations on measurements, display of trends and numerical values of MATH channels, and recording.

■ Number of MATH Channels
The numbers of MATH channels are as follows.

Type	Model	Number of MATH Channels
DX1000	DX1002	**12 (101–112)**
	DX1004	
	DX1006	**24 (101–124)**
	DX1012	
DX2000	DX2004	**12 (101–112)**
	DX2008	
	DX2010	**60 (101–160)**
	DX2020	
	DX2030	
	DX2040	
	DX2048	

■ Data That Can Be Used in Expressions
The data that can be used in expressions are as follows.

Data Types	Channel Numbers	Remarks
Measurement channel data	001–048	The number of Measurement channels varies depending on the model
MATH channel data	101–160	The number of MATH channels varies depending on the model
External channel data	**201–440**	**Only with DX2000 external channel option installed**
Constants	K01–K60	Range (up to 5 digits valid) -9.9999E+29– -1.0000E-30,0,1.0000E-30–9.9999E+29
Communication input data	C01–C24 (DX1000) C01–C60 (DX2000)	Range (up to 5 digits valid) -9.9999E+29– -1.0000E-30,0,1.0000E-30–9.9999E+29
Remote control terminal status	D01–D08	You can associate the remote input signal status to 1 or 0 and use in computations. • Contact: Close = 1, open = 0 • Open collector: Remote terminal voltage level is Lo 1 Remote terminal voltage level is Hi 0 *Fixed to 0 when the remote option is not installed
Pulse input	**P01–P08**	**You can count pulses (in units of the measurement interval)** ***Fixed to 0 when the pulse input option is not installed**
	Q01–Q08	**You can count pulses (in units of 1 sec. intervals)** ***Fixed to 0 when the pulse input option is not installed**
Internal switch status	**S01–S30**	**-**
Relay status	**I01–I06 (DX1000) I01–I36 (DX2000)**	**-**
Flag	**F01–F08**	**1 upon occurrence of events of the Event action function**

■ Types of Expressions
The following are the types of expressions.

Computation Type	Operation	Description
Four arithmetical operations	+	Determines the sum
	-	Determines the difference
	*	Determines the product
	/	Determines the quotient
Square root	SQR	Determines the square root
Absolute value	ABS	Determines the absolute value
Common log	LOG	Determines the common logarithm $y=\log_{10}X$
Natural logarithm	**LN**	**Determines the natural logarithm $y=\log_e X$**
Exponents	EXP	Determines the power of constant e as $y=e^x$
Powers	**	Determines the power $y=X^n$
Relational operations	.EQ.	Determines whether two data are the same (=) and outputs 0 or 1
	.NE.	Determines whether two data are not the same (≠), outputs 0 or 1
	.GT.	Determines the size of two data (>) and outputs 0 or 1
	.LT.	Determines the size of two data (<) and outputs 0 or 1
	.GE.	Determines the size of two data (≥) and outputs 0 or 1
	.LE.	Determines the size of two data (≥) and outputs 0 or 1
Logical operations	AND	Determines the logical product
	OR	Determines the logical sum
	NOT	Determines the logical negation
	XOR	Determines the exclusive OR
Statistical computations (Time)	TLOG.MAX	Determines the maximum value
	TLOG.MIN	Determines the minimum value
	TLOG.AVE	Determines the average
	TLOG.SUM	Determines the integral value
	TLOG.P-P	Determines the maximum-minimum value
Statistical computations (channels)	**CLOG.MAX**	**Determines the maximum value within the specified channels**
	CLOG.MIN	**Determines the minimum value within the specified channels**
	CLOG.AVE	**Determines the average value within the specified channels**
	CLOG.SUM	**Determines the integral value within the specified channels**
	CLOG.P-P	**Determines the max.-min. value within the specified channels**
Special operations	**PRE**	**Determines the previous measured data**
	HOLD(a): b	**When a is something other than 0, holds its own data (including TLOG data and long-duration moving average data)** *** A MATH error results if computation result of a is an error** *** Same as when computation stops**
	RESET(a): b	**When a is something other than 0, the value of b up to the previous time is reset, and b is computed** *** A MATH error results if computation result of a is an error** *** Function equivalent to MATH reset (long-duration moving average is also cleared)**
	CARRY(a): b	**If the computed result of b is greater than or equal to the threshold value (a), the value that exceeded a is added to the computed result of b.** *** Can only be set to b with the TLOG.SUM operator** *** A MATH error results if computation result of a is an error** *** Clears the long-duration moving average** *** Carried-over data is cleared during battery backup, MATH reset, and TLOG reset (same as when 101=101+K01)**
Conditional expressions	**[a ? b : c]**	**When the computed result of a is true (other than 0), execute b otherwise (a is false (0)) execute c.** *** A MATH error results if computation result of a is an error** *** Other operators cannot be combined in one expression** *** Conditional expressions can be nested**

■ Restrictions on Data Used
There are some limits on which data can be used in statistical (TLOG and CLOG) and special computations.
The restrictions are as follows.

Computation Type	Available Data									
	Meas. ch	MATH ch	Expn. ch	Constants	Communications Input	Remote	Pulse	Internal SW	Relay	Flag
Statistical comp (TLOG)	○	○	○	○	○	○	○	×	×	×
Statistical comp (CLOG)	○	○	○	×	×	×	×	×	×	×
Special comp. (PRE)	○	○	○	○	○	○	○	×	×	×

○: Can be used
×: Cannot be used

■ Computed Results of OVER Data
The following are the computed results when OVER data is handled in expressions.

Computation	Expression	Computation Contents	Computed Result
Multiplication	op1*op2	0 * (+OVER)	0
		0 * (-OVER)	0
		(+OVER) * 0	0
		(-OVER) * 0	0
Relational comp. (.EQ.)	op1.EQ.op2	(+OVER).EQ.(+OVER)	0
		(-OVER).EQ.(-OVER)	0
Relational comp. (.NE.)	op1.NE.op2	(+OVER).NE.(+OVER)	1
		(-OVER).NE.(-OVER)	1

■ Special Data of Computed Results
The following are the displays and recording when computed results are over values, or other such cases.

Special Data	Display	Description
+OVER	+Over	Displayed and recorded as +OVER
-OVER	-Over	Displayed and recorded as -OVER
Set OFF	-	Not displayed or recorded
Error	+Over/-Over	Displayed and recorded as either +OVER or -OVER (you can specify which is used)

12.1.2 MATH Channel Settings

■ MATH Channel Basic Settings

The MATH channel basic settings are as follows.

MATH Channel Settings	Selection Items (Setting Range)	Description
MATH channel numbers	The number of MATH channels varies depending on the model	Specified MATH channel numbers
MATH channel On/Off	On/Off	MATH channel use/do not use setting
Expression	**Up to 120 chars**	**Number of stacks, 35 or fewer**
Low limit of span	-9999999–99999999	You can set the decimal place in the range from 0 to 4.
High limit of span	-9999999–99999999	* Low limit of span must not be equal to the High limit of span
Units	Up to 6 characters	Unit setting (alphanumeric)

■ TLOG Computation Setting

The TLOG computation settings are as follows.

The timer can be set for each channel.

TLOG Comp. Setting	Selection Items (Setting Range)	Description
MATH channel numbers	No. of MATH ch varies by model	Specified MATH channel numbers
Timer number	**1–4**	Specified timer number
Integration Units	Off /s /min /h	Integration units of the integral value Off: Σ (meas./computed data at each measurement interval) /s: Σ (meas./computed data at each measurement interval) * measurement interval /min: Σ (measured/computed data at each measurement interval) * measurement interval/60 /h: Σ (measured/computed data at each measurement interval) * measurement interval/3600
Reset	On/Off	Sets whether to reset the TLOG computed value when the timer times up On: Reset the TLOG computed value on time up Off: Do not reset the TLOG computed value on time up

■ Long-Duration Moving Average Settings

The following are the settings of the long-duration moving average.

Long-Duration Moving Average Setting	Selection Items (Setting Range)	Description
MATH channel numbers	The number of MATH channels varies depending on the model	Specified MATH channel numbers
Long-duration moving average	On/Off	Select to use or not use long-duration moving average
Sampling interval	1s–6s/10s/12s/15s/20s/30s/ 1min–6min/10min/12min/ 15min/20min/30min/1h	The interval at which the moving average data is sampled
No. of samplings	1–1500	Number of data used in the moving average

12.1.3 START Key Operation

You can set the operation of computations per the START key.

The following are the settings for computation operations with the START key.

Setting Item	Setting Items (Setting Range)	Description

Computation	Off
	Start
	Start+Reset
		START key operation setting
		Off: Do not start computation simultaneously
		Start: Start computation simultaneously
		Start+Reset:
		        Start computation simultaneously
		        (reset computation on computation start)

12.2 Report Functions

     * **Bolded** items represent changes or additions to the conventional DX.

12.2.1 Report Function Basic Specifications

You can create hourly, daily, weekly, monthly, and other reports.

With reports, you can select 4 types from the specified channel's average value, maximum, minimum, integral value, and **instantaneous value**.

■ Number of Report Channels

The numbers of report channels are as follows.

Type	Model	Number of Report Channels
DX1000	DX1002	**12 (R01–R12)**
	DX1004	
	DX1006	**24 (R01–R24)**
	DX1012	
DX2000	DX2004	**12 (R01–R12)**
	DX2008	
	DX2010	**60 (R01–R60)**
	DX2020	
	DX2030	
	DX2040	
	DX2048	

■ Report Types

The report types are as follows.

Report Type	Description
Hourly	The average, maximum, minimum, integral and instantaneous values from 1 hour's worth of data up to the hour on the hour on the specified channel are written to the internal memory.
Daily	Every day at the specified time, the average, maximum, minimum, integral and instantaneous values from 1 day's worth of data up to that time on the specified channel are written to the internal memory.
Hourly + Daily (H+D)	You can select whether to output hourly and daily reports to separate files or the same file
Daily + Weekly (D+W)	You can select whether to output daily and weekly reports to separate files or the same file
Daily + Monthly (D+M)	You can select whether to output daily and monthly reports to separate files or the same file

■ Report Computation Types

Report Computation Types		Description
Mean value	AVE	Determines the average value of the specified channel
Maximum	MAX	Determines the maximum value of the specified channel
Minimum value	MIN	Determines the minimum value of the specified channel
Sum value	SUM	Determines the integral value of the specified channel
Instantaneous value	INST	Determines the instantaneous value of the specified channel

12.2.2 Report Settings

■ Report Basic Settings
For the report types, see section 12.2.1, "Report Function Basic Specifications."

■ Report Creation Date and Time

Setting Item	Report Type					Description
	Hr	Day	Hr + day	Day + week	Day + month	
Day	-	-	-	-	1–28	Daily setting
Day of the week	-	-	-	Sun–Sat	-	Day of the week setting
Hr	-	0–23				Time setting

■ Report Channel Setting
The following are the report channel settings.

Report Channel Setting	Selection Items (Setting Range)	Description
Report channel number	No. of report ch varies by model	Specified report channel numbers
Report On/Off	On/Off	Sets whether or not to use report channels
Channels	-	Measurement, MATH and external channels to assign to report channels
Integration Units	Off /s /min /h /day	Integration units of the integral value Off: Σ (meas./computed data at each measurement interval) /s: Σ (measured/computed data at each measurement interval) * measurement interval /min: Σ (measured/computed data at each measurement interval) * measurement interval/60 /h: Σ (measured/computed data at each measurement interval) * measurement interval/3600 /day: Σ (measured/computed data at each measurement interval) * measurement interval/86400

12.3 Processing of Statistical Computation (TLOG and CLOG) and Report Computation Data

* **Bolded** items represent changes or additions to the conventional DX.

12.3.1 Abnormal Data Types

The following are the abnormal data types.

■ Skip Data
- (1)   If the measurement channels are set to skip
- (2)   If the MATH channels are set to off
- (3)   If the external channels are set to off

■ Error Data
- (1)   Measurement on a measurement channel results in error (A/D failure, etc.)
- (2)   Computation on a MATH channel results in error

■ Undefined data
- (1)   No data present on an external channel when communication is stopped, or such cases

■ NAN
- (1)   No data present on a communication input channel when communication is stopped, or such cases

12.3.2 Processing of Abnormal Data

Processing when abnormal data occurs is as follows.
- ■ The abnormal data is ignored and computation continues.
- ■ If all data is abnormal, the computation result in an error.

12.3.3 Processing of Overflow Data

You can select the OVER data processing method for statistical computation (TLOG and CLOG) and report computation.

■ Processing of Overflow Data
The processing of overflow data is as follows.

Statistical computations		Processing of Overflow Data
TLOG CLOG report	SUM	You can select a processing method of ERROR, SKIP, or LIMIT
	AVE	
	MAX	You can select a processing method of SKIP or OVER
	MIN	
	P-P	

■ Overflow Data Processing Method Settings
The overflow data processing method settings are as follows.

Overflow Data Settings	Selection Items (Setting Range)	Description

Overflow data processing during SUM and AVE computation	ERROR SKIP LIMIT	Overflow data processing method during TLOG, CLOG, and report computation
		ERROR : Sets the computed result to MATH error.
		SKIP : Overflow data is ignored and computation continues
		LIMIT : Processed as the following data.
		   •Measurement channels on which linear scaling is not set
		     High/low limit value of the measuring range
		   •Measurement channels on which linear scaling is set
		     Specified high/low limit value of scaling
		   •MATH channels
		     Specified high/low limit of span

Overflow data processing during MAX, MIN, and P-P computation	OVER SKIP	Overflow data processing method during TLOG, CLOG, and report computation (MAX, MIN, and P-P) OVER : Computed with overflow data SKIP : Overflow data is ignored and computation is performed

13 External Channel Functions (Optional)

13.1 Overview of External Channel Functions

* **The external channel functions are newly-added functions for DXAdvanced**.

13.1.1 Overview of External Channel Functions

External channels are dedicated to communication input. They use the instrument's Modbus master function to allow loading of other instrument's data, and enable you to set data using communication input commands.

When the external channel option is equipped, fast sampling mode is not available.

■ Models Compatible with the External Channel Function Option
Models on which the external channel function option can be installed are as follows.
The installation possibilities by model are as follows:

Type	Model Name	External Channel Functions		
		Option Installation	Number of Channels	Channel Numbers
DX1000	DX1002	×	-	-
	DX1004			
	DX1006			
	DX1012			
DX2000	DX2004	×	-	-
	DX2008	×	-	-
	DX2010	○	240	201–440
	DX2020	○		
	DX2030	○		
	DX2040	○		
	DX2048	○		

○: Option can be installed
×: Option can not be installed

■ List of External Channel Functions
The following is a list of external channel functions.

Function		Description	Details
Data	Valid no. of bits	16	-
	Data Range	-30000–30000	-
Alarm	Type	H/L/T/t	High/low limit alarm (H/L),delay high/low alarm (T/t) are possible
	Hysteresis	Allowed	0.0–5.0% of the setting span
E-mail	Alarm mail	Allowed	E-mail can be sent upon activation or release of an alarm
Report	Channel specification	Allowed	External channels can be set
Manual sampling	Channel specification	Allowed	External channels can be set

13.1.2 External Channel Settings

■ External Channel Basic Settings
The external channel basic settings are as follows.

External Channel Settings	Selection Items (Setting Range)	Description
External channel number	201–440	Specified external channel numbers
External channel On/Off	On/Off	External channel use/do not use setting
Low limit of span	-30000–30000	You can set the decimal place in the range from 0 to 4.
High limit of span	-30000–30000	* Low limit of span must not be equal to the High limit of span
Units	Up to 6 characters	Unit setting (alphanumeric)

13.1.3 Manual Sampling

When the external channel option is installed, you can select measurement channels, MATH channels, or external channels as the save channels for manual sampling.
The number of channels that can save manually sampled data is 120.

14 Expansion of Input Types (Optional)
14.1 Cu10, Cu25 Resistance Temperature Detector (/N1)
* **Bolded** items represent changes or additions to the conventional DX.

Cu10 and Cu25 input have been added to resistance temperature detector (RTD).
The added ranges are as follows.

Input	Added Range		Measuring Range
	Range	Range Name	
RTD	CU10: GE	Cu1	-200.0–300.0°C
	CU10: L&N	Cu2	
	CU10: WEED	Cu3	
	CU10: BAILEY	Cu4	
	CU10: 0.00392at20	Cu5	
	CU10: 0.00393at20	Cu6	
	CU25: 0.00425at0	Cu25	

14.2 Expansion Input (/N3)
* **Bolded** items represent changes or additions to the conventional DX.

Input types have been added to thermocouple (TC) and resistance temperature detector (RTD).
The added ranges are as follows.

Input	Added Range		Measuring Range
	Range	Range Name	
TC	Kp vs Au7Fe	Kp	0.0–300.0 K
	PLATINEL	PLATI	0.0–1400.0 °C
	PR40–20	PR	0.0–1900.0 °C
	NiNiMo	NiMo	0.0–1310.0 °C
	W/WRe26	W/WRe	0.0–2400.0 °C
	Type N(AWG14)	N2	0.0–1300.0 °C
RTD	Pt50	Pt50	-200.0–550.0 °C
	Ni100(SAMA)	Ni1	-200.0–250.0 °C
	Ni100(DIN)	Ni2	-60.0–180.0 °C
	Ni120	Ni3	-70.0–200.0 °C
	J263*B	J263	0.0–300.0 K
	Cu53	Cu53	-50.0–150.0 °C
	Cu100	Cu100	-50.0–150.0 °C
	Pt25	Pt25	-200.0–550.0 °C

15 Pulse Input (Optional)
15.1 Overview of Pulse Input
* The pulse input function is a newly-added function for DXAdvanced.

You can use the remote input terminal as a pulse input terminal.
The MATH option is included in the pulse input option.

■ Pulse Input: Basic Specifications
Number of inputs: 3 (however you can use the remote control terminal as a pulse input terminal, in which case the maximum is 8 inputs)
Input types: No-voltage contact or open collector
Count method: Counts on rising edge of pulses
                     For no-voltage contact input   Contact open -> contact closed
                     For open collector: Voltage level High -> Low
Allowable input voltage: 30 VDC
Maximum measurement pulse interval: 100Hz
Minimum detection pulse width:
                     5 ms or more for both Low (close) and High (open)
Pulse detection interval
                     Approximately 3.9 ms (256 Hz)
Pulse measurement accuracy: ± 1 pulse

■ Pulse Integration
Using MATH channels, you can perform two kinds of pulse integration.
The following are the types of pulse integration.

MATH Channels		Description
Pulse Input Terminal	When Using Remote Terminal	
P01–P03	P01–P08	Counts the number of pulses for each measurement interval and displays the result
Q01–Q03	Q01–Q08	Counts the number of input pulses per second and displays the result

16 USB Interface (Optional)

16.1 Overview of the USB Interface

* **The USB interface function is a newly-added function for DXAdvanced.**

■ USB Specifications
USB: Conforms to Rev. 1.1, host function
Number of ports: 2 (front and rear panel)
Supplied power: 5 V, 500 mA (each port) *
          * When connecting a low powered device (bus power < 100 mA):   5 V±5%
            When connecting a high powered device (bus power < 500 mA):   5 V±10%
            Devices for which the bus power on 2 ports exceeds 500 mA cannot be
            connected at the same time.
Connectable devices: As follows.

Device	USB Standard	Details
Keyboard	Conforms to USB HID Class Ver. 1.1	104 keyboard /89 keyboard (US) 109 Keyboard /89 keyboard (Japanese) Supports keyboards that conform to the above USB standard One keyboard can be connected
USB flash drive	-	All USB flash drive operations not guaranteed

USB flash drive:
          Drive names: "USB0:"(fixed)
          Available operations: (1) Writing/reading settings data files
                        (2) Writing display data/event data files (manual save only)
                        (3) Loading of display/event data files
                        (4) Formatting
                        (5) Listing and deleting files

16.2 Connecting USB Devices

■ Simply connect the USB device to the USB port. It will be automatically recognized.
■ Two or more USB memories are not required to connect two or more keyboards.

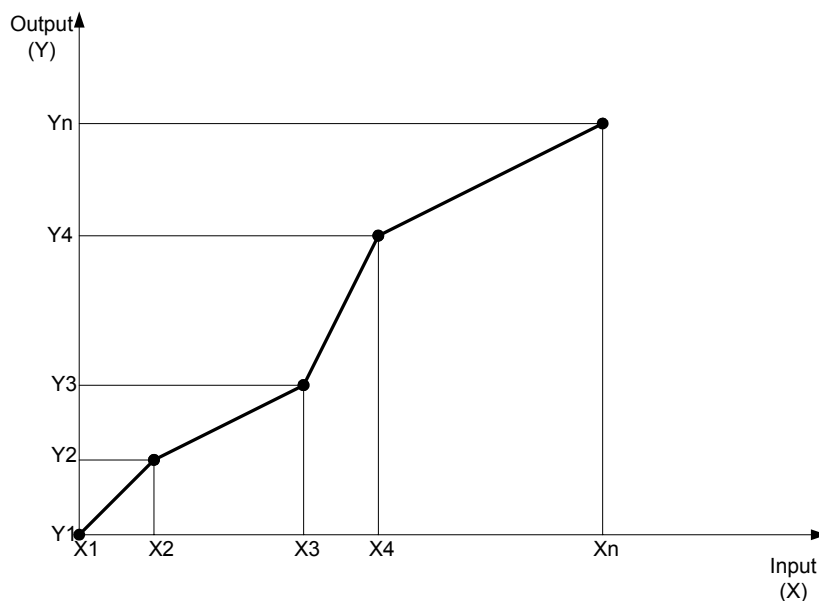# 17 Calibration Correction Function (Optional)
17.1 Overview of the Calibration Correction Function

* **The calibration correction function is a newly-added function for DXAdvanced (possible with the DX100P/DX200P)**.

■ You can correct values from each measurement channel input using a broken line approximation.
Number of set broken line points: 2–16

■ Overview Diagram of Broken Line Approximation

17.2 Calibration Correction Function Settings

The calibration correction settings are as follows.
There are two methods for setting input values: entering them directly with numerical values, and automatically loading measured values.

Calibration Correction Setting	Selection Items (Setting Range)	Description
Measurement channel numbers	-	Specified measurement channel numbers
No. of corrections	Off/2–16	Specified number of corrections Off : Do not use input value correction function 2–16: No. of corrected input values
Correction point 1 input value	Within the setting range of the currently set range	Correction point 1 input value setting Enter number within the setting range, or set the measured value
Correction point 1 output value	Within setting range of the currently set range	Correction point 1 output value setting
Correction point n input value	Same as correction point 1	Correction point n input value setting (where n is the number of correction points)
Correction point n output value	Same as correction point 1	Correction point n output value setting (where n is the number of correction points)

18   FAIL/Status Output Relay Function (Optional)

18.1   Overview of the FAIL/Status Output Relay Function
* The status output relay function is a newly-added function for DXAdvanced.

When an abnormality occurs with the instrument's CPU, or when a certain status occurs, a relay contact signal is output.

■ FAIL/Status Output Relay Basic Specifications
The FAIL/status output relay basic specifications are as follows.

Type	Relay Contact Capacity	Relay Action	Output Cause
FAIL output	250 VDC/0.1A (resistance load) 250 VAC/3A (50Hz/60Hz)	On system abnormality: De-energize	CPU abnormality
Status output	250 VDC/0.1A (resistance load) 250 VAC/3A (50Hz/60Hz)	Upon status occurrence: Energize/ Non-Hold	Memory or media status Measurement abnormality Communication abnormality Memory stop

■ Status Output Causes and Relay Action
The following are status output causes and their relay operations.

Instrument Action	Description
Memory or media status	Relay energized when internal memory or external storage media is in the following conditions: Abnormality in the internal memory When automatic saving of settings to the external storage media is ON •When the remaining space on the external storage medium reaches 10% •When an abnormality occurs with the external storage medium, and auto save fails •When the external storage medium is not inserted, operation is same as when automatic saving of settings to the external storage media is Off When automatic saving of settings to the external storage media is Off •When the remaining space on the internal memory reaches 10% •When the number of data file which is not saved to external storage media exceeds 390 * Not including USB memory connected to the instrument.
Measurement abnormality	Relay energized upon A/D converter abnormality or burnout detection
Communication abnormality	Relay energized when communication error occurs in the Modbus master
Memory stop	Relay energized upon memory stop

19 Easy Text Entry (Remote Control) Function (Optional)
19.1 Easy Text Entry (Remote Control) Function

* The easy text entry function is a newly-added function for DXAdvanced (possible with the DX100P/DX200P).

Through remote control you can perform the same operations on DXAdvanced as with the main unit keys.
* The operation of the favorite key is not available.
* In case of DX1000, entering the computation expression through remote control is not available.
Up to thirty-two DXAdvanced units can be operated at the same time.

■ Remote Control Specifications
The remote control specifications are as follows:

Item	Description
Operating temperature range	0–40 °C
Operating humidity range	20–80% RH (5–40°C no condensation)
Storage temperature range	10–60 °C
Power supply	3 VDC, two AA batteries
Weight	Approx. 60 grams (not including batteries)
External dimensions	170(H)x50(W)x23.7(D)mm
No. of individually operable units	Up to 32 per the ID code setting
Max. communication distance	Instrument light acceptance surface of 8 m or less (reference value)
Accessories (/KB1)	Remote control, two alkali dry cells, ID code label

20 Appendix (Comparison of DXAdvanced and DX100/DX200)

DX1000 vs. DX100 Comparison Table

Function/Specification	DX1000	DX100
Input		
Number of inputs	2, 4, 6, 12ch	2, 4, 6, 12ch
Measurement interval	2, 4ch: 125ms, 250ms **(Fast sampling mode: 25ms)** 6, 12ch: 1s, 2s, 5s **(Fast sampling mode: 125ms)**	2, 4ch: 125ms, 250ms 6, 12ch: 1s, 2s
Type of inputs	DCV: 20, 60, 200mV, 2, 6, **1-5**, 20, 50V DCA: with external shunt resistor TC: R, S, B, K, E, J, T, N, W, L, U, **WRe** RTD: Pt100, JPt 100 DI(digital input for event recording)	DCV: 20, 60, 200mV, 2, 6, 20, 50V DCA: with external shunt resistor TC: R, S, B, K, E, J, T, N, W, L, U RTD: Pt100, JPt 100 DI(digital input for event recording)
Measurement accuracy (6V range)	**+/-(0.05% of rdg + 3digits)** **(Fast sampling mode: +/-(0.1% of rdg + 15digits))**	+/-(0.1% of rdg + 2digits)
Burn out function	For TC and **1-5V** range	For TC range only
Low cut function	**For sqrt mode (0 to 5% of span)** **For 1-5V scaling mode (fixed to lower span limit)**	N/A
Display		
Display unit	TFT color LCD (5.5", 320x240dot)	TFT color LCD (5.5", 320x240dot)
Display span rate	15, 30sec, 1, 2, 5, 10, 15, 20, 30min, 1, 2, 4, 10hour/div (15sec/div are only for 2, 4ch model), **with display scan rate change function**	15, 30sec, 1, 2, 5, 10, 20, 30min, 1, 2, 4, 10hour/div (15, 30sec/div are only for 2, 4ch model)
Display group	**10 groups**	4 groups
Type of display	Trend/**Trend split**/ Numeric/Bar graph, Overview, Information, Zone display, Partial expanded display Historical trend	Trend/Numeric/Bar graph, Overview, Information, Zone display, Partial expanded display Historical trend
Scale display	Pointer flag, **Bar graph, Alarm set point, green band**	Pointer flag
Configuration	Panel keys Through communication, removable storage media (CF card) or **USB flash memory (optional)** **USB keyboard (optional)** **Remote control unit (optional)**	Panel keys Through communication or removable storage media (FD, Zip, ATA)
Memory		
Medium	Internal memory: Flash memory External media: CF card, **USB flash memory (optional)**	Internal memory: Flash memory External memory: 3.5-inch FD, Zip, ATA flash memory card
Internal memory capacity	**80MB (standard), 200MB (large)**	1.2MB
Data file name	**Configurable**	Data and time
Communication		
Medium	Ethernet (10Base-T), RS-422A/485 (optional), RS-232 (optional), **USB Rev1.1 host (optional)**	Ethernet (10Base-T), RS-422-A/485 (optional), RS-232 (optional)
Protocols (functions)	Serial: Yokogawa protocol, Modbus/RTU Ethernet: Yokogawa protocol, FTP server/client, Web server, E-mail, **Modbus/TCP, SNTP server/client, DHCP** **USB: USB keyboard, USB flash memory**	Serial: Yokogawa protocol, Modbus/RTU Ethernet: Yokogawa protocol, FTP server/client, Web server, E-mail

Function/Specification	DX1000	DX100
Computation		
Number of Math channels	DX1002/1004: **12ch** DX1006/1012: **24ch**	DX102/104: 4ch DX106/112: 12ch
Operators	Basic four arithmetic, Square root, Absolute, Common logarithm, Exponential, Power, Relational, Logical operators, TLOG (average, max., min., P-P), **CLOG (average, max., min., P-P), Special operators (RESET, CARRY, PRE, HOLD)**, **Conditional operators**, Rolling Average	Basic four arithmetic, Square root, Absolute, Common logarithm, Exponential, Power, Relational, Logical operators, TLOG (average, max., min., P-P), Rolling Average
Others	Constants **(up to 60)**, Communication digital input **(up to 24)**, Remote status input (up to 8), **Pulse input summation, Internal switch input (up to 30), Relay status input (up to 6), Flag (up to 8)**	Constants (up to 12), Communication digital input (up to 12), Remote status input (up to 8)
Report function	Report function (hourly, daily, hourly and daily, daily and weekly, daily and monthly) Average, Max., Min., Sum., **Instantaneous**	Report function (hourly, daily, hourly and daily, daily and weekly, daily and monthly) Average, Max., Min., Sum.
Alarm		
Types	High and low limits, delay high and low, differential high and low limits, high and low rate-of-change limits	High and low limits, delay high and low, differential high and low limits, high and low rate-of-change limits
Rate-of-change alarm interval	**1 to 32 (number of sampling)**	1 to 15 (number of sampling)
Delay alarm function	Delay time: 1 to 3600 sec.	Delay time: 1 to 3600 sec.
Output relay	DO: 2, 4, 6points (optional), **Internal switch: 30points**	DO: 2, 4, 6points (optional)
Alarm no logging function	**On/Off selectable**	N/A
Alarm hysteresis	**Can be set for high/low alarm and differential high/low alarm (only for measurement channels) on measurement/MATH/external channels (0.0 to 5.0%)**	Can be set for only high/low alarm on measurement channels (0.5% fixed)
Message function		
Number of messages	**100 messages (incl. free 10 messages)**	8 messages
Characters	**32 characters (max.)**	16 characters (max.)
Message display direction	**Horizontal/Vertical selectable**	Horizontal only
Message addition function	**Messages can be added to data**	N/A
Batch function		
Batch name	**(Standard)** **40 characters (batch number 32 characters + lot number 8 characters)**	(Optional) 20 characters (batch number 16 characters + lot number 4 characters)
Batch comment	**50 characters x 3**	32 characters x 3
Text field	**8 fields, 50 characters (title 20 characters + 30 characters)**	N/A
Event action		
Number of event action	**40**	N/A (remote control only)
Event	Remote, USER key **Relay, Internal switch, Alarm, Timer, Match time**	Remote, USER key
Action	Memory start/stop, Event trigger, Alarm ACK, Math start/stop/reset, Manual sample, Snapshot, Message write, Time adjust, **Display scan rate change, Display data save, Event data save, Timer reset, SNTP time adjust, Display group change, Flag, Setting load**	Memory start/stop, Event trigger, Alarm ACK, Math start/stop/reset, Manual sample, Snapshot, Message write, Time adjust, Setting file load

Function/Specification	DX1000	DX100
Power supply		
Supply voltage	90 to 132, 180 to 250VAC	90 to 132, 180 to 250VAC
Rated supply frequency	50/60Hz	50/60Hz
Power consumption	PS 100VAC: 45VA max. (approx.) PS 240VAC: 60VA max. (approx.)	PS 100VAC: 45VA max. (approx.) PS 240VAC: 62VA max. (approx.)
Operating conditions		
Ambient temperature	0 to 50 deg C	0 to 50 deg C (when using FDD 5 to 40 degC)
Ambient humidity	20 to 80%RH (at 5 to 40 degC)	20 to 80%RH (at 5 to 40 degC)
Dust and water proof (front panel)	IEC529-IP65	IEC529-IP65, NEMA No.250 TYPE4 (except external icing test)
Others		
Insulation resistance	20M ohm (500VDC)	20M ohm (500VDC)
Withstanding voltage	**Between power supply terminal and ground: 2300VAC (1min.)** Between input terminal and ground: 1500VAC (1min.) Between each input terminal: 1000VAC (1min.) **Between contact output and ground: 1600VAC (1min.)** **Between remote control terminal and ground: 1000VDC (1min.)**	Between power supply terminal and ground: 1500VAC (1min.) Between input terminal and ground: 1500VAC (1min.) Between each input terminal: 1000VAC (1min.) Between contact output and ground: 1500VAC (1min.) Between remote control terminal and ground: 500VDC (1min.)
Clock accuracy	**+/- 10ppm**	+/- 100ppm
Dimension (mm)	144(W) x 144(H) x 229(D)	144(W) x 144(H) x 218(D)
Weight	2.9kg (approx.)	3.0kg (approx.)
Optional function	Alarm relay output (2, 4, 6 points) RS-232 communication RS-422A/485 communication **FAIL/status output** Clamp input terminal Desktop type Computation function Cu10, Cu25 RTD input/3-wire isolated RTD input 3-wire isolated RTD input Remote control 24VDC transmitter power supply (2, 4 loops) **Extra input type (Platinel, PR40-20, Pt50, etc.)** **Easy text entry (with/without remote terminal)** **USB interface (2 ports)** **Pulse input (including remote control and computation function)** **Calibration correction function**	Alarm relay output (2, 4, 6 points) RS-232 communication RS-422A/485 communication FOUNDATION Fieldbus FAIL/memory end output Clamp input terminal Desktop type Computation function Cu10, Cu25 RTD input/3-wire isolated RTD input 3-wire isolated RTD input 24VDC/AC power supply Remote control Batch function 24VDC transmitter power supply (2, 4 loops)
Application software	DAQSTANDARD for DXAdvanced (viewer, setting) DAQEXPLORER (DX Desktop, Remote Monitor)*1 DAQLOGGER (Logging)*1 DataBrowser (Data file search, Viewer)*2 *1 From 2006/04 *2 From 2006/07	DAQSTANDARD (viewer, setting) DAQEXPLORER (DX Desktop, Remote Monitor) DAQLOGGER (Logging) DataBrowser (Data file search, Viewer) DAQOPC (OPC server)

DX2000 vs. DX200 Comparison Table

Function/Specification	DX2000	DX200
Input Number of inputs	4, 8, 10, 20, 30, **40, 48ch**	4, 8, 10, 20, 30ch
Measurement interval	4, 8ch: 125ms, 250ms **(Fast sampling mode: 25ms)** 10, 20, 30, 40, 48ch: 1s, 2s, 5s **(Fast sampling mode: 125ms)**	4, 8ch: 125ms, 250ms 10, 20, 30: 1s, 2s
Type of inputs	DCV: 20, 60, 200mV, 2, 6, **1-5**, 20, 50V DCA: with external shunt resistor TC: R, S, B, K, E, J, T, N, W, L, U, **WRe** RTD: Pt100, JPt 100 DI(digital input for event recording)	DCV: 20, 60, 200mV, 2, 6, 20, 50V DCA: with external shunt resistor TC: R, S, B, K, E, J, T, N, W, L, U RTD: Pt100, JPt 100 DI(digital input for event recording)
Measurement accuracy (6V range)	**+/-(0.05% of rdg + 3digits)** **(Fast sampling mode: +/-(0.1% of rdg + 15 digits))**	+/-(0.1% of rdg + 2digits)
Burn out function	For TC and **1-5V** range	For TC range only
Low cut function	**For sqrt mode (0 to 5% of span)** **For 1-5V scaling mode (fixed to lower span limit)**	N/A
Display Display unit	TFT color LCD (10.4", 640x480dot)	TFT color LCD (10.4", 640x480dot)
Display span rate	15, 30sec, 1, 2, 5, 10, 15, 20, 30min, 1, 2, 4, 10hour/div (15sec/div are only for 4, 8ch model), **with display scan rate change function**	15, 30sec, 1, 2, 5, 10, 20, 30min, 1, 2, 4, 10hour/div (15, 30sec/div are only for 4, 8ch model)
Display group	**36 groups**	4 groups
Type of display	Trend/**Trend split/Circular**/ Numeric/Bar graph/4 panel display, Overview, Information, Zone display, Partial expanded display Historical trend	Trend/Numeric/Bar graph/4 panel display, Overview, Information, Zone display, Partial expanded display Historical trend
Scale display	Pointer flag, **Bar graph, Alarm set point, green band**	Pointer flag
Configuration	Panel keys Through communication, removable storage media (CF card) or **USB flash memory (optional)** **USB keyboard (optional)** **Remote control unit (optional)**	Panel keys Through communication or removable storage media (FD, Zip, ATA)
Memory Medium	Internal memory: Flash memory External media: CF card, **USB flash memory (optional)**	Internal memory: Flash memory External memory: 3.5-inch FD, Zip, ATA flash memory card
Internal memory capacity	**80MB (standard), 200MB (large)**	1.2MB
Data file name	**Configurable**	Data and time
Communication Medium	Ethernet (10Base-T), RS-422A/485 (optional), RS-232 (optional), **USB Rev1.1 host (optional)**	Ethernet (10Base-T), RS-422-A/485 (optional), RS-232 (optional)
Protocols (functions)	Serial: Yokogawa protocol, Modbus/RTU Ethernet: Yokogawa protocol, FTP server/client, Web server, E-mail, **Modbus/TCP, SNTP server/client, DHCP** **USB: USB keyboard, USB flash memory**	Serial: Yokogawa protocol, Modbus/RTU Ethernet: Yokogawa protocol, FTP server/client, Web server, E-mail

Function/Specification	DX2000	DX200
Computation		
Number of Math channels	DX2004/2008: **12ch** DX2010/2020/2030/2040/2048: **60ch**	DX204/208: 8ch DX210/220/230: 30ch
Operators	Basic four arithmetic, Square root, Absolute, Common logarithm, Exponential, Power, Relational, Logical operators, TLOG (average, max., min., P-P), **CLOG (average, max., min., P-P), Special operators (RESET, CARRY, PRE, HOLD)**, **Conditional operators**, Rolling Average	Basic four arithmetic, Square root, Absolute, Common logarithm, Exponential, Power, Relational, Logical operators, TLOG (average, max., min., P-P), Rolling Average
Others	Constants **(up to 60)**, Communication digital input **(up to 60)**, Remote status input (up to 8), **Pulse input summation, Internal switch input (up to 30), Relay status input (up to 36), Event flag (up to 8)**	Constants (up to 12), Communication digital input (up to 12), Remote status input (up to 8)
Report function	Report function (hourly, daily, hourly and daily, daily and weekly, daily and monthly) Average, Max., Min., Sum., **Instantaneous**	Report function (hourly, daily, hourly and daily, daily and weekly, daily and monthly) Average, Max., Min., Sum.
Alarm		
Types	High and low limits, delay high and low, differential high and low limits, high and low rate-of-change limits	High and low limits, delay high and low, differential high and low limits, high and low rate-of-change limits
Rate-of-change alarm interval	**1 to 32 (number of sampling)**	1 to 15 (number of sampling)
Delay alarm function	**Delay time: 1 to 3600 sec.**	N/A
Output relay	DO: 2, 4, 6, 12, 24 points, 22 points+Fail points (optional), **Internal switch: 30points**	DO: 2, 4, 6, 12, 24 points (optional)
Alarm no logging function	**On/Off selectable**	N/A
Alarm hysteresis	**Can be set for high/low alarm and differential high/low alarm (only for measurement channels) on measurement/MATH/external channels (0.0 to 5.0%)**	Can be set for only high/low alarm on measurement channels (0.5% fixed)
Message function		
Number of messages	**100 messages (incl. free 10 messages)**	8 messages
Characters	**32 characters (max.)**	16 characters (max.)
Message display direction	**Horizontal/Vertical selectable**	Horizontal only
Message addition function	**Messages can be added to data**	N/A
Batch function Batch name	**(Standard)** **40 characters (batch number 32 characters + lot number 8 characters)**	(Optional) 20 characters (batch number 16 characters + lot number 4 characters)
Batch comment	**50 characters x 3**	32 characters x 3
Text field	**8 fields, 50 characters (title 20 characters + 30 characters)**	N/A
Event action Number of event action	**40**	N/A (remote control only)
Event	Remote, USER key **Relay, Internal switch, Alarm, Timer, Match time**	Remote, USER key
Action	Memory start/stop, Event trigger, Alarm ACK, Math start/stop/reset, Manual sample, Snapshot, Message write, Time adjust, **Display scan rate change, Display data save, Event data save, Timer reset, SNTP time adjust, Display group change, Flag, Setting load**	Memory start/stop, Event trigger, Alarm ACK, Math start/stop/reset, Manual sample, Snapshot, Message write, Time adjust, Setting file load

Function/Specification	DX2000	DX200
Power supply		
Supply voltage	90 to 132, 180 to 250VAC	90 to 132, 180 to 250VAC
Rated supply frequency	50/60Hz	50/60Hz
Power consumption	PS 100VAC: 74VA max. (approx.) PS 240VAC: 100VA max. (approx.)	PS 100VAC: 75VA max. (approx.) PS 240VAC: 106VA max. (approx.)
Operating conditions		
Ambient temperature	0 to 50 deg C	0 to 50 deg C (when using FDD 5 to 40 degC)
Ambient humidity	20 to 80%RH (at 5 to 40 degC)	20 to 80%RH (at 5 to 40 degC)
Dust and water proof (front panel)	IEC529-IP65	IEC529-IP65, NEMA No.250 TYPE4 (except external icing test)
Others		
Insulation resistance	20M ohm (500VDC)	20M ohm (500VDC)
Withstanding voltage	**Between power supply terminal and ground: 2300VAC (1min.)** Between input terminal and ground: 1500VAC (1min.) Between each input terminal: 1000VAC (1min.) **Between contact output and ground: 1600VAC (1min.)** **Between remote control terminal and ground: 1000VDC (1min.)**	Between power supply terminal and ground: 1500VAC (1min.) Between input terminal and ground: 1500VAC (1min.) Between each input terminal: 1000VAC (1min.) Between contact output and ground: 1500VAC (1min.) Between remote control terminal and ground: 500VDC (1min.)
Clock accuracy	**+/- 10ppm**	+/- 100ppm
Dimension (mm)	288(W) x 288(H) x 226(D)	288(W) x 288(H) x 220(D)
Weight	6.0 to 7.3kg (approx.)	6.6 to 7.3kg (approx.)
Optional function	Alarm relay output (2, 4, 6, 12, 24 points) RS-232 communication RS-422A/485 communication VGA output **FAIL/status output** **FAIL + Alarm relay output 22 points** Clamp input terminal Desktop type Computation function Cu10, Cu25 RTD input/3-wire isolated RTD input 3-wire isolated RTD input Remote control Batch function 24VDC transmitter power supply (4, 8 loops) **Extra input type (Platinel, PR40-20, Pt50, etc.)** **Easy text entry (with/without remote terminal)** **USB interface (2 ports)** **Pulse input (including remote control and computation function)** **Calibration correction function** **External input function**	Alarm relay output (2, 4, 6, 12, 24points) RS-232 communication RS-422A/485 communication FOUNDATION Fieldbus VGA output FAIL/memory end output Clamp input terminal Desktop type Computation function Cu10, Cu25 RTD input/3-wire isolated RTD input 3-wire isolated RTD input 24VDC/AC power supply Remote control Batch function 24VDC transmitter power supply (4, 8 loops)
Application software	DAQSTANDARD for DXAdvanced (viewer, setting) DAQEXPLORER (DX Desktop, Remote Monitor)*1 DAQLOGGER (Logging)*1 DataBrowser (Data file search, Viewer)*2 *1 From 2006/04 *2 From 2006/07	DAQSTANDARD (viewer, setting) DAQEXPLORER (DX Desktop, Remote Monitor) DAQLOGGER (Logging) DataBrowser (Data file search, Viewer) DAQOPC (OPC server)