# DX200
# /S123 Expandable Input Option

The DX200 /S123 expandable input option supports up to 200 additional input channels from external hardware that can be used in conjunction with built in measurement channels, for a total of up to 230 channels. Specify /S123 in the option code of DX210, DX220, or DX230 models to order. /S123 specifications are as follows:

## Ordering information

Option code:  /S123

Base models:
  /S123 can only be specified on DX210, DX220 or DX230 base models.

Media:
  Only CF card or ZIP disk removable media can be specified. Floppy disk media is not available.

Communications:
  /C2 RS-232C or /C3 RS-422/485 serial communication option must also be specified.

Computation option:
  /M1 Math is not required for /S123. Math is specified when computation capability is required or to hold up to 30 more external input channels.

## Expandable input channels

General functions:
  Logical external input channels are dedicated for assignment to serial communication data channels. These logical channels read data from external hardware using MODBUS RTU slave protocol. Data for these logical channels can also be written from PC applications using communication commands.
  When /S123 is specified, 170 logical input channels are provided. When /M1 Math option is also specified, each of the 30 math channels can be used to hold additional external MODBUS input values, providing a total capacity of 200 external input channels to the DX200.

Maximum channel numbers:

| DX210 + /S123 + /M1 (math): | 210ch total |
| --- | --- |
| Measurement channels | 10 |
| Expanded channels | 170 maximum |
| Math channels | 30 |
| DX220 + /S123 + /M1 (math): | 220ch total |
| Measurement channels | 20 |
| Expanded channels | 170 maximum |
| Math channels | 30 |
| DX230 + /S123 + /M1 (math): | 230ch total |
| Measurement channels | 30 |
| Expanded channels | 170 maximum |
| Math channels | 30 |

Channel number assignment:

| Measurement channels | 001 to 030 |
| --- | --- |
| Expanded channels | 101 to 270 |
| Math channels | 031 to 060 |

Channel mapping:
  Expanded channel can feed data to Math channel.
    Example; 031=(101+102) / 103
  Expanded channel can also be assigned to TLOG computations.
    Example; TLOG.AVE(101)
  Expanded channel cannot be assigned to Report computation.
    Example; R01 source = 101 is not available.

Effective bits and range:
  170ch., -30000 to 30000

Decimal points:
  Selectable within above range

Alarm setting:
  Up to 4 levels/ch. High/Low, Delay-High/Delay-Low

Alarm hysteresis:
  Off, 0.5% of full span ("off" to calculated channels)

## Display groups for expanded channels

Display group:
  Up to 23 groups, 10ch per group.

Display group ON and OFF:
  Available individually.

Display group name:
  Up to 16 characters

Combination of channels in one display group:
  Assigned by channel numbers.
  Example; 001, 003-005, 031, 101- 105

## Storage functions

Internal memory:  5MB

Removable storage media:
  ZIP drive (100MB), compact flash memory card

Memory data size:
  Display data file;

| Measurement data | 4bytes/record |
| --- | --- |
| Expanded channel | 4bytes/record |
| Math channel | 8bytes/record |

  Event data file;

| Measurement data | 2bytes/record |
| --- | --- |
| Expanded channel | 2bytes/record |
| Math channel | 4bytes/record |

Sampling times:

Maximum sampling times is calculated by the following formula

Display data file only;

5,000,000 / (measurement channel number x 4 + Expanded channel number x 4 + Math channel number x 8 + 8) bytes

Event data file only;

5,000,000 bytes / (measurement channel number x 2 + Expanded channel number x 2 + Math channel number x 4 + 8) bytes

Display data file when DISP + EVENT mode selected;

3,750,000 / (measurement channel number x 4 + Expanded channel number x 4 + Math channel number x 8 + 8) bytes

Event data file when DISP + EVENT mode selected;

1,250,000 / (measurement channel number x 2 + Expanded channel number x 2 + Math channel number x 4 + 8) bytes

Note:

Expanded channels' data is not saved in the Manual Sampling file (.DMN).

Expanded channels' data is not saved in the TLog Data file (.DTG)

Example; when 31=TLog.SUM(101) computation is executed, the result of CH31 is saved into the TLog Data file, but the instant value of CH101 is not saved into the TLog Data file.(CH101 is saved by assigning to Math channel)

Number of TLog data saved in the TLog Data file (.DTG); 30

Number of Manual Sample data saved in the Manual Sampling file (.DMN); 5

Number of Report data saved in the Report file; 5

## Media FIFO functions

General functions:

When the removable media becomes full or the number of files in the folder reaches 1000, the oldest file will be deleted and the latest data file will be saved.

Specifications:

DX media;

Functions on ZIP or ATA flash media only

Effected data files:

Only files in the specified folder will be automatically deleted by the FIFO function.

If the folder name is changed, data files saved before the folder name change will not be deleted.

Note:

No warning will be given even if the remaining capacity on the media reaches less than 10% of total capacity

## MODBUS communications with /C2, /C3 option

Operation mode:

RTU master or RTU slave

Communications:

/C2 (RS-232-C) or /C3 (RS-422-A. RS-485) serial communication option is mandatory

RTU slave function:

Output data of measurement channels, Math channels and alarm statuses.

| Code | Function | Operation |
|---|---|---|
| 3 | Reading the hold register (4xxxx). | The master device can read the communication input data of the DX that are written to the communication input data using function code 6 or 16. |
| 4 | Reading the input register (3xxxx) | The master device loads the data of measurement, Math, and expanded channels of DX. |
| 6 | Writing to the hold register (4xxxx) | The master device writes to the communication input data of the DX. |
| 8 | Loop back test | Supports message return. |
| 16 | Writing to the hold register (4xxxx) | The master device writes to the communication input data of the DX. |

RTU slave "input" register assignment:

| Input register | Data | Data type |
|---|---|---|
| 30001 to 30030 | Measured data from 001 to 030ch. | 16-bits signed integer |
| 31001 to 31030 | Alarm status of measurement channels. | 16-bits unsigned integer. 1 resister per 1 channel. Order of A2A1A4A3 |
| 32001 to 32060 | Math data from 031 to 060ch. | 32-bits signed integer Order of upper to lower. |
| 33001 to 33030 | Alarm status of Math channels (031 to 060). | 16-bits unsigned integer. 1 resister per 1 channel. Order of A2A1A4A3 |
| 34001 to 34170 | Data of expanded channels (101 to 270ch). | 16-bits signed integer |
| 35001 to 35170 | Alarm status of expanded channels (101 to 270ch). | 16-bits unsigned integer. 1 resister per 1 channel. Order of A2A1A4A3 |
| 39001 to 39008 | Time stamp | Year/month/date/time/minute/second/m-second/summer time |

RTU slave "hold" register assignment:

| Hold register | Data | Data type |
|---|---|---|
| 40001 to 40030 | Communication input data (C01 to C30) | 16-bits signed integer |
| 41001 to 41170 | Data of expanded channels (101 to 270ch). | 16-bits signed integer |

Note:

Register numbers, 34001 to 34170 are measured data for expansion channels. Use these register numbers for reading data. Register numbers, 41001 to 41170 are for writing to expansion channels/ When reading the register numbers, written data can be read.*

* : When value of range is over, errors are given.

Error code for data of +30000 or more: 7FFFH

Error code for data of -30000 or less: 8001H

RTU master function:

Data acquisition of 8 packet groups. The continuous register that is same type of data in a slave group can be registered in single group.

| Code | Function | Operation |
|------|----------|-----------|
| 3 | Reading the hold register. (4xxxx, 4xxxxx). | The DX reads the hold register data of another device and makes it either the communication input data (C01 to C30) or expanded channel data (101 to 270) |
| 4 | Reading the input register. (3xxxx, 3xxxxx). | The DX reads the input register data of another device and makes it either the communication input data (C01 to C30) or expanded channel data (101 to 270) |

Data types RTU master can read:

| DX | Data type of DX | Data type DX can read |
|----|-----------------|------------------------|
| Expanded channel data 101 to 270 | 16-bits signed integer | INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L |
| Communication input data C01 to C30 | 32-bits floating point data | INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L |

| | |
|---|---|
| INT16; | 16-bits signed integer |
| UINT16; | 16-bits unsigned integer |
| INT32_B; | 32-bits signed integer, upper/lower |
| INT32_L; | 32-bits signed integer, lower/upper |
| UINT32_B; | 32-bits unsigned integer, upper/lower |
| UINT32_L; | 32-bits unsigned integer, lower/upper |
| FLOAT_B; | 32-bits floating-point data, upper/lower |
| FLOAT_L; | 32-bits floating-point data, lower/upper |

Communication intervals:

125ms, 250ms, 500ms, 1s, 2s, 5s, 10s

Command timeout:

125ms, 250ms, 500ms, 1s, 2s, 5s, 10s, 1min

Retrials:

Off, 1, 2, 3, 4, 5, 10, 20 times

MODBUS master auto-recovery:

Off, 1min, 2min, 5min, 10min, 20min, 30min, 60min

## Time synchronization (SNTP) functions

SNTP Server Function:

The DX can operate as an SNTP server.

The time resolution of the implemented SNTP server is 15.625 milliseconds.

SNTP Client Function:

The time on the DX can be synchronized to the time of an SNTP server using the SNTP client function. Time synchronization can be executed using the SNTP client during memory sampling

"Periodic query" and "manual query" are available as methods to query the time on an SNTP server.

Periodic query;

The time is queried on the SNTP server at a specified time interval (off, 1h, 8h, 12h, or 24h)

In periodic query, corrections that exceed $\pm 10$ minutes are not executed.

Manual query;

The time is queried on the SNTP server by operating the keys.

## Daylight savings time (DST) functions

General functions:

Automatically calculates Daylight Savings Time change. Transition to Daylight Savings Time and to Standard Time is automatically calculated and adjusted for each seasonal time change.

Setting parameters:

Month;

Month at which the summer/winter time adjustment is made. Select a value between 1 and 12.

Day order;

The $n^{th}$ day of the week in a given month (for example, the second Sunday) when the summer/winter time adjustment is made.

Select 1, 2, 3, 4, or last.

Weekday;

Day of the week at which the summer/winter time adjustment is made.

Select Mon, Tue, Wed, Thu, Fri, Sat, or Sun.

## Expanded text messages

Pre-set text messages:

There are 7 groups (group 1 to 7) for pre-set messages with 8 messages per group. Each message has up to 16 characters.

Free text messages:

There are eight types of free text messages, with 16 characters each. Free text messages can be written using keys, communication commands and via Web.

Message types and writing enable/disable:

| Message type | Key operation | Comm. command | Remote Input | USER key | Web |
|--------------|---------------|---------------|--------------|----------|-----|
| Gr 1 to 6 | ✓ | ✓ | | | |
| Gr 7 | ✓ | ✓ | ✓ | ✓ | |
| Free Message | ✓ | ✓ | | | ✓ |

System messages:

Power failure message, display rate change message

## Automatic monitor window recovery functions

General function:

Jump to user-defined default monitor display after a pre-set time.

Recovery Time:

1min, 2min, 5min, 10min, 20min, 30min, 1h

Note:

This function is effective for monitor window only

## Logarithmic scale and exponential display functions
General functions:
A logarithmic scale for Trend Display pen scales (common logarithm) can be selected. Process values are expressed as an exponent.
General specifications:.
Input range;
DC voltage input range of measurement channels (001 to 030) only
Scale setting span;
1.0E-15 to 1.0E+15.
Maximum exponential span;
Up to 15 decades
Number of mantissa digits;
2 or 3 digits
Alarm setting;
H/L and Delay H/delay L alarm only
Set alarm values using voltage values.
Alarm hysteresis;
Fixed at 0%.
Note:
Logarithmic scale and exponential display mode can be assigned to measurement channels only; this mode cannot be assigned to Expanded-input logical channels. Log-mode measurement channels cannot be used in math expressions with /M1 option. Only non-log measurement channels can be used in math expressions.

## Simulator functions (with /R1 Remote option)
Freeze:
Contact input or Communication command freezes all display functions including clock. Clock resumes correct time on release.
Memory clear:
Contact input or Communication command clears the internal memory and the displayed waveform. Configuration settings are not affected.
Turning ON/OFF the time clock display:
Select ON/OFF at Setup mode.

## Bar scale and scale band display functions
Trend bar scale display:
Users can choose a color bar or color pen pointer in the Trend Display scale. Only the first channel specified in the display group settings can be displayed in the scale when color bar is selected.
Scale band display:
In the Trend Display scale and Bar Display, a "normal zone" scale band can be displayed in the specified color.
Banding area;
Inside or outside specified positions.
Setting of banding positions;
0 to 100% of range.
Up to 1% width can be set.

## Alarm pointer display function
General functions:
Displays alarm pointers on the scales and bar graphs of the trend window.
Specifications:
Colors of alarm pointers are as follows;.

| Alarm level | Color |
|---|---|
| Level 1 | Red |
| Level 2 | Orange |
| Level 3 | Orange |
| Level 4 | Red |

The display colors will not change even if alarms occur.
Alarm types displayed with alarm marks;
Upper-limit alarm (H)
Lower-limit alarm (L)
Delay upper-limit alarm (T)
Delay lower-limit alarm (t)

## Display rate switching functions
General functions:
Two speed time/div is available to switch by key operations and remote input. Secondary setting time/div speed is effective only on real-time monitor screen.
Historical trends show data with the primary time/div setting.
Special condition for DX200 models set to Horizontal Trend Display mode:
With one pen scale, digital OFF, the displayed trend-scale is 19.5 divisions.
With one pen scale, digital ON, the displayed trend-scale is 15 divisions.
With combinations of total channels and maximum math computations configured for some DX200 models, past trend trace data may be less than the full screen 19.5 or 15 divisions as described above. The minimum trend trace data will always be at least 13 divisions of recent trend data once the unit has initially recorded the information. No data is lost in the archived data files. This may be noticed when switching screens or powering off and on the unit.

## Addition of waveform colors
Waveform color:        Added Black color
The background of the historical trend window:
Changed to a color that allows recognition of the black color.

## Internal switch functions

General functions:

Alarms can activate remote control functions without using alarm relays.

Specifications:

Number of Internal Switches;

30 (S01 to S30) selectable in alarm setting menu

Functions;

Functions that can be assigned to internal switches are as follows.

| Function | Menu | FUNC key |
|---|---|---|
| Memory start/stop | Memory start/stop | Memory (DX100) Start/Stop(DX200) |
| Event data trigger | Trigger | Trigger |
| Alarm ACK | AlarmACK | AlarmACK |
| Math start/stop | MathStart/Stop | Math |
| Math reset | MathReset | Math rst |
| Manual sample | ManualSample | M.sample |
| Snap shot | SnapShot | Snapshot |
| Message writing | Message | Message |
| Screen freeze (Simulation) | Freeze | Freeze |
| Memory clear (Simulation) | Memory Clear | Clear |
| Display rate change | Rate Change | Change |

## Addition of TC and RTD input types

TC:     Kp vs Au7Fe, PLATINEL, PR40–20, NiNiMo, WRe3 - 25, W/WRe26, Type N (AWG14)

RTD (without /N1 option):

JPt50, Ni100 (SAMA), Ni100 (DIN), Ni120, J263*B, Cu53, Cu100

RTD (with /N1 option):

JPt25

The newly input types are only selectable with DX200 measurement channels (001 to 030).

## Increased number of characters for optional math expressions

Number of characters for each math expression:

Up to 120 characters

Number of Stack (number of channels and constants used in arithmetic expressions):

Up to 35

Number of constants:

Up to 30

## PC software

Configuration, viewer and data conversion:

DAQStandard for /S123 is provided as standard accessory

Data logging and monitoring:

Gate DX/S123 (sold separately) is required to feed the data of this model to DAQLogger.

## Other notes for this model

Partial trending function is not available.

/CF1 (FOUNDATION Fieldbus) option cannot be specified with this option.