

DCS — 100A OPTION**DCS-101A****INSTRUCTION MANUAL**
(For Optional Arithmetic Operation)

Thank you for purchasing KYOWA's product DCS-100A DYNAMIC DATA RECORDING SOFTWARE (For Optional Arithmetic Operation).

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

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

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NOTATIONS USED IN THE INSTRUCTION MANUAL

For your convenience, the following notes and memos are stated in this Instruction Manual to attract customer's attention to informative reference items when using the DCS-100A Dynamic Data Recording Software (hereinafter referred to as the DCS-100A) for optional arithmetic operations.

Example:

NOTE

Describes essential instructions for handling the DCS-100A.

MEMO

Describes reference information for handling the DCS-100A.

ESSENTIAL PRECAUTIONS FOR USING THE DCS-100A

NOTE

Do not set your PC to the following state. Or, the DCS-100A may not operate properly.

- Screen saver is set to activate.
- Power consumption function including System standby is set to activate.
- Application software such as virus check software, etc. is set to activate on the way.
- PC is receiving access from the network. Or the PC is accessing to the network.
- Font size is set to other than normal (Small).

1. OUTLINE

The DCS-100A is dynamic data recording software that, by controlling KYOWA's dynamic measuring instrument, is designed to record data as well as reproduce data.

This Instruction Manual describes specifications and operating method of the DCS-100A optional function. Arithmetic operations described in this Instruction Manual are shown below.

Simultaneous Processing Arithmetic Operations Function

Capable of monitoring and recording arithmetic operations data (result data of arithmetic expressions) and measured data at the same time.

Capable of setting arithmetic functions such as rosette functions to arithmetic expressions.

1-1 TARGET MEASURING INSTRUMENT

The DCS-100A optional function can only be used when controlling the following measuring instruments. For details of measuring instruments, see "DCS-100A Dynamic Data Recording Software Instruction Manual (For EDS-400A operation), (For EDX-100A operation), or (For PCD-300 Series operation)." (Suppose the EDX-100A as the control target measuring instrument, this Instruction Manual describes operations of the DCS-100A optional function.)

Measuring Instrument	Instruction Manual
EDX-10A	[FOR EDX-10A OPERATION]
EDX-100A	[FOR EDX-100A OPERATION]
EDX-200A	[FOR EDX-200A OPERATION]
EDX-3000A/B	[FOR EDX-3000A/B OPERATION]
EDX-5000A	[FOR EDX-5000A OPERATION]
EDS-400A	[FOR EDS-400A OPERATION]
UDAS-100A	[FOR UDAS-100A OPERATION]
UCAM-550A	[FOR UCAM-550A OPERATION]
NTB-500A	[FOR NTB-500A OPERATION]
PCD-300 series	[FOR PCD-300 SERIES OPERATION]
PCD-400A series	[FOR PCD-400A SERIES OPERATION]
CTRS-100A	[FOR CTRS-100A OPERATION]

1-2 OPERATING ENVIRONMENT

Operating environment of the DCS-100A optional function is described in the following.

CPU	Core i5 2GHz or more
OS	Windows 8.1, Windows 10, Windows 11 32/64bits (Windows 11 is 64bits Only)
Memory	For 32bits OS, 2 GByte or more For 64bits OS, 4 GByte or more.
Hard Disk	Residual capacity: 10 MByte or more (Recording data file size is not included.)
Display	Resolution: 1024 × 768 dots or more Color: Full color or more
Disk unit	CD-ROM drive

*For the 64-bit OS, use the WOW64 system.

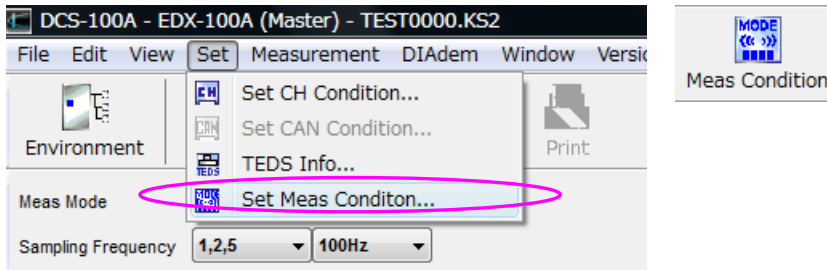
*For recording moving images and conducting arithmetic operations simultaneously, you need Core i5 3GHz or higher CPU.

NOTE

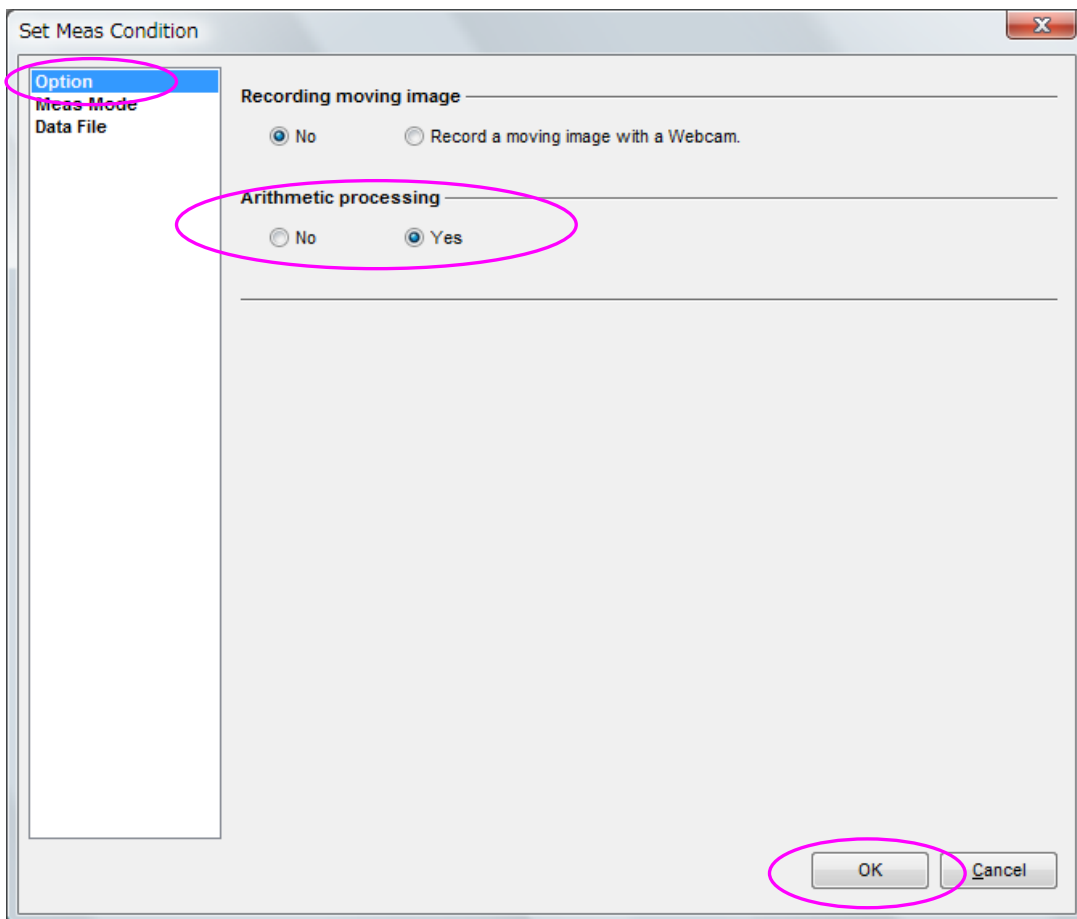
PC satisfying the above conditions may not guarantee operations of all the instrument models.
In addition, due to PC's performance, error may occur as to display more windows than required.

2. OPERATIONS FOR ADDING OPTIONAL FUNCTION

- (1) Point to **Set** on the menu bar and select **Set Meas Condition...** or select the **Meas Condition** icon from the toolbar to open the **Meas Condition** window.



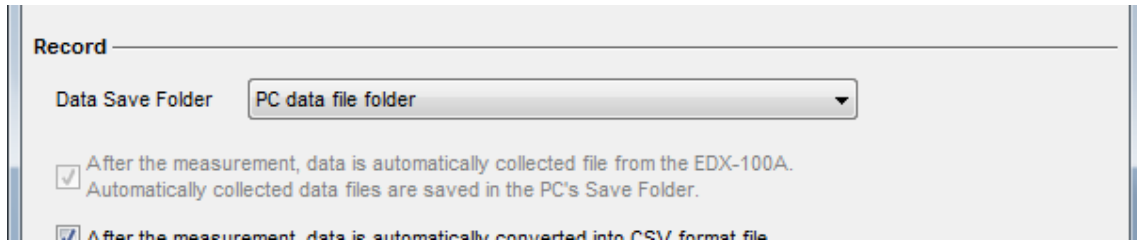
- (2) Check the target optional function in the **Option** item on the **Meas Condition** window, click the **OK** button and close the window.



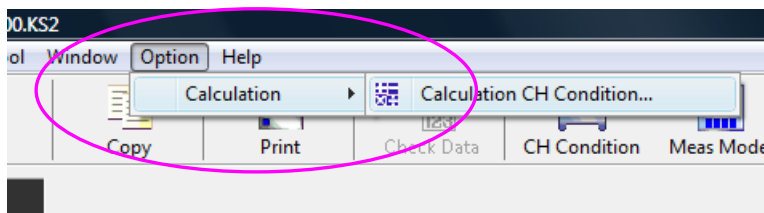
NOTE

For the EDX-100A, EDS-400A, and PCD-300 series, note the following restrictions.

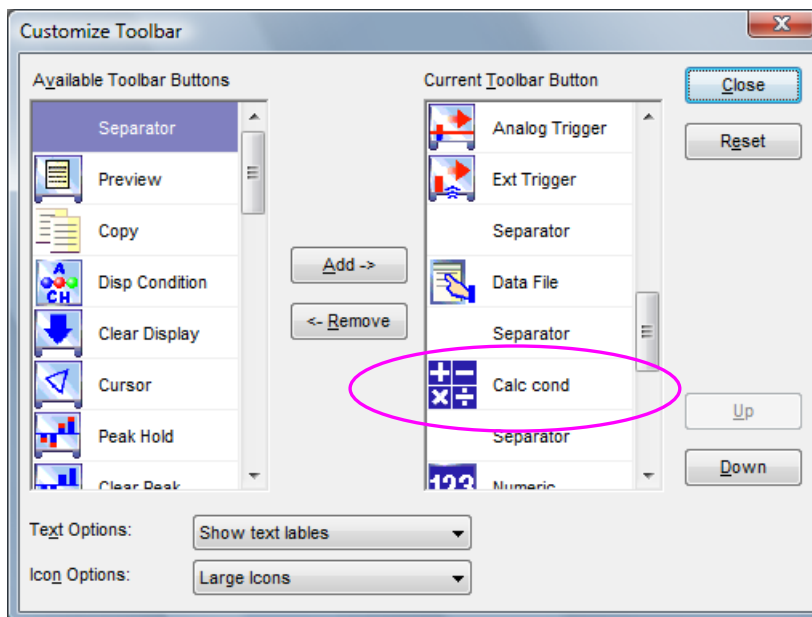
- Do not use the optional functions at the same time.
- Only when the **Data Save Folder** in the **Record** item on the **Environment** window is set to **PC data file folder**, the DCS-100A optional functions can be used.



- (3) An optional function menu checked on the **Meas Condition** window is added to the main menu.



A toolbar button of the checked optional function is added to the toolbar also.



3. SIMULTENOUS PROCESSING ARITHMETIC OPERATIONS

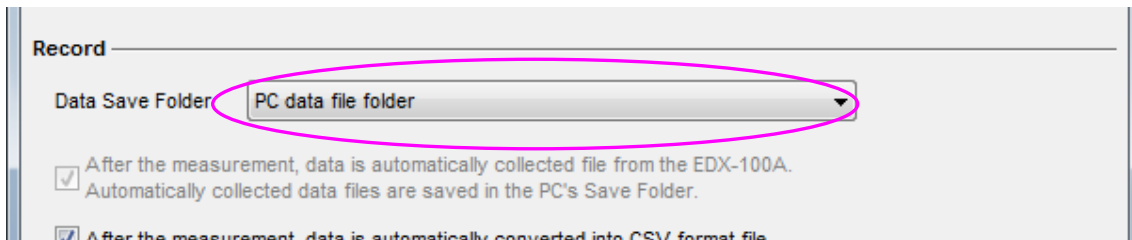
By setting the result data of the preset arithmetic expressions as calculation CH data, it is capable of monitoring and recording the result data and measured data at the same time.

Capable of setting maximum 32 calculation CHs.

The calculation CH data and measured data is saved in the same file.

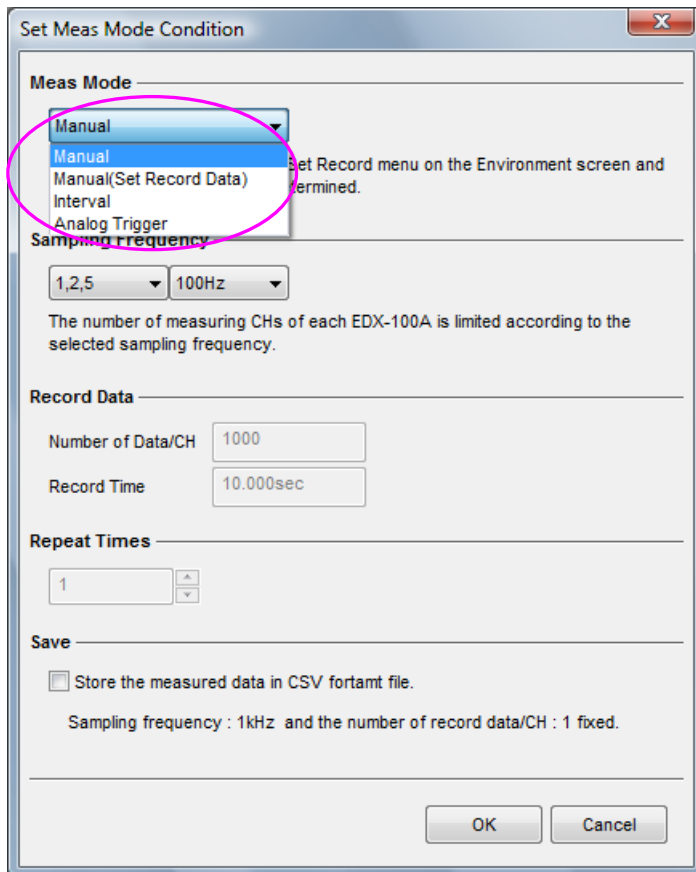
3-1 RESTRICTIONS

- Only when the **Data Save Folder** in the **Record** item on the **Environment** window is set to **PC data file folder**, the DCS-100A optional functions can be used.

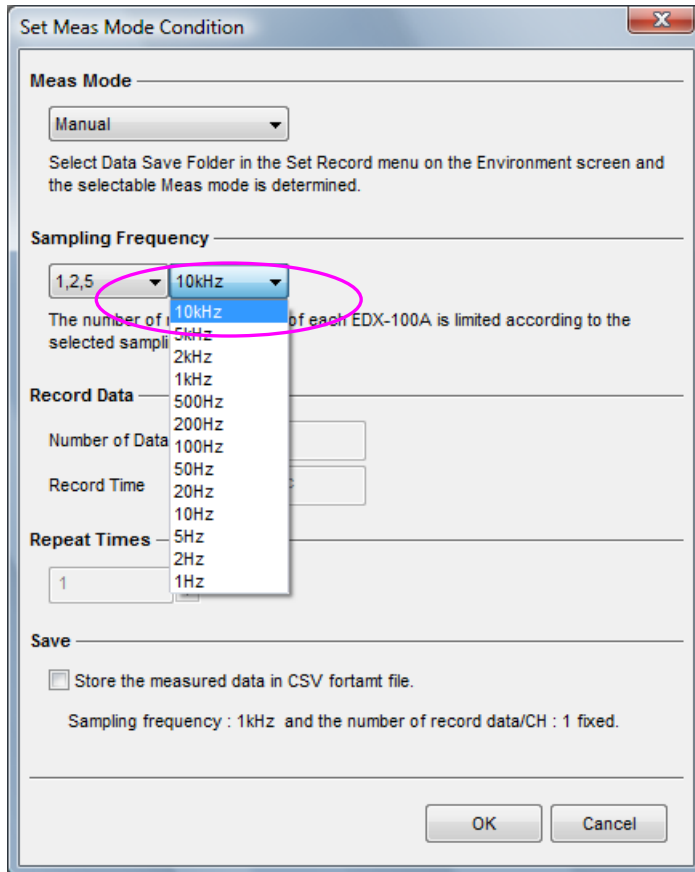


- Selectable **Meas Mode** when using the simultaneous processing arithmetic operations function are **Manual**, **Manual (Set Record Data)**, **Interval**, and **Analog Trigger**.

Even when the **Meas Mode** is **Manual** or **Manual (Set Record Data)**, recording cannot be paused by pressing a **REC/PAUSE** button on the Meas Operation Panel during recording.



- Selectable **Sampling Frequency** when conducting arithmetic operations is up to 10 kHz.

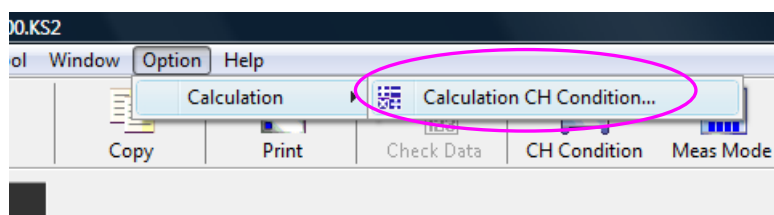


NOTE

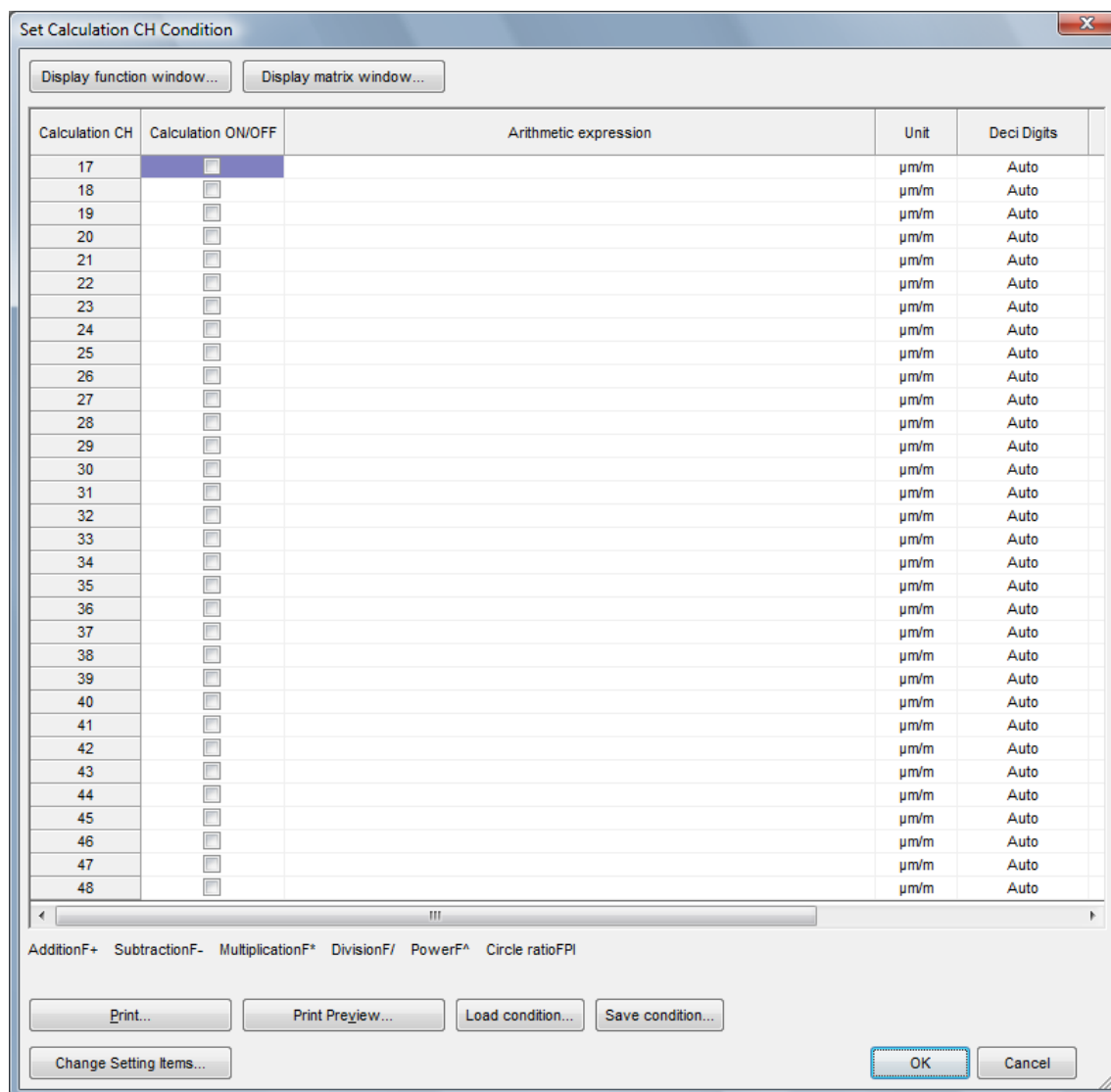
According to the control target measuring instruments, the actual selectable sampling frequency may be less than 10 kHz.

3-2 CALCULATION CH CONDITION WINDOW DISPLAYING METHOD

- (1) Point to **Option** on the menu bar, **Calculation** and click the **Calculation CH Condition...**
Or select the **Calc cond** icon from the toolbar.



(2) Following **Set Calculation CH Condition** window appears.



- Print...**..... Print out **Set Calculation CH Condition** window.
- Print Preview...**..... Display the print image of the **Set Calculation CH Condition** window.
- Change Setting Items...**..... Setting items on the window are added, removed, or sorted.
- Display function window...**..... Display the **Calculation Function** window describing the selectable calculation functions to the arithmetic expressions.
Using the **Calculation Function** window enables you to input the calculation functions easily.
- Display matrix window...**..... Display the **Matrix** window.
Using the **Matrix** window enables you to input determinants easily.
- Load condition...**..... Load the pre-saved **Calculation condition file**.
- Save condition...**..... Save the current calculation conditions as the **Calculation condition file** to the PC.
- OK**..... Determine the set contents and close the **Set Calculation CH Condition** window.
- Cancel**..... Cancel the set contents and close the **Set Calculation CH Condition** window.

3-3 SETTING CALCULATION CH CONDITIONS

(1) Calculation CH

Displays the **Calculation CH**.

Calculation CH is determined for every control target measuring instrument as follows.

- For the EDS-400A and PCD-300 series
The number of connected measuring instruments $\times 4 + 1$
- For the EDX-100A
 $[(\text{Last measurement CH No.} - 1) \div 16 + 1] \times 16 + 1$

Calculation CH	Calc
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	

(2) Calculation ON/OFF

Put a check mark on the calculation target CH box.

The checked calculation CHs become valid. After measuring the measurement CHs, automatically calculates the checked calculation CHs (calculation of the arithmetic expressions).

Be sure to input the Arithmetic expressions to the checked calculation target CHs.

Calculation ON/OFF
☒
☒
☒
☒
☒
☒
☒
☒
☒
☒

(3) Arithmetic expression

Input Arithmetic Expression within 200 characters. Double-click the desired **Calculation CH** item or press the **SPACE** key to be in input available state.

Input the desired arithmetic expression.

Arithmetic expression
CH01+CH02
SIN(CH05)
COS((CH02+CH03)*0.5)
CH05
SQR(CH05+CH08)+EXP(CH02)
CH07/1000

- The usable expression to the **Arithmetic expression** is arithmetic expression using such as Measurement CH, Calculation CH, Operator, and Calculation function.

(See the following table.)

Available CH No.	Measurement CH or calculation CH
Operator +, -, *, /, ^, (,)	+: Addition -: Subtraction * Multiplication /: Division ^: Power Parenthesis (): Specify calculation priority
Calculation Function	See "3-4 CALCULATION FUNCTION."

- Place the cursor to the target arithmetic expression and press the **DEL** key to clear it.
- Sample of the arithmetic expression

Example 1: $CH02 - (CH01 + CH03)/2$

Subtract the average value of the measurement CH01 data and CH03 data from the measurement CH02 data.

Example 2: $CH02 * 2/2.05 + 500$

After compensating the gage factor to the measurement CH02 data obtained from the strain gage with gage factor 2.05, add 500 ($\mu\text{m/m}$).

For gage factor compensation, coefficient setting function of converting engineering value is more easy to use.

- When the entered arithmetic expressions are incorrect, they are displayed in red as follows.

In the following example, when the measurement CHs are from CH01 to CH08, the incorrect arithmetic expressions are displayed in red. That is because in the arithmetic expression of the calculation CH17, “CH70” is incorrect CH No., in the arithmetic expression of the calculation CH19, “)” is needed, and in the arithmetic expression of the calculation CH21, no arithmetic expression is entered.

Calculation CH	Calculation ON/OFF	Arithmetic expression
17	☒	CH01+CH70
18	☒	SIN(CH05)
19	☒	COS((CH02+CH03)*0.5
20	☒	CH05
21	☒	
22	☒	CH07/1000
23	☒	
24	☒	

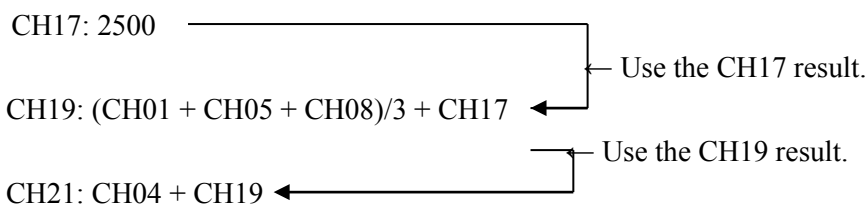
NOTE

When using the calculation CHs in the **Arithmetic expression**, use the calculation CHs (source CH) having small CH No. than that of the destination CH.

After measuring the measurement CHs, the arithmetic expressions of the checked calculation CHs are calculated in due order from the small CH No. as follows.

(Following CH17, CH19, and CH21 are calculation CHs.)

Example



(4) Unit

Set unit according to calculation result.

Double-click the target calculation CH or press the **SPACE** key to display the following Set Unit window. Select the relevant unit from the unit list.

Set Unit CH17

KS1/KS2 Format unit

☒ $\mu\text{m/m}$	☐ e	☐ mV	☐ V	☐ mA	☐ A
☐ mm	☐ cm	☐ m	☐ °C	☐ °F	☐ gf/cm ²
☐ kgf/mm ²	☐ kgf/cm ²	☐ kgf/m ²	☐ mmHg	☐ kPa	☐ MPa
☐ g	☐ kg	☐ ton	☐ gf	☐ kgf	☐ tonf
☐ N	☐ kgf·mm	☐ kgf·cm	☐ kgf·m	☐ Nm	☐ OHM
☐ kOHM	☐ MOHM	☐ %	☐ dB	☐ ppm	☐ cm/s
☐ m/s	☐ m/min	☐ km/h	☐ Hz	☐ kHz	☐ MHz
☐ °	☐ deg	☐ rad	☐ kN	☐ kNm	☐ kW
☐ rpm	☐ cm/s ²	☐ m/s ²	☐ G	☐ daN	☐ mile/h
☐ *100kpa	☐ deg/s	☐ msec	☐ sec	☐ min	☐ hour
☐	☐	☐			

OK Cancel

User's unit

MEMO

If the relevant unit is not on the unit list, users can register up to 3 original units (user's unit). At this time, set the user's unit on the **Environment** window in advance.

(5) Deci Digits

Set the number of digits below decimal point of numeric value display.

Select the relevant item from the list box.

On selecting the **Auto**, the numeric having 5 numbers with no sign is automatically displayed.

Example) -100.123 → -100.12

5001.57 → 5001.6

For details, see separate volume of the “DCS-100A DYNAMIC DATA RECORDING SOFTWARE INSTRUCTION MANUAL (For Common Operation).”

Deci Digits

Auto

Auto

0 (*****)

1 (*****)

2 (*****)

3 (*****)

4 (*****)

5 (*****)

6 (*****)

7 (*****)

8 (*****)

(6) CH Name

Input **CH Name** comment strings within 40 characters.

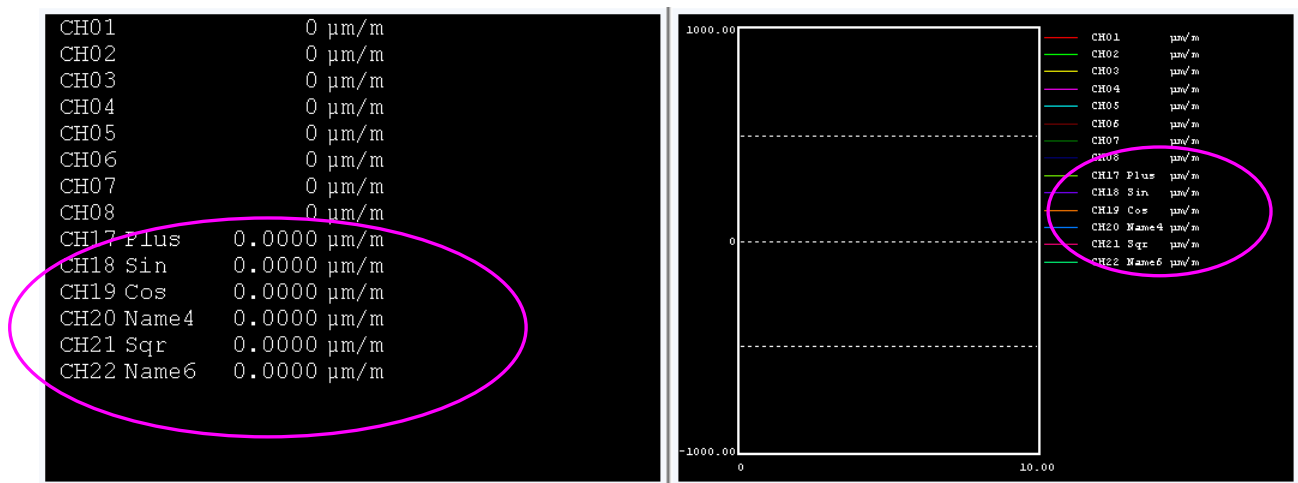
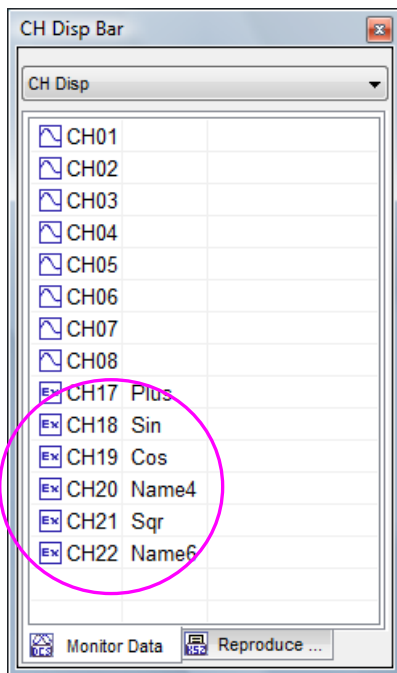
Double-click the target calculation CH or press the **SPACE** key to be in input available state. Input desired comment character string.

Place the cursor to the target **CH Name** and press the **DEL** key to clear it.

CH Name					
Plus					
Sin					
Cos					
Name4					
Sqr					
Name6					

After setting the items from (1) to (6), click the **OK** button and close the **Set Calculation CH Condition** window.

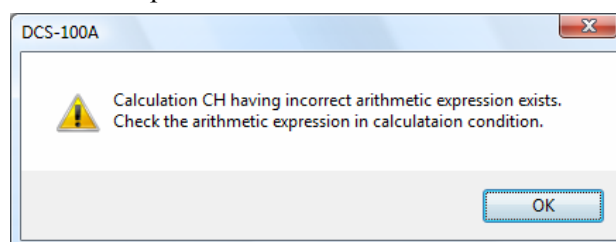
Calculation CHs are added to the **CH Disp Bar** on the main window. Then, calculation CHs can be displayed on the numerical window and graphical window.



NOTE

When the incorrect arithmetic expressions exist in the checked **Calculation CH** and if the **OK** button is clicked, the following message appears.

Correct the incorrect arithmetic expressions.



3-4 CALCULATION FUNCTIONS

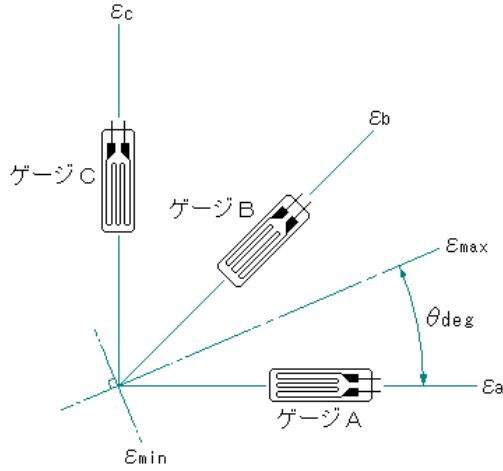
Usable calculation functions to the arithmetic expressions are described below.

- **SQR (nn)** Square Root Function
Obtain square root of the specified argument.
Ex.) SQR (CH01) When the CH01 data is 8.78, the calculation result shall be 2.9631.
- **ABS (nn)** Absolute Function
Obtain absolute value of the specified argument.
Ex.) ABS (CH01) When the CH01 data is -8.78, the calculation result shall be 8.78.
- **SIN (nn)** SIN Function
Obtain sine of the specified argument.
The argument is in radians.
Ex.) SIN (CH01) When the CH01 data is 8.78, the calculation result shall be 0.69102.
- **COS (nn)** COS Function
Obtain cosine of the specified argument.
The argument is in radians.
Ex.) COS (CH01) When the CH01 data is 8.78, the calculation result shall be -0.79923.
- **TAN (nn)** TAN Function
Obtain tangent of the specified argument.
The argument is in radians.
Ex.) TAN (CH01) When the CH01 data is 8.78, the calculation result shall be -0.75200.
- **ASIN (nn)** ASIN Function
Obtain arcsine of the specified argument.
The return value is in radians.
When the argument is -1 or less, the argument is -1.
When the argument is +1 or more, the argument is +1.
EX.) ASIN (CH01) When the CH01 data is 0.5, the calculation result shall be -0.52360.
- **ACOS (nn)** ACOS Function
Obtain arccosine of the specified argument.
The return value is in radians.
When the argument is -1 or less, the argument is -1.
When the argument is +1 or more, the argument is +1.
EX.) ACOS (CH01) When the CH01 data is 0.5, the calculation result shall be 1.0472.
- **ATAN (nn)** ATAN Function
Obtain arctangent of the specified argument.
The return value is in radians.
EX.) ATAN (CH01) When the CH01 data is 0.5, the calculation result shall be 0.46365.

- DSIN (nn) DSIN Function
Obtain arcsine of the specified argument.
The return value is in degrees.
When the argument is -1 or less, the argument is -1.
When the argument is +1 or more, the argument is +1.
- DCOS (nn) DCOS Function
Obtain arccosine of the specified argument.
The return value is in degrees.
When the argument is -1 or less, the argument is -1.
When the argument is +1 or more, the argument is +1.
- DTAN (nn) DTAN Function
Obtain arctangent of the specified argument.
The return value is in degrees.
- LOG (nn) LOG Function (Common Logarithm)
Obtain common logarithm of the specified argument.
EX.) LOG (CH01) When the CH01 data is 8.78, the calculation result shall be 0.94349.
- LN (nn) LN Function (Natural Logarithm)
Obtain natural logarithm of the specified argument.
EX.) LN (CH01) When the CH01 data is 8.78, the calculation result shall be 2.1725.
- EXP (nn) EXP Function (Exponent)
Obtain exponent (e^x) of the specified argument.
EX.) EXP (CH01) When the CH01 data is 8.78, the calculation result shall be 6502.9.

This section describes analytical function using 3-axis rosette gage.

Three strain gages denoted by A, B, and C are located as shown in the following figure.



where,

argument $\epsilon_a, \epsilon_b, \epsilon_c$: CH Nos.
E: Young's modulus (unit $\times 10^6$)
 ν : POison's ration.

- HMX ($\epsilon_a, \epsilon_b, \epsilon_c$) Maximum Principal Strain Function

Obtain the maximum principal strain from the measurement CH data.

Example) HMX (CH01, CH02, CH03)

When each of the measurement CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, the calculation result shall be 924.86 $\mu\text{m/m}$.

Expression

$$\epsilon_{\max} = \frac{1}{2} \left[\epsilon_a + \epsilon_c + \sqrt{2 \{ (\epsilon_a - \epsilon_b)^2 + (\epsilon_a - \epsilon_c)^2 \}} \right]$$

- HMN ($\epsilon_a, \epsilon_b, \epsilon_c$) Minimum Principal Strain Function

Obtain the minimum principal strain from the measurement CH data.

Example) HMN (CH01, CH02, CH03)

When each of the measurement CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, the calculation result shall be 660.14 $\mu\text{m/m}$.

Expression

$$\epsilon_{\min} = \frac{1}{2} \left[\epsilon_a + \epsilon_c - \sqrt{2 \{ (\epsilon_a - \epsilon_b)^2 + (\epsilon_a - \epsilon_c)^2 \}} \right]$$

- HSM ($\epsilon_a, \epsilon_b, \epsilon_c$) Maximum Shearing Strain Function

Obtain the maximum shearing strain from the measurement CH data.

Example) HSM (CH01, CH02, CH03)

When each of the measurement CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, the calculation result shall be 264.71 $\mu\text{m/m}$.

Expression

$$\gamma_{\max} = \sqrt{2 \{ (\epsilon_a - \epsilon_b)^2 + (\epsilon_b - \epsilon_c)^2 \}}$$

- SMX ($\epsilon_a, \epsilon_b, \epsilon_c, E, \nu$) Maximum Principal Stress Function

Obtain the maximum principal stress from the measurement CH data.

Example) SMX (CH01, CH02, CH03, 0.205, 0.3)

When each of the measurement CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, Young's modulus: 205 GPa (Input to arithmetic expression: 0.205), and Poisson's ratio: 0.3, the calculation result shall be 252.96 MPa.

Expression

$$\sigma_{\max} = \frac{E}{2(1-\nu^2)} \left[(1+\nu)(\epsilon_a + \epsilon_c) + (1-\nu) \times \sqrt{2\{(\epsilon_a - \epsilon_b)^2 + (\epsilon_b - \epsilon_c)^2\}} \right]$$

- SMN ($\epsilon_a, \epsilon_b, \epsilon_c, E, \nu$) Minimum Principal Stress Function

Obtain the minimum principal stress from the measurement CH data.

Example) SMN (CH01, CH02, CH03, 0.205, 0.3)

When each of the measurement CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, Young's modulus: 205 GPa (Input to arithmetic expression: 0.205), and Poisson's ratio: 0.3, the calculation result shall be 211.22 MPa.

Expression

$$\sigma_{\min} = \frac{E}{2(1-\nu^2)} \left[(1+\nu)(\epsilon_a + \epsilon_c) - (1-\nu) \times \sqrt{2\{(\epsilon_a - \epsilon_b)^2 + (\epsilon_b - \epsilon_c)^2\}} \right]$$

- SSM ($\epsilon_a, \epsilon_b, \epsilon_c, E, \nu$) Maximum Shearing Stress Function

Obtain the maximum shearing stress from the measurement CH data.

Example) SSM (CH01, CH02, CH03, 0.205, 0.3)

When each of the measurement CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, Young's modulus: 205 GPa (Input to arithmetic expression: 0.205), and Poisson's ratio: 0.3, the calculation result shall be 20.872 MPa.

Expression

$$\tau_{\max} = \frac{E}{2(1+\nu)} \times \sqrt{2\{(\epsilon_a - \epsilon_b)^2 + (\epsilon_b - \epsilon_c)^2\}}$$

- DEG ($\epsilon_a, \epsilon_b, \epsilon_c, \nu$) Principal Strain Direction Function

Obtain direction of the principal strain from the measurement CH data.

Set angle of gage A direction to 0° (Degree). When strain amount of gages A and C is $\epsilon_a < \epsilon_c$, the angle shall be gage A and minimum principle strain. ($E_{\min}$).

Example) DEG (CH01, CH02, CH03)

When each of the calculation CH data items are CH01: 671 $\mu\text{m/m}$, CH02: 740 $\mu\text{m/m}$, CH03: 914 $\mu\text{m/m}$, the calculation result shall be 11.685°.

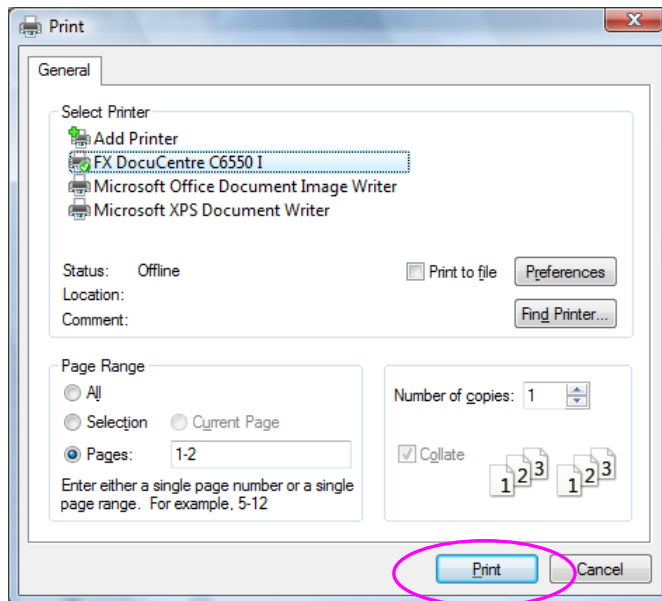
Expression

$$\theta = \frac{1}{2} \tan^{-1} \left[\frac{2\epsilon_b - \epsilon_a - \epsilon_c}{\epsilon_a - \epsilon_c} \right]$$

3-5 SETTING WINDOWS FUNCTIONS

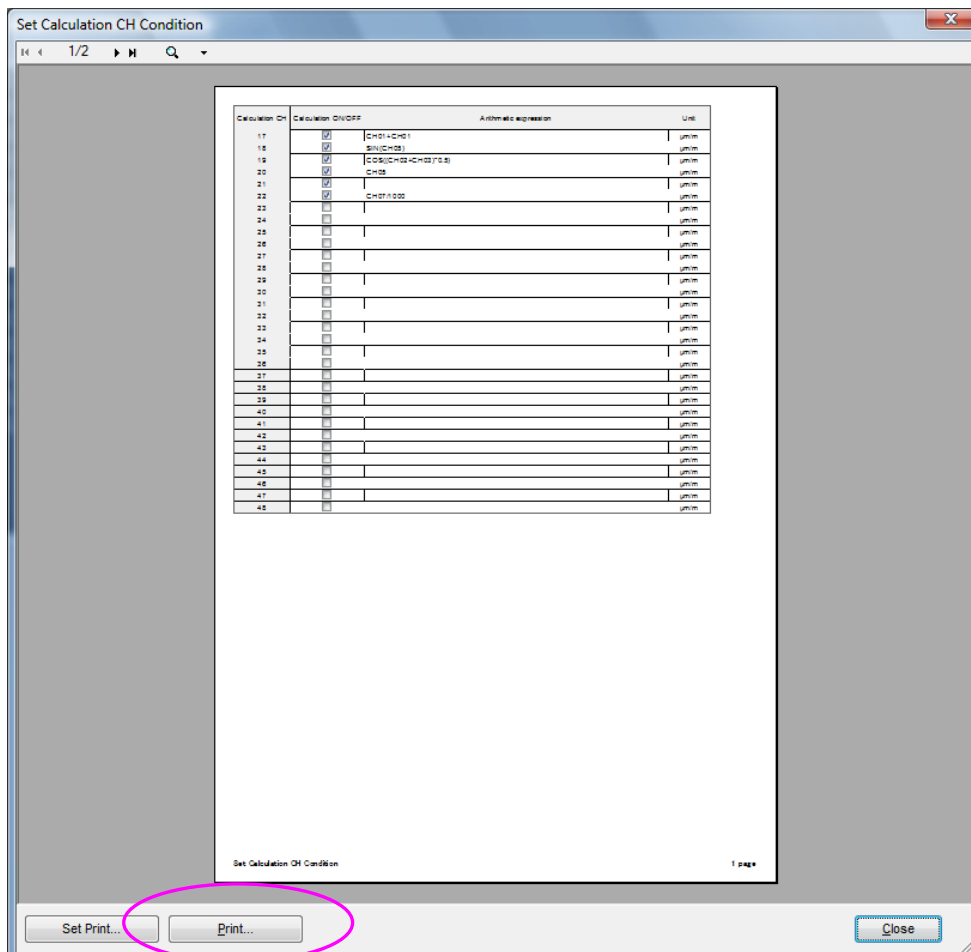
■ Print

Select the **Print** button and the following **Print** window appears. Click the **Print** button on the **Print** window and print the calculation conditions.



■ Print Preview

Select the **Print Preview** button and the following window appears. For printing, click the **Print** button and print the calculation conditions.

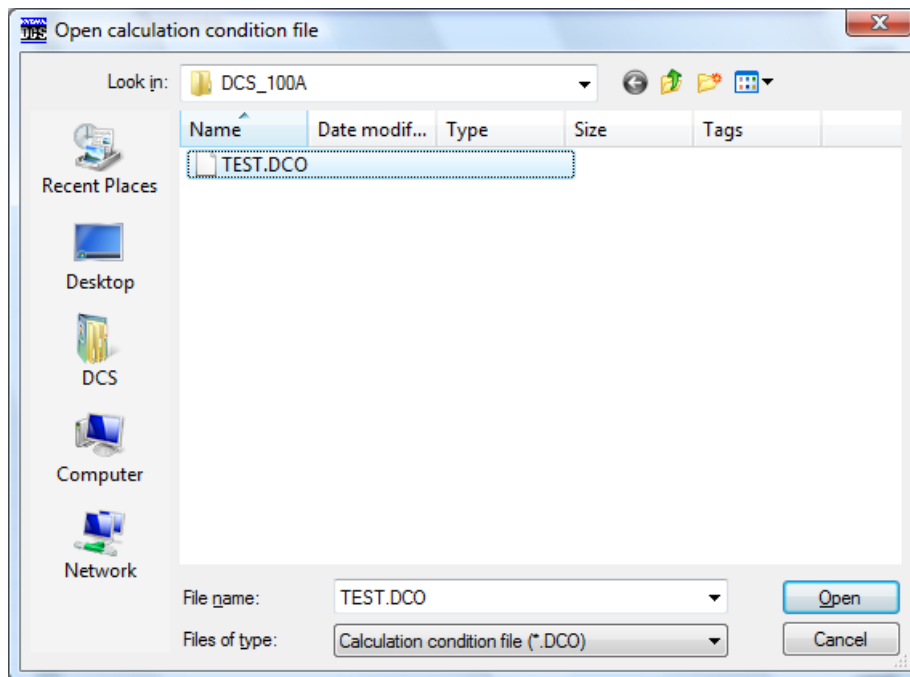


- Load Condition

Loads the pre-saved calculation CH condition file and sets the calculation CH conditions.

Select the **Load condition** button and the following **Open calculation condition file** window appears.

Select the **Calculation CH condition file**, press the **Open** button, load the calculation CH condition from the selected **Calculation CH condition file** for setting.

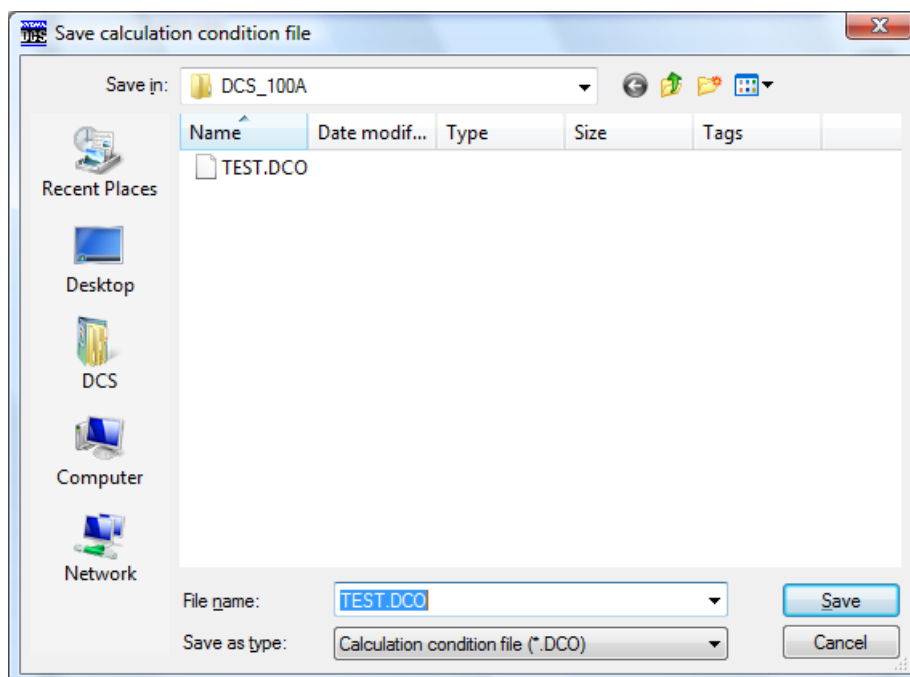


- Save Condition

Save the calculation CH conditions on the current **Set Calculation CH Condition** window as a **Calculation CH condition file**.

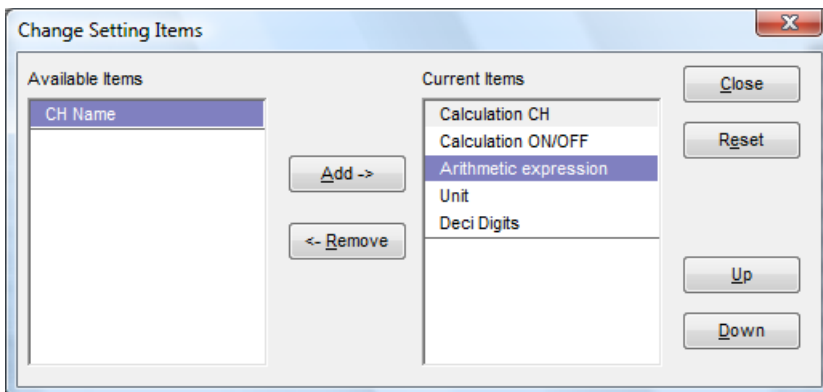
Select the **Save condition** button and the following **Save calculation condition file** window appears.

Input the **File name**, click the **Save** button and save the calculation CH conditions on the current **Set Calculation CH Condition** window as a **Calculation CH condition file**.



■ Change Setting Items

Select the **Change Setting Items...** button and the following **Change Setting items** window appears. Setting items on the window are added, removed, or sorted.



Add-> Item currently not on the window is added to the **Set Calculation CH Condition** window.

<-Remove Item currently displayed on the window is removed from the **Set Calculation CH Condition** window.

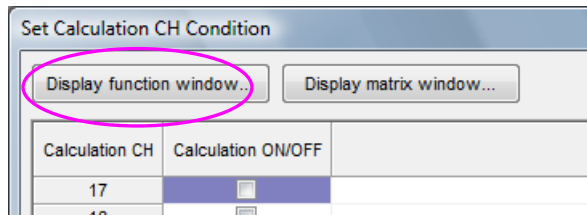
Close Determine the setting contents and close the window.

Reset Reset the setting items to the default state.

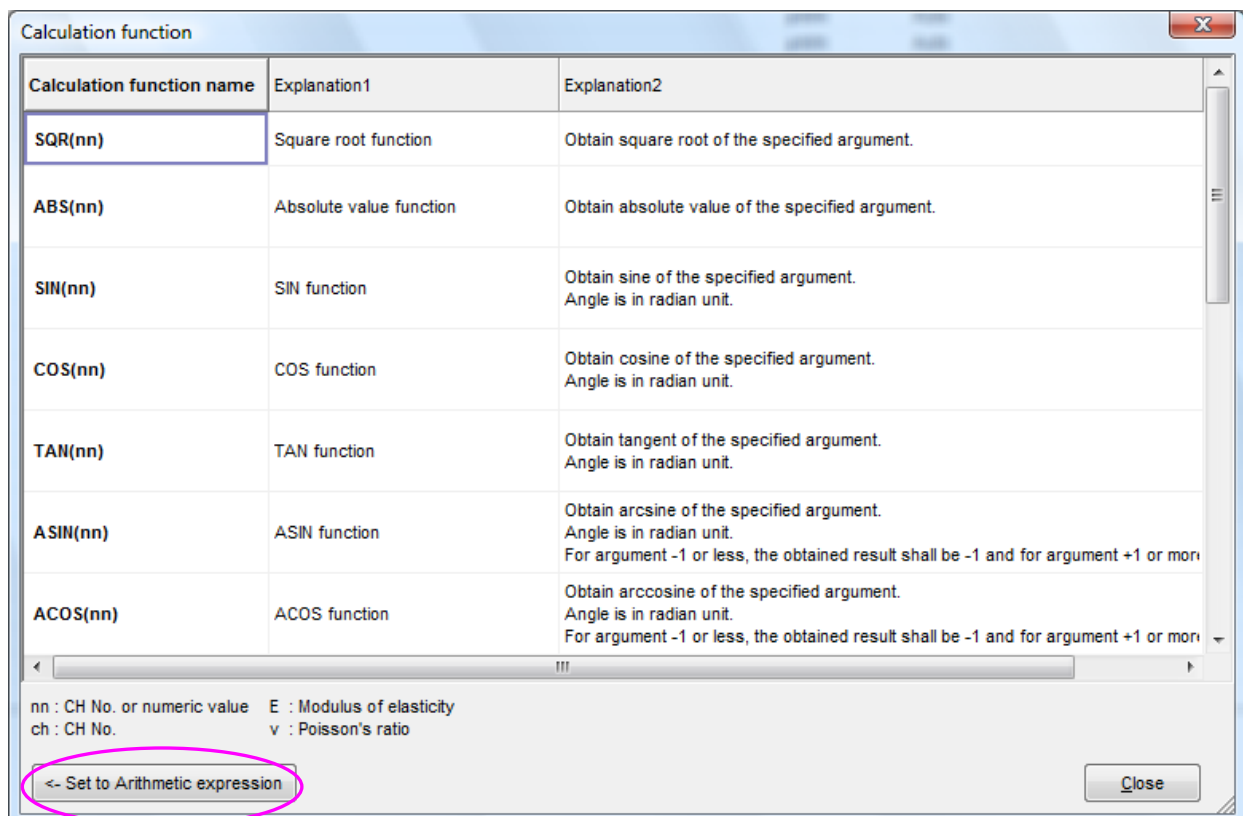
Up/Down Sort the current setting items.
Select the target setting items and click **Up** or **Down** button.

■ Calculation function window

Click the **Display function window...** button and the following **Calculation function** window appears.

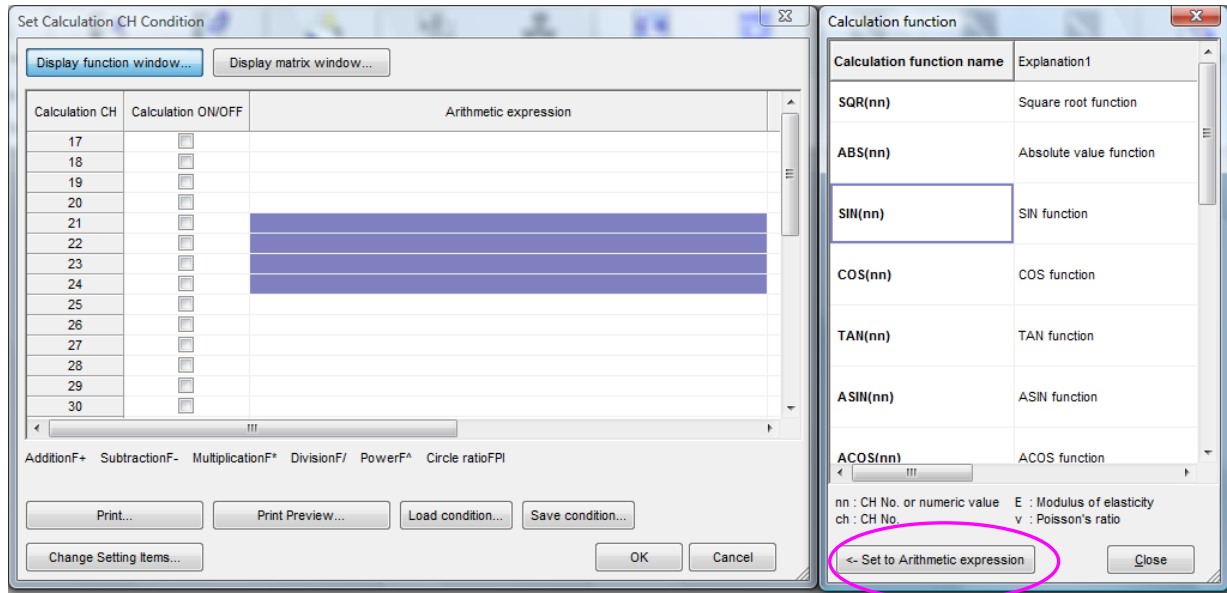


By pressing the **<-Set to Arithmetic expression** button on the **Calculation function** window, the target calculation function is set to the **Arithmetic expression** on the **Set Calculation CH Condition** window.

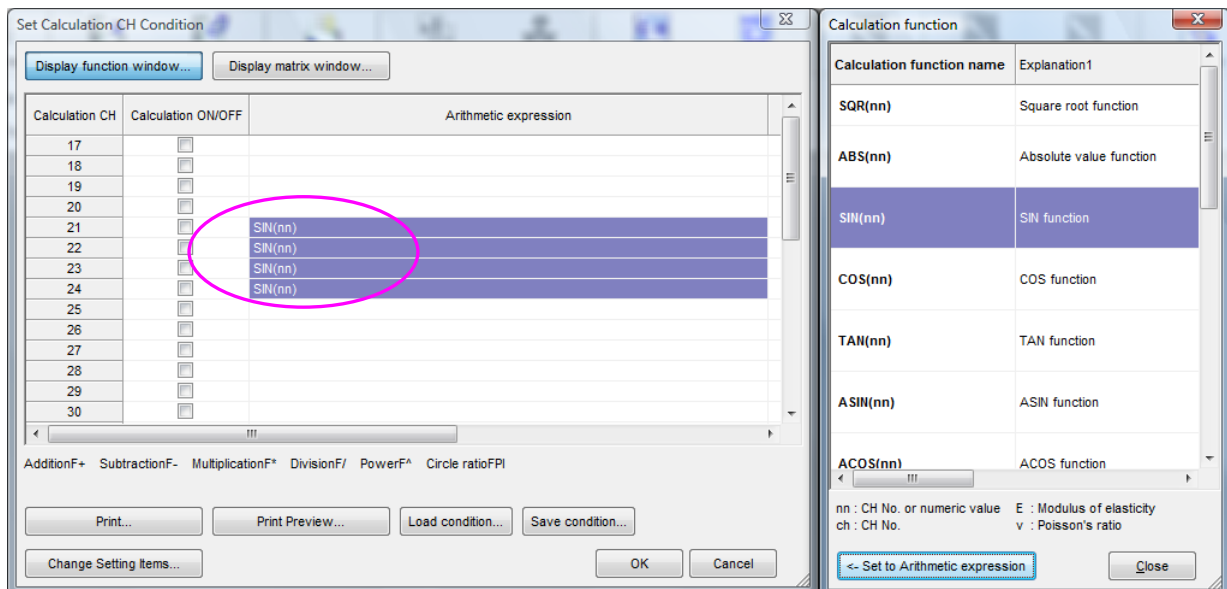


An example for setting the SIN function to the arithmetic expressions of the calculation CH21 to CH24 on the **Set Calculation CH Condition** window is shown below.

- (1) On the **Set Calculation CH Condition** window. Select the **Arithmetic expression** items of the calculation CH21 to CH24, then select the SIN (nn) on the **Calculation function** window and click the **<-Set to Arithmetic expression** button on the **Calculation function** window.



- (2) The SIN function is set to the **Arithmetic expression** items of calculation CH21 to CH24.

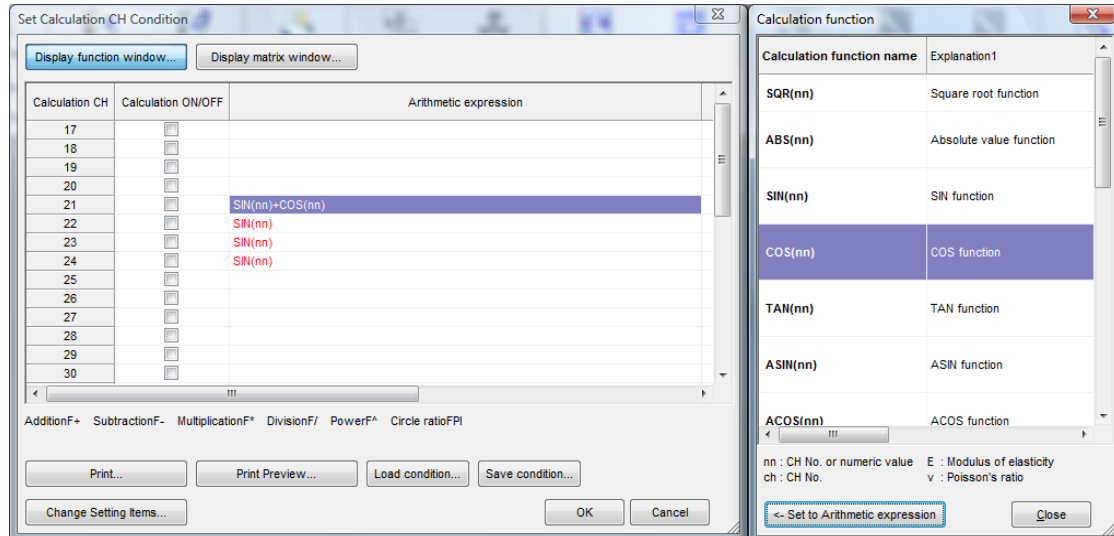


MEMO

Select the **Arithmetic expression** item where the arithmetic expressions are already entered and if the **<-Set to Arithmetic expression** button is clicked, the selected calculation function is added to the arithmetic expression in the **Arithmetic Expression** item.

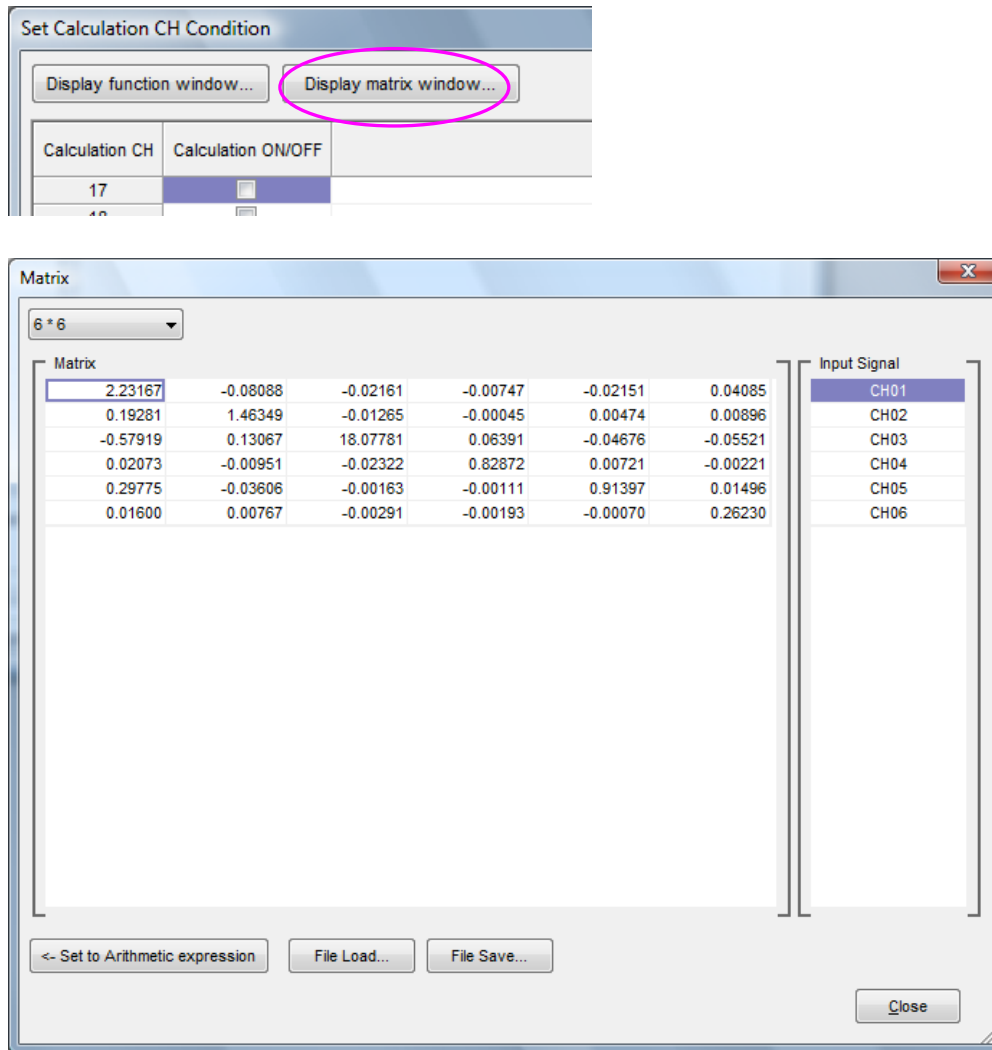
For instance, after the (2) in the above, select the arithmetic expression of the calculation CH21 on the **Set Calculation CH Condition** window, click the **Display function window** button and select the COS function. The arithmetic expression of the CH21 becomes “SIN (nn) + COS (nn).”

(See the following window.)



■ Matrix window

Click the **Display matrix window...** button and the following **Matrix** window appears.



<-Set to Arithmetic expression Set the determinant of current set conditions to the arithmetic expressions on the **Set Calculation CH Condition** window.

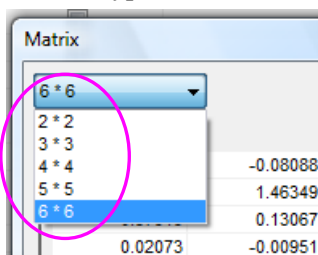
File Load... Load the pre-saved matrix condition file.
(The matrix condition file is CSV format file.)

File Save... Save the current set conditions as a matrix condition file to the PC.

Close Determine the setting contents and close the window.

(1) Matrix type

Matrix type is selectable from “2×2”, “3×3”, “4×4”, “5×5”, and “6×6.”



(2) Matrix

Input matrix component within 20 characters.

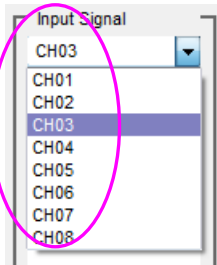
Double-click the desired item or press the **SPACE** key to be in input available state. Input desired matrix component.

Matrix					
2.23167	-0.08088	-0.02161	-0.00747	-0.02151	0.04085
0.19281	1.46349	-0.01265	-0.00045	0.00474	0.00896
-0.57919	0.13067	18.07781	0.06391	-0.04676	-0.05521
0.02073	-0.00951	-0.02322	0.82872	0.00721	-0.00221
0.29775	-0.03606	-0.00163	-0.00111	0.91397	0.01496
0.01600	0.00767	-0.00291	-0.00193	-0.00070	0.26230

Place the cursor to the target **Arithmetic expression** and press the **DEL** key to clear it.

(3) Input Signal

Select the measurement CH or calculation CH used for components of the input signal.



Determinant (6×6) is set to the arithmetic expression on the **Set Calculation CH Condition** window as follows.

$$\begin{array}{c} \text{Matrix} \\ \left(\begin{array}{cccccc} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} & a_{26} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} & a_{36} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} & a_{46} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & a_{56} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} \end{array} \right) \end{array}
 \begin{array}{c} \text{Input Signal} \\ \left(\begin{array}{c} ch_1 \\ ch_2 \\ ch_3 \\ ch_4 \\ ch_5 \\ ch_6 \end{array} \right) \end{array}$$

$$\begin{array}{lcl} CH_1 & = & a_{11} \times ch_1 + a_{12} \times ch_2 + a_{13} \times ch_3 + a_{14} \times ch_4 + a_{15} \times ch_5 + a_{16} \times ch_6 \\ CH_2 & = & a_{21} \times ch_1 + a_{22} \times ch_2 + a_{23} \times ch_3 + a_{24} \times ch_4 + a_{25} \times ch_5 + a_{26} \times ch_6 \\ CH_3 & = & a_{31} \times ch_1 + a_{32} \times ch_2 + a_{33} \times ch_3 + a_{34} \times ch_4 + a_{35} \times ch_5 + a_{36} \times ch_6 \\ CH_4 & = & a_{41} \times ch_1 + a_{42} \times ch_2 + a_{43} \times ch_3 + a_{44} \times ch_4 + a_{45} \times ch_5 + a_{46} \times ch_6 \\ CH_5 & = & a_{51} \times ch_1 + a_{52} \times ch_2 + a_{53} \times ch_3 + a_{54} \times ch_4 + a_{55} \times ch_5 + a_{56} \times ch_6 \\ CH_6 & = & a_{61} \times ch_1 + a_{62} \times ch_2 + a_{63} \times ch_3 + a_{64} \times ch_4 + a_{65} \times ch_5 + a_{66} \times ch_6 \end{array}$$

a_{nn} : Matrix component of the matrix condition

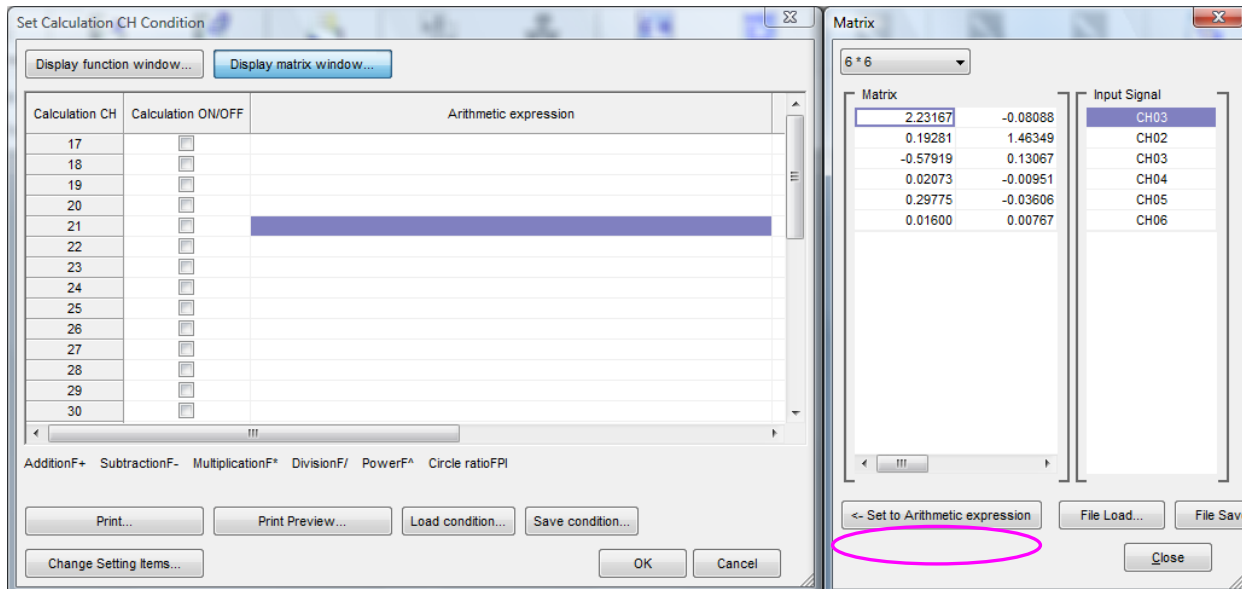
ch_n : Measurement CH or calculation CH used for components of the input signal

CH_n : Calculation CH where determinants of the matrix conditions are set.

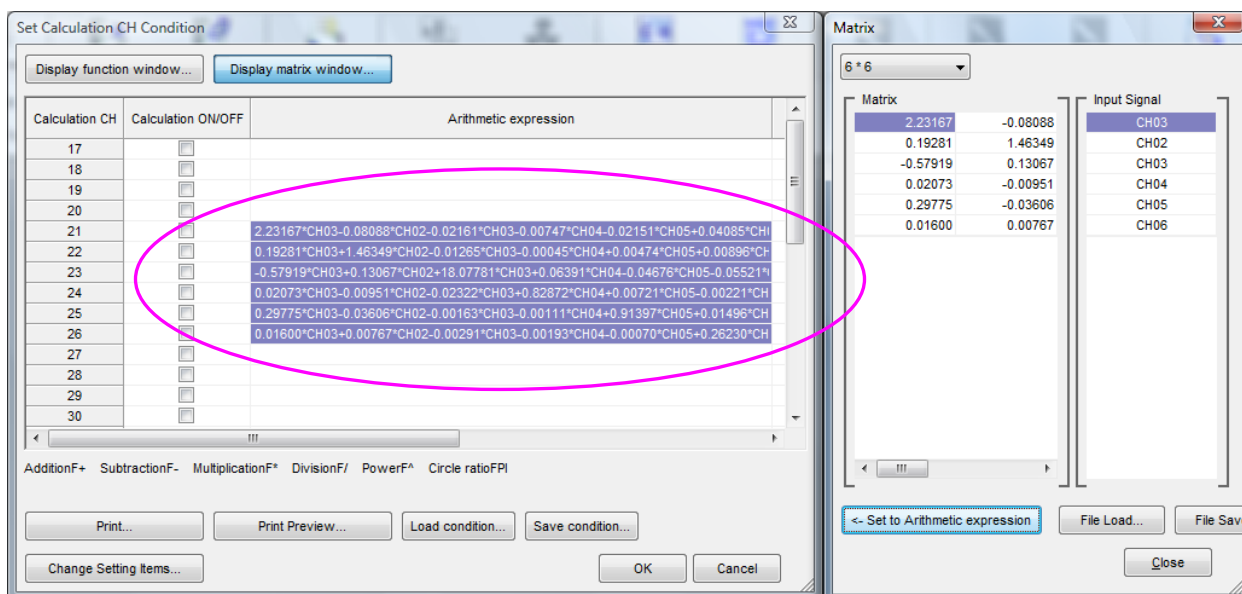
(n: 1 to 6)

An example for setting the determination (6×6) to the arithmetic expressions of the calculation CH21 to CH24 on the **Set Calculation CH Condition** window is shown below.

- (1) Set the **Matrix** and **Input Signal** on the **Matrix** window.
- (2) Select the **Arithmetic expression** items of calculation CH21 to CH26 on the **Set Calculation CH Condition** window and click the **<-Set to Arithmetic expression** button.



- (3) Determinations are set to the calculation CH21 to CH26.



MEMO

Select the **Arithmetic expression** item where the arithmetic expressions are already entered and if the **<-Set to Arithmetic expression** button is clicked, the selected determinant is overwritten to the arithmetic expression in the **Arithmetic Expression** item.

4. SPECIFICATIONS

4-1 ARITHMETIC OPERATIONS

The number of the calculation CHs	Maximum 32 CHs
Calculation CH conditions	Calculation ON/OFF, arithmetic expression (within 200 characters), unit, deci digits, CH name (within 40 characters)
Print	Capable of printing and previewing the calculation CH condition.
Load/save	Capable of loading and saving the calculation CH conditions as the calculation CH condition file. Capable of loading and saving the matrix conditions as the condition file (CSV format file).
Operation	Capable of monitoring and recording the calculation CH data and measured data at the same time. The calculation CH data and measured data are saved in the same data file.

4-2 ARITHMETIC EXPRESSION

Available numeric values and CH Nos.	Numeric value, measurement CH, and calculation CH
Available operators and constants	Addition: +, subtraction: -, multiplication: *, division: /, power: ^, circle ratio: PI, and bracket ()
Available calculation functions	SQR Square Root Function ABS Absolute Function SIN SIN Function COS COS Function TAN TAN Function ASIN ASIN Function ACOS ACOS Function ATAN ATAN Function DSIN DSIN Function DCOS DCOS Function DTAN DTAN Function LOG LOG Function (Common Logarithm) LN LN Function (Natural Logarithm) EXP EXP Function (Exponent) HMX Maximum Principal Strain Function HMN Minimum Principle Strain Function HSM Maximum Sheering Strain Function SMX Maximum Principle Stress Function SMN Minimum Principle Stress Function SSM Maximum Sheering Stress Function DEG Principle Strain Direction Function

4-3 MEASURING CONDITIONS WHEN ARITHMETIC OPERATING

Target measuring instruments	EDX-10A, EDX-100A, EDX-200A, EDX-3000A/B, EDX-5000A, EDS-400A, PCD-300 Series, PCD-400A Series, NTB-500A, UDAS-100A, UCAM-550A, CTRS-100A
Data save folder	PC data file folder (For the EDX-3000A/B, the data file can be saved in the hard disk of the EDX-3000A/B.)
MEAS mode	Manual, Manual (Set Record Data), Interval, Analog Trigger
Sampling frequency	Maximum 10 kHz
Actually settable measuring conditions vary with the control target measuring instrument.	