

STRAIN/VOLTAGE MEASUREMENT CARD**For EDX-2000A/EDX-100A****CDV-40B/CDV-40B-F****CDV-40A/CDV-40A-F****INSTRUCTION MANUAL**

Thank you for purchasing KYOWA's product CDV-40A/CDV-40A-F and CDV-40B/CDV-40B-F STRAIN/VOLTAGE MEASUREMENT CARD for EDX-2000A/EDX-100A.

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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The contents of this Manual are subject to change without prior notice.

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This Instruction Manual describes details of CDV-40A/CDV-40B/CDV-40A-F/CDV-40B-F Strain/Voltage Measurement Card for EDX-2000A/EDX-100A (hereinafter referred to as the CDV card).

Difference between cards with or without ‘-F’ is described in the following.

Model Name	Anti-aliasing Filter Function
CDV-40A/B	Without
CDV-40A/B-F	With

STANDARD ACCESSORIES

The following accessories are packed with the CDV card. When unpacking, check the contents to ensure that all accessories are enclosed.

Term and Conditions of Product Warranty	1
Cross- recessed head binding screw M3×6	2

SAFETY PRECAUTIONS

The CDV card is designed according to detailed specifications in “9. SPECIFICATIONS.” Do not use the CDV card in environment not conforming to specifications when using the EDX-2000A Memory/Recorder Analyzer (hereinafter referred as the EDX-2000A) and EDX-100A Universal Recorder (hereinafter referred to as the EDX-100A). Or, damage of the product may result.

PRIOR TO USE

For safe use of the CDV-40A/B-F, do not forget to read the “Safety Precautions” prior to use.

Kyowa Electronic Instruments Co., Ltd. assumes no liability for any damages resulting from user’s failure to comply with the safety precautions.

SAFETY SYMBOLS

For safety operation of the CDV card, the following “**WARNING**” and “**CAUTION**” symbols are used in “Safety Precautions” of this Instruction Manual.

 WARNING	Improper operation of the system may result in death or severe injury of the operator.
 CAUTION	Improper operation of the system may result in injury of the operator and physical damage of the system.

 WARNING
● WARNING Always take special care for Warning Precautions stated in “EDX-2000A Memory/Recorder Analyzer Instruction Manual for Hardware” and EDX-100A Universal Recorder Instruction Manual for Hardware.”

 CAUTION
● CAUTION Always take special care for Warning Precautions stated in “EDX-2000A Memory/Recorder Analyzer Instruction Manual for Hardware” and “EDX-100A Universal Recorder Instruction Manual for Hardware.” ● When installing or removing the CDV card to/from the EDX-2000A/EDX-100A, do not contact any component parts on the CDV card. Or, performance of the CDV card may deteriorate and failure of the product may result. ● Conduct the internal calibration when changing the Low Pass Filter setting to or from "AUTO".

NOTATIONS USED IN THE INSTRUCTION MANUAL

Informational Notes

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

Examples of Notations

NOTE

Essential precautions required when handling the CDV card.

MEMO

Reference items required when handling the CDV card.

1. PRODUCT OUTLINE

1-1 OUTLINE OF CDV-40A/B

- CDV card is a conditioner card for strain gages, strain gage transducers, and voltage output sensors.
- Measurement of up to 8 CHs per CDV card is available
- The CDV card is capable of reading TEDS (Transducer Electronic Data Sheet) built-in sensor information items. In addition, based on the read information, the CDV card automatically sets appropriate channel conditions. When using the TEDS built-in sensors, refer to separate volume of “TEDS Sensor Information Instruction Manual” and “EDX-2000A Instruction Manual for Hardware/Software.”
When using the EDX-100A, refer to “EDX-100A Instruction Manual” and DCS-100A Instruction Manual for EDX-100A Operation.”

1-2 PRECAUTIONS FOR USING THE CDV-40A/B

- When mixedly using voltage input and strain sensor input in the same CDV card, signal crosstalk may generate and waveform different from sensor input waveform may appear on the CH connected with strain sensor.

[Worst Value] The worst signal crosstalk of 120 $\mu\text{ep-p}$ generates on the strain sensor input CH.

(Condition)		
	Voltage input CH	• Mode: Voltage • Range: 10 V • LPF: FLAT • Input: Rectangular waveform of 20 Vp-p
	Strain sensor input CH	• Mode: Strain • Range: 500 $\mu\epsilon$ • LPF: FLAT • Input: Arbitrary

At this time, set the LPF of the strain sensor input CH to 10 kHz or less to solve the above crosstalk problem.

1-3 OUTLINE OF CDV-40A/B-F (CDV-40A/B WITH ANTI-ALIASING FILTER)

- The CDV-40A-F card is a CDV-40A/B conditioner card mounted with anti-aliasing filter function. The anti-aliasing filter function is designed to prevent A/D converter from aliasing.
- The anti-aliasing filter function of the CDV card is composed of 8th order Butterworth and attenuation obtained by entering 1/2 of sampling frequency is -48 dB $\pm$ 5 dB.
- Since ON/OFF selection is available for using the anti-aliasing filter, the CDV card can be used without the anti-aliasing filter
In addition, since the ON/OFF selection is available for every channel, you can set whether or not using the anti-aliasing filter to channels in the same card.
- Cutoff frequency of the anti-aliasing filter automatically changes at the same time when setting the sampling frequency of the EDX-2000A/EDX-100A. Therefore, it is not required to set the cutoff frequency. In addition, for the EDX-2000A, when entering the external clock signal, the same can be mentioned and it is also not required to set the cutoff frequency.

MEMO

ALIASING is a phenomenon of a waveform not available to correctly monitor or reproduce the waveform when frequency of the input signal becomes more than 1/2 of the sampling frequency. The anti-aliasing filter is used to prevent from aliasing.

1-4 PRECAUTIONS FOR USING THE CDV-40A/B-F

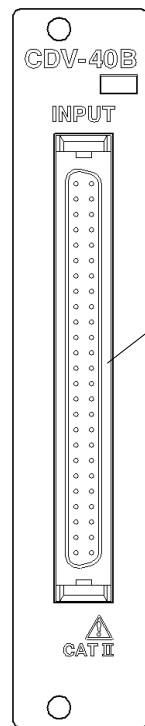
- Cutoff frequency of the anti-aliasing filter is set to have 1/4 of the sampling frequency. It is recommended to set the sampling frequency to be more than 4 times as large as the predicted input frequency.
- Sampling frequency range compatible for the anti-aliasing filter shall be more than 100 Hz. You cannot set the sampling frequency to less than 100 Hz.
(Measurement with anti-aliasing filter set to OFF is available.)

NOTE

This section describes mainly anti-aliasing filter function.

For details except for the anti-aliasing filter function, precautions are in common with the CDV card. For other precautions, connection methods, etc., refer to CDV-40A/B related description in EDX-2000A or EDX-100A Instruction Manual.

1-5 PARTS NAMES AND FUNCTIONS

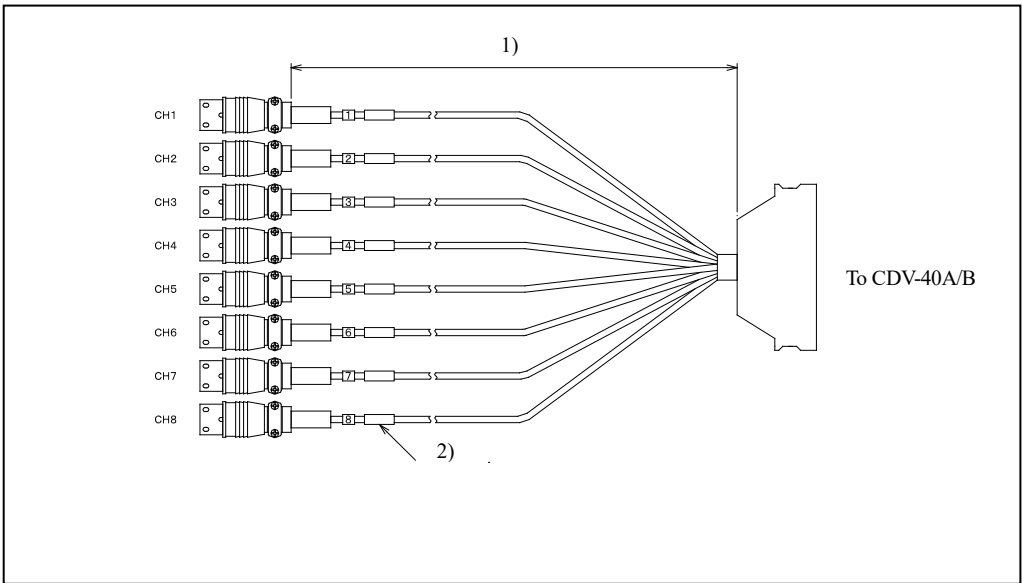


Input connector
Input connector for 8 CHs
When connecting sensors, use dedicated input cables.
Provided with the following dedicated input cables.

CDV-40B

List of Input Cables

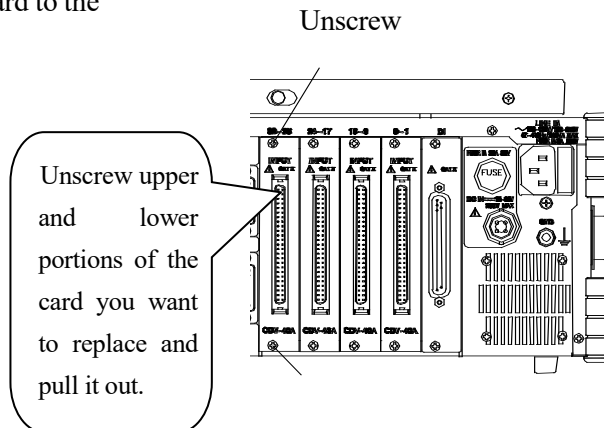
Product Name	Model Name	Cable Length (Fig. 1)	Heat-shrinkable Tube Color (Fig. 2)	Product Name	Model Name	Cable Length (Fig. 1)	Heat-shrinkable Tube Color (Fig. 2)
Input cable	U-40	50 cm	Without tube	Input cable	U-46	50 cm	Blue
	U-41		Brown		U-47		Purple
	U-42		Red		U-48		Gray
	U-43		Orange				
	U-44		Yellow		U-38	1.5 m	Without tube
	U-45		Green		U-39	1.0 m	Without tube



2. INSTALLING TO EDX-2000A

Always turn OFF the power before installing the CDV card to the EDX-2000A.

- 1) Unscrew upper and lower portions of the already installed conditioner card or dummy panel
- 2) Remove the already installed conditioner card or dummy panel.
- 3) Slowly insert the CDV card along the guide rail in the EDX-2000A and tightly fasten the upper and lower screws.



- 4) After replacing the CDV card, turn ON the EDX-2000A and check the startup window. If the "Card Type" is displayed on the "Slot No." column, the CDV card is properly replaced.
- 5) If "DISABLE" or "UNKNOWN" is displayed as the "Card Type," it is required to update the EDX-2000A hardware. At this time, contact KYOWA or our representative for updating the EDX-2000A hardware.

Slot No.	Card Type
1	CDV-40B
2	CDV-40B
3	***

CDV-40B cards are installed in slot Nos. 1 and 2.

NOTE

- When installing the CDV card into the EDX-2000A, do not touch any component parts of the CDV card. Or, system failure or damage of the product may result.
- When installing the CDV card into the EDX-100A, refer to the EDX-100A Instruction Manual.

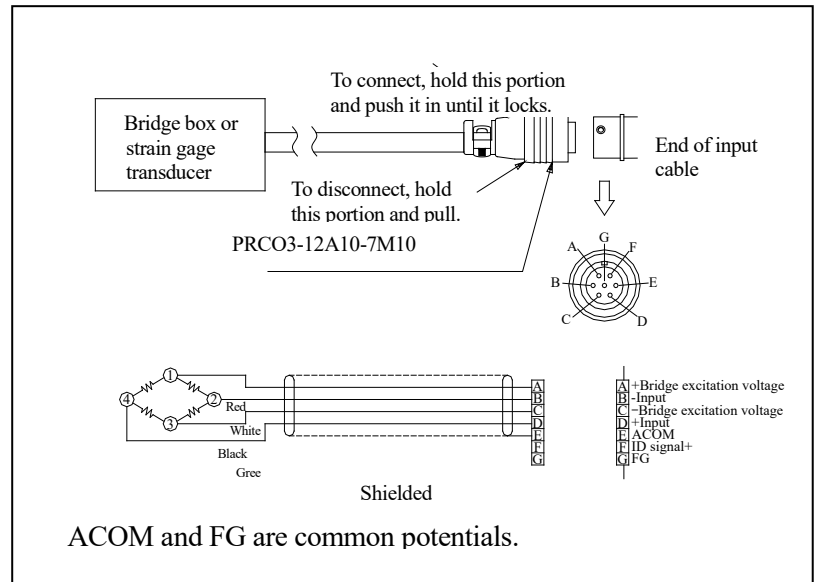
3. CONNECTING SENSORS

The CDV card is capable of measuring strain and voltage. This section explains how to connect sensors to the CDV card from input cables.

3-1 WHEN USING STRAIN GAGE OR STRAIN GAGE TRANSDUCER

When measuring the output of the strain gage or strain gage transducer, connect the bridge box or strain gage transducer as shown in the right figure.

Before recording data, select the strain mode monitor the noise. If excessive noise is detected, ground the ground terminal of the bridge box or connect it to the GND terminal of the EDX-2000A, and use whichever results in less noise.



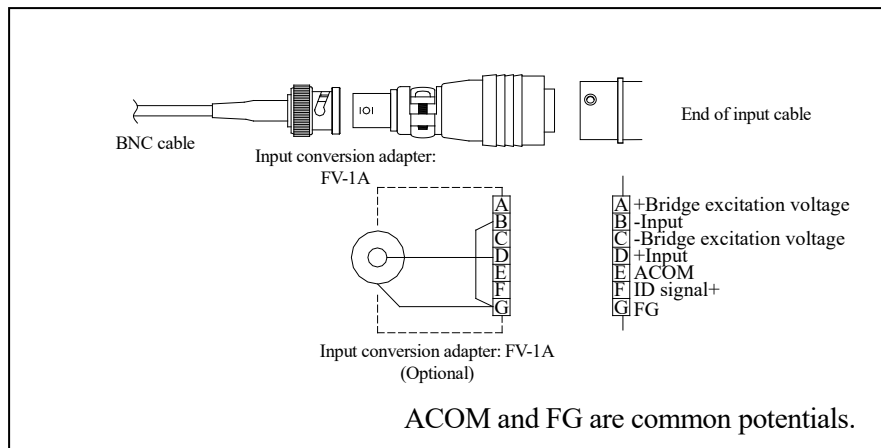
MEMO

When using other measuring cards, read carefully the instruction manuals of the other measuring cards.

NOTE

- The F terminal of each channel input of the CDV card is intended for sensor ID signals. If any other signals are connected to this F terminal, the EDX-2000A may not be able to recognize all the conditioner cards installed in the system. At this time, the startup window will display "UNKNOWN" where it should have the name of the conditioner card name (e.g. CDV-40A) in the normal state, resulting to unable the measurement.
- Strain generator: CAB-120D, 350D and WDS-10 are not available because F and A terminals are short-circuited.
- It should be noted that when using a transducer with a remote sensing function, always connect by locating the connection cable (N-81 to N-85) between the CDV card input cable and the transducer..
- When using an extension cable between the input cable and bridge box or strain gage transducer, use connection cables N81 to N85.

3-2 WHEN APPLYING VOLTAGE



When measuring the voltage, connect the FV-1A input conversion adapter (optional) to a quick mating connector using the BNC connector. Select the voltage mode to conduct monitoring. If excessive noise is detected, connect the negative side of the voltage signal source to the GND terminal of the EDX-2000A.

WARNING

- **Maximum Input Voltage Range for Measurement**

Do not apply input voltage higher than the voltage range specified for the CDV card. Or, an electric shock hazard, deteriorated performance and system failure may result.

In addition, take care of the following precautions when measuring DC voltage of the battery, power supply voltage, etc.

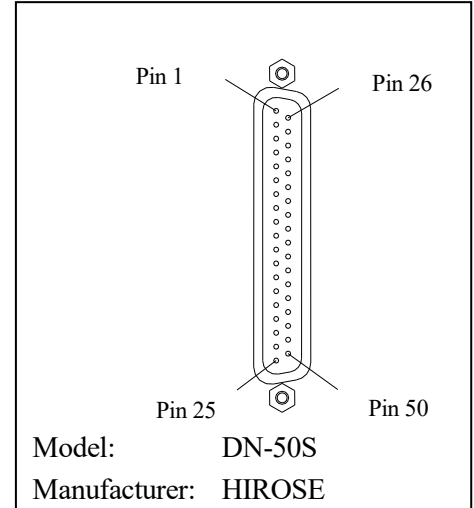
- 1) Use a tester or the like to measure voltage between negative sides of the DC voltage and check that the voltage is approximately 0 V.
- 2) Check that the voltage between the negative side of the DC voltage and the GND terminal of the EDX-2000A is approximately 0 V.
- 3) When connecting the input cable, correctly connect the positive and negative sides.
- 4) Maximum input voltage of the CDV card is ± 10 V. Do not apply input voltage exceeding ± 10 V.

Failure to do so will result in shortcircuit of the signal source (e.g. DC power supply, etc.) of the measuring target in the CDV card, thus causing system failure and a fire hazard.

4. CENTRALIZED CONNECTOR PIN ASSIGNMENT

This section describes pin assignment of the centralized connector pins.

Pin No.	CH	Name	Pin No.	CH	Name
1	1	+BV	26	1	-IN
2		-BV	27		+IN
3		COM	28		ID
4	2	+BV	29	2	-IN
5		-BV	30		+IN
6		COM	31		ID
7	3	+BV	32	3	-IN
8		-BV	33		+IN
9		COM	34		ID
10	4	+BV	35	4	-IN
11		-BV	36		+IN
12		COM	37		ID
13	5	+BV	38	5	-IN
14		-BV	39		+IN
15		COM	40		ID
16	6	+BV	41	6	-IN
17		-BV	42		+IN
18		COM	43		ID
19	7	+BV	44	7	-IN
20		-BV	45		+IN
21		COM	46		ID
22	8	+BV	47	8	-IN
23		-BV	48		+IN
24		COM	49		ID
25	-	Shield	50	-	Shield



5. HOW TO SET CDV-40A/B

If the CDV card is already installed in the EDX-2000A, settings of all the required conditions are conducted from the EDX-2000A.

EDX-2000A Initial Window

2) Setting Conditions



1) CH Condition

Items	1) Meas CH	2) Mode	3) Range	4) HPF	5) LPF	6) Balance	7) CAL	8) CAL Range
Selection	Measure	Strain	500 μ 1 k μ 2 k μ 5 k μ 10 k μ 20 k μ 50 k μ OFF	OFF	FLAT 10 kHz 3 kHz 1 kHz	ON OFF	ON OFF	100 % 50 % Shunt
	Not measure	Voltage	0.1 V 0.2 V 0.5 V 1.0 V 2.0 V 5.0 V 10.0 V OFF	0.2 Hz 1.0 Hz	300 kHz 100 kHz 30 Hz 10 Hz			



EDX-2000A Initial Window



1) Measurement

<Setting Order of the CDV Card>

Set required conditions to the CDV card in due order in the above table.

MEMO

When installing the CDV card to the EDX-100A, see Instruction Manuals of the EDX-100A and DCS-100A.

EDX-2000A Initial Window

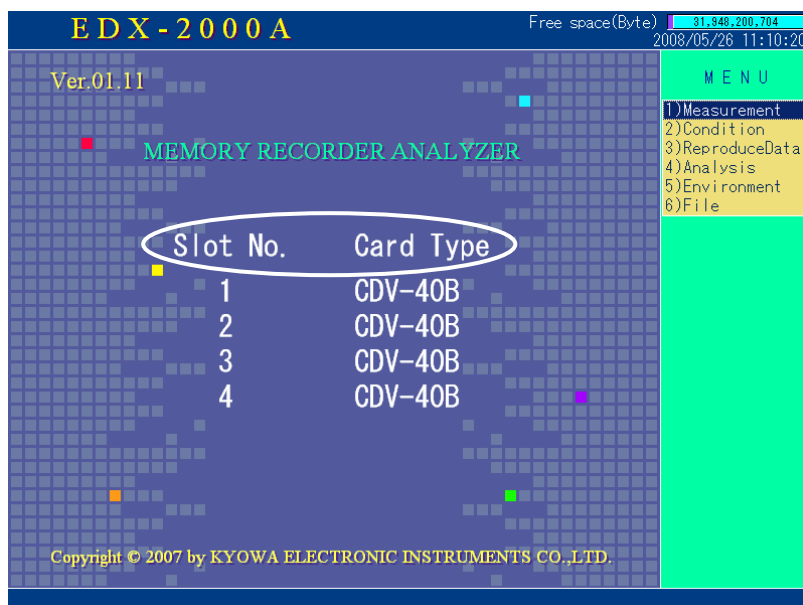
When the CDV card is properly installed in the EDX-2000A, CDV-40A or CDV-40B appears on the initial window.

(The window at the right shows that CDV-40B is installed in the 1st to 4th slots.)

Here, set the cursor to the item 2) Condition and press the **ENTER** key.

MEMO

Card Type of Slot No. with no conditioner card is displayed with "***."



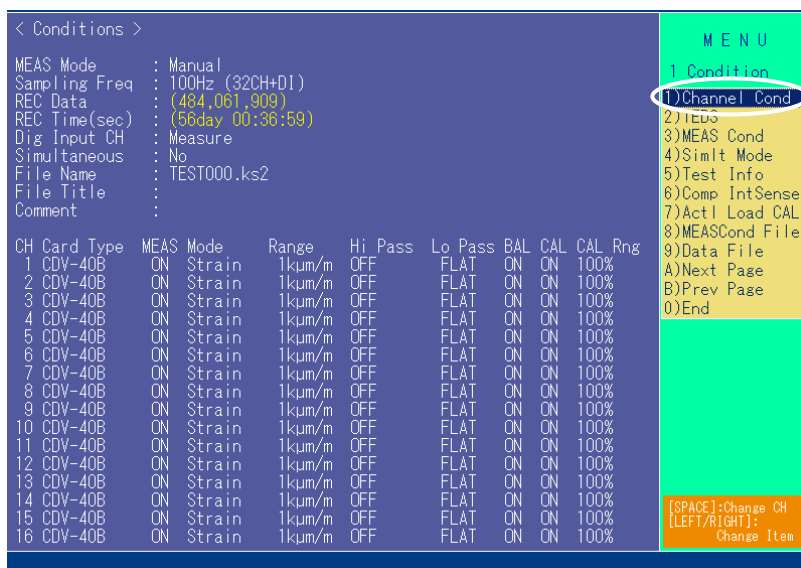
Condition Setting Window

Select the item 2) Condition on the initial window to display the right window.

Here, set the cursor to 1) CH Condition and press the **ENTER** key.

MEMO

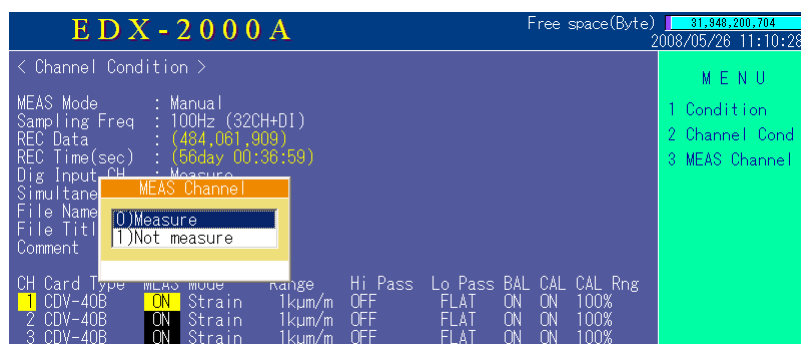
CH column with no conditioner card and setting not available column are displayed with "*."



Meas CH

Select the item 1) Meas CH is selected on the CH Condition window to display the right window.

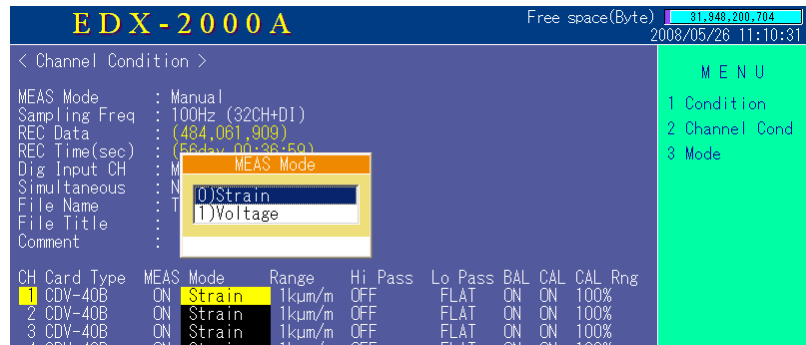
Set the cursor to either 0) Measure or 1) Not Measure for every CH and press the **ENTER** key.



Mode

Select the item 2) Mode on the CH Condition window to display the right window.

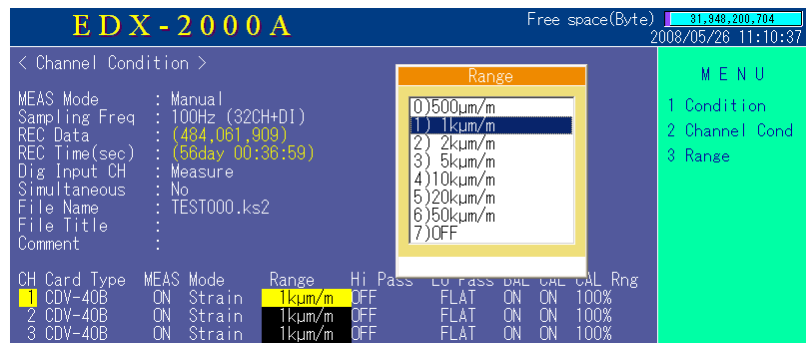
Set the cursor to either Strain or Voltage for every CH and press the **ENTER** key.



Range

Select the item 3) Range on the CH Condition window to display the right window.

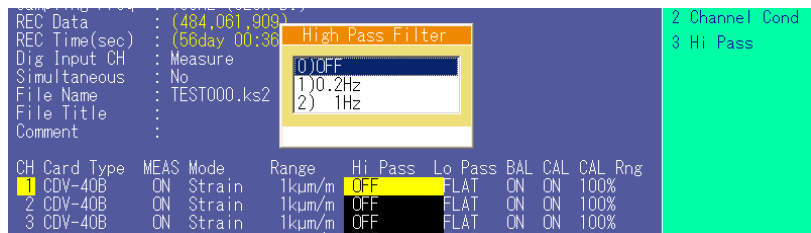
Set the cursor to the desired Meas Range for every CH and press the **ENTER** key.



High Pass Filter

Select the item 4) High Pass Filter on the CH Condition window to display the right window.

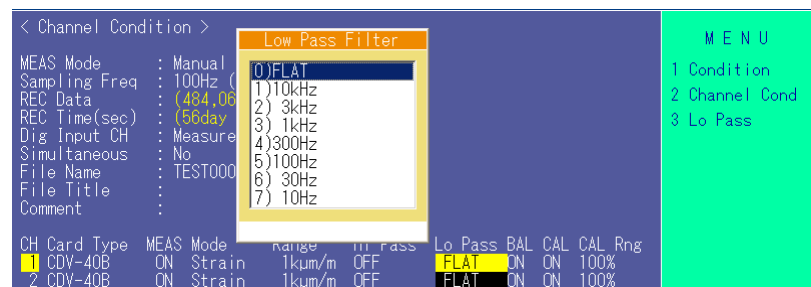
When using High Pass Filter for every CH (Input AC coupling), set the cursor to “0.2Hz” or “1Hz” and if not, (Input DC coupling), set the cursor to “OFF” and press the **ENTER** key.



Low Pass Filter

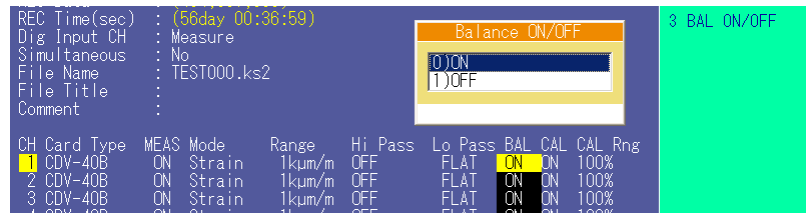
Select the item 5) Low Pass Filter on the CH Condition window to display the right window..

Set the cursor to appropriate frequency for every CH and press the **ENTER** key.



BAL ON/OFF

Select the item 6) BAL ON/OFF on the CH Condition window to display the right window.



BAL ON/OFF is selected to set whether or not to conduct strain bridge initial adjustment (balance) of the measuring CH. Set the cursor to “ON” or “OFF” for every CH and press the **ENTER** key.

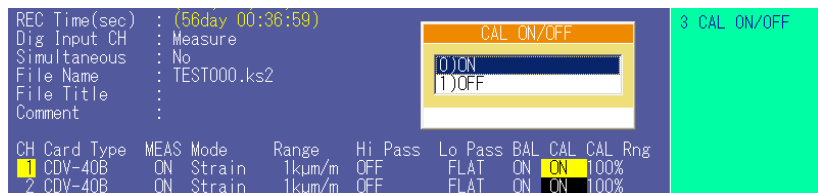
Here, a CH set to balance “ON” shall be a target for balancing when selecting menus in due order Measure → Balance.

NOTE

When mode of the target CH is set to “Voltage,” this item is exempted.

CAL ON/OFF

Select the item 7) CAL ON/OFF on the CH Condition window to display the right window.



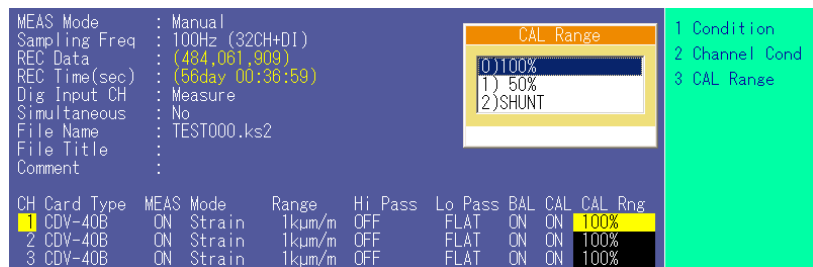
Set CAL value output target of the conditioner card for every CH.

Set the cursor to “ON” or “OFF” for every CH and press the **ENTER** key.

Here, a CH set to CAL “ON” shall be a target for CAL output when selecting menus in due order Measure → CAL ON/OFF.

CAL Range

Select the item 8) CAL Range on the CH Condition window to display the right window.



Cal range (CAL output value) of the conditioner card is set for every CH. When it is desired to 100 % output the CAL value for every CH, set the cursor to “100%,” for 50% output, to “50%,” and for outputting CAL value equal to SHUNT resistance ([Note]) that is connected to Meas CH bridge, to “SHUNT” and press the **ENTER** key.

NOTE**SHUNT**

Insert a fixed resistance between '+BV' and '+IN' of the strain gage bridge and output a value obtained by adding the bridge output value at that time to the current output value.

Irrespective of measuring range or CAL output range, it is determined by the bridge resistance of the strain sensor.

Output value of each bridge resistance is described in the following table.

Bridge Resistance [Ω]	Output [$\mu\text{m/m}$] *
120	Approx. 80
240	Approx. 176
350	Approx. 257
700	Approx. 515
1000	Approx. 735

Expression

$$\text{Output value} = \frac{\text{Bridge resistance}}{1360 \times 10^3} \times 10^6$$

*: +CAL and -CAL is same output. Accuracy is approximately $\pm 5\%$.

Measurement

After the entire settings are complete, select 0) Exit on the CH Condition window to return to the EDX-2000A initial window.

Here, select 1) Measurement to start the measurement with determined CH conditions.

NOTE

For details of data recording or data reproduction, refer to EDX-2000A Instruction Manual.

MEMO

Window examples are taken from the EDX-2000A windows. When using the CDV card by installing to the EDX-100A, refer to DCS-100A Dynamic Data Recording Software Instruction Manual for EDX-100A Operation.

6. HOW TO SET ANTI-ALIASING FILTER (CDV-40A/B-F)

Set anti-aliasing filter in due order as described in Figure 1.

If you cannot set the anti-aliasing filter even if in due orders according the following procedures, see “7. PRECAUTIONS FOR SETTING ANTI-ALIASING FILTER.”

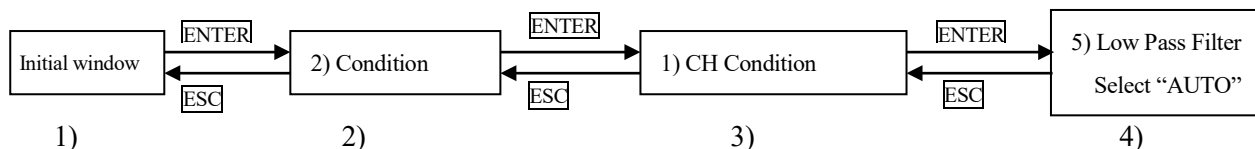
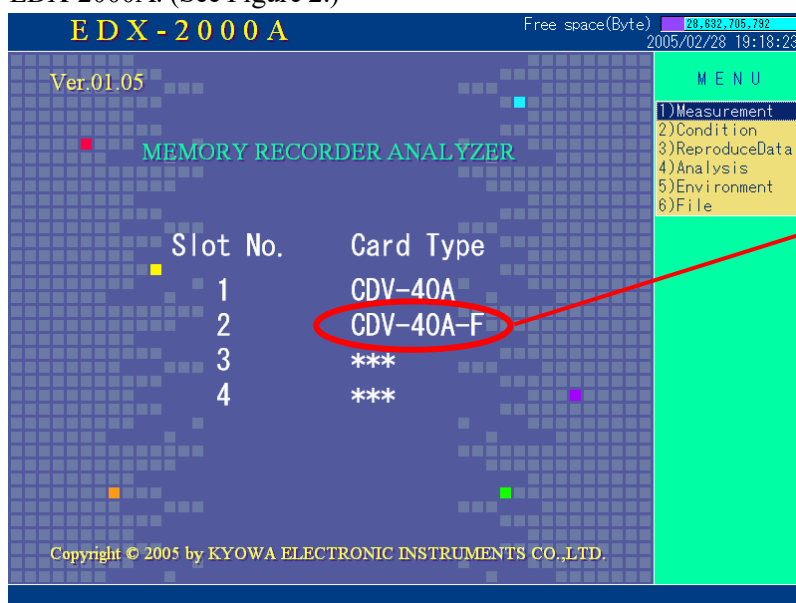


Figure 1. Operational Flow for Setting Anti-aliasing Filter

- 1) After starting up the EDX-2000A, check whether or not the CDV-40A-F or CDV-40B-F is installed in the EDX-2000A. (See Figure 2.)



The left window shows that CDV-40A-F is installed in the 2nd Slot.

Figure 2. EDX-2000A Initial Window

- 2) Select 2) Condition on the initial window to display the following window as shown in Figure 3.

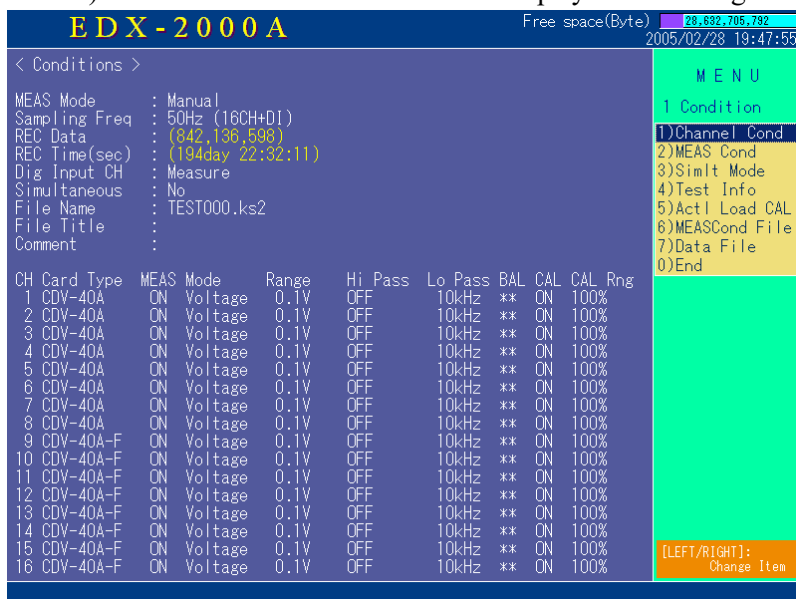


Figure 3. Set Condition Window

- 3) Select 1) CH Condition on the Condition Window to display the following window as shown in Figure 4.

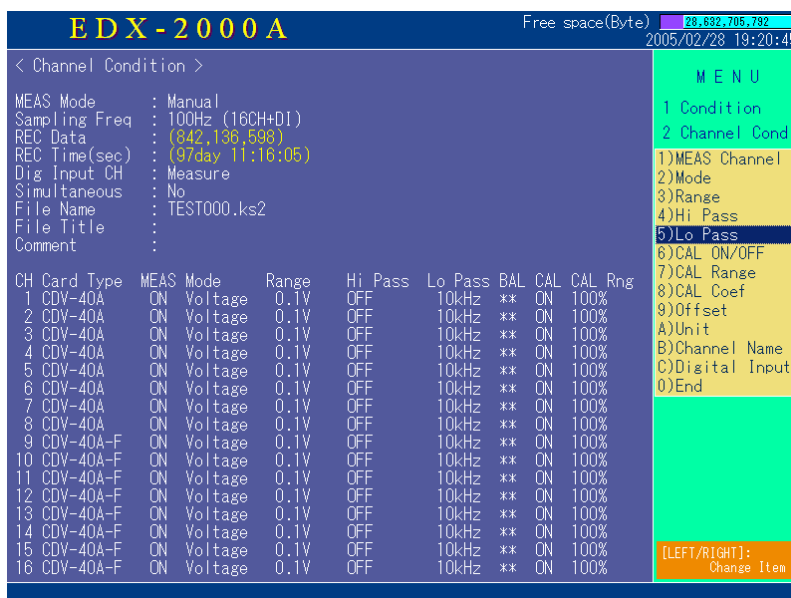


Figure 4. CH Condition Window

- 4) Select 5) Low Pass Filter on the CH Condition window to display the following window in Figure 5.

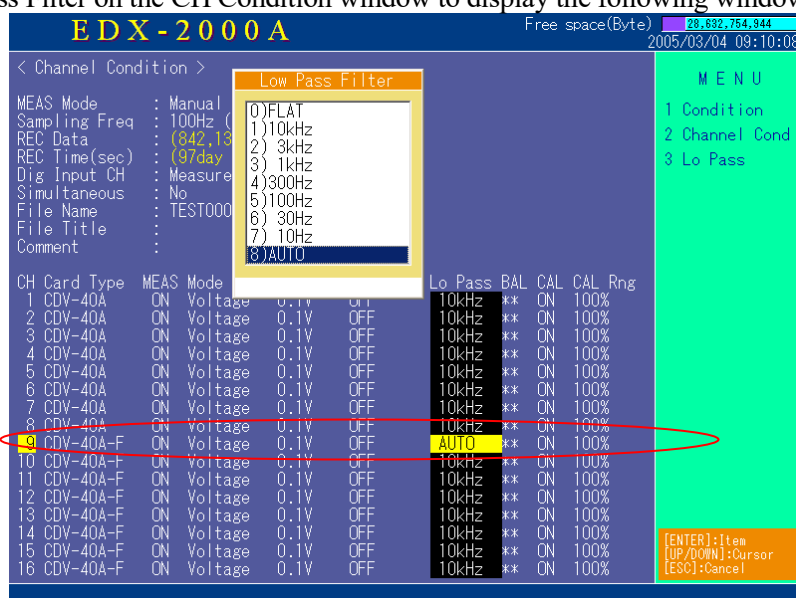


Figure 5. Set Low Pass Filter Window

In the above Figure 5, Low Pass Filter of the 9th CH is changed from 10 kHz to AUTO. By setting the Low Pass Filter to AUTO, the anti-aliasing filter is set to ON.

MEMO

- Window examples are taken from EDX-2000A windows. When using the EDX-100A, refer to “DCS-100A Dynamic Data Recording Instruction Manual for Software (For EDX-100A Operation).”
- For details except for setting the anti-aliasing filter function, setting methods are in common with the CDV card. Refer to CDV-40A/B related description in EDX-2000A or EDX-100A Instruction Manual.

7. PRECAUTIONS FOR SETTING ANTI-ALIASING FILTER

- When AUTO is not indicated on the Low Pass Filter menu items

Allowable sampling frequency range of the anti-aliasing filter is 100 Hz or more. If the sampling frequency is set to less than 100 Hz as shown in the Figure 6, AUTO does not appear on the Low Pass Filter menu items.

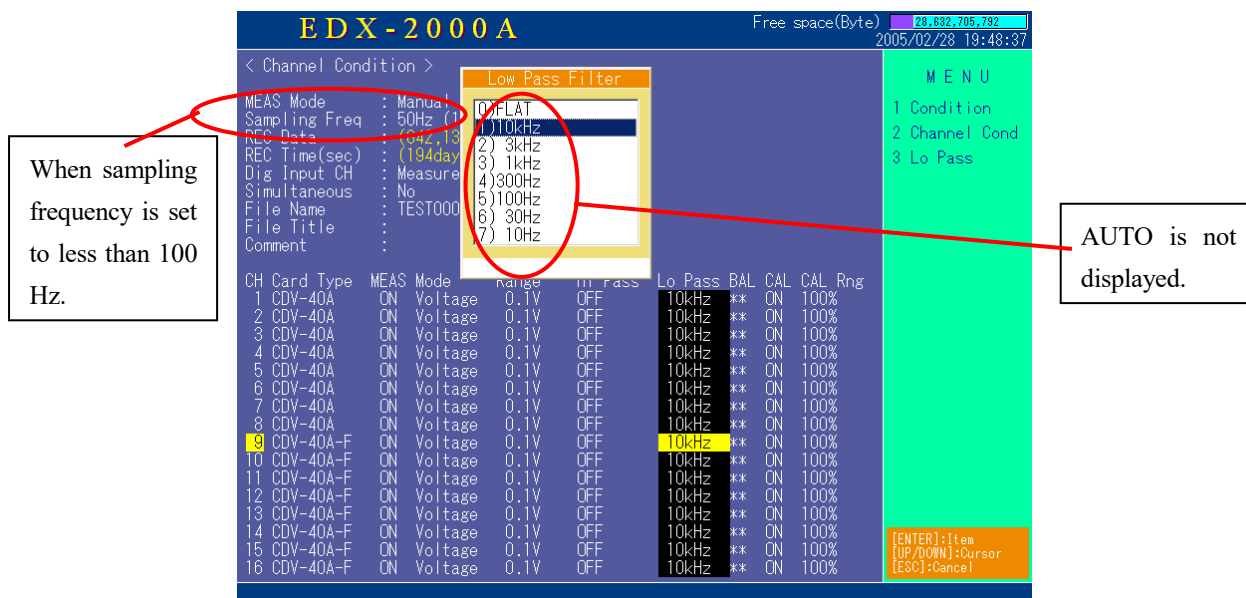


Figure 6. When AUTO is not displayed

To use the anti-aliasing filter, select menus in due order and set the sampling frequency to 100 Hz or more.
Initial Window → 2) Condition → 2) Meas Condition → 2) Sampling

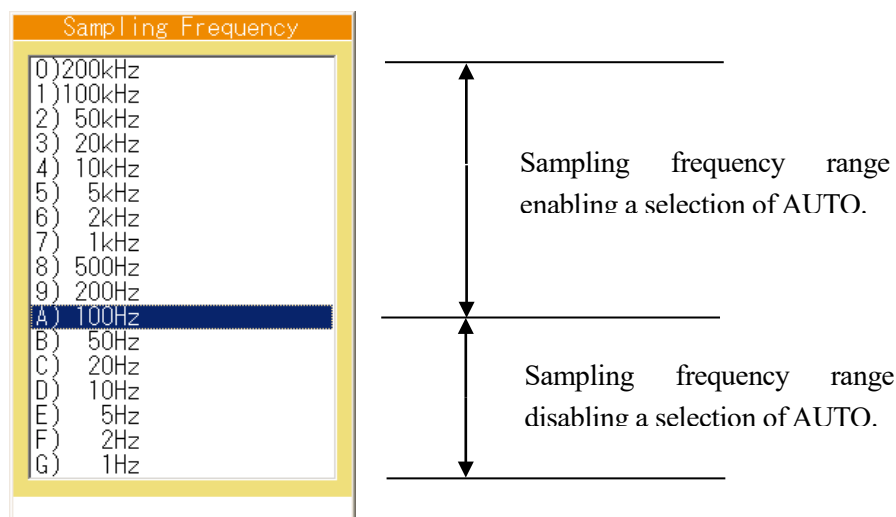


Figure 7. Set Sampling Frequency Window

- When it is required to set sampling frequency to 100 Hz or less

When setting the sampling frequency to 100 Hz or less, in some cases, it is not available to set the sampling frequency to the required 100 Hz. If AUTO is set to any CH on the Low Pass filter menu items, sampling frequencies of less than 100 Hz are not displayed.

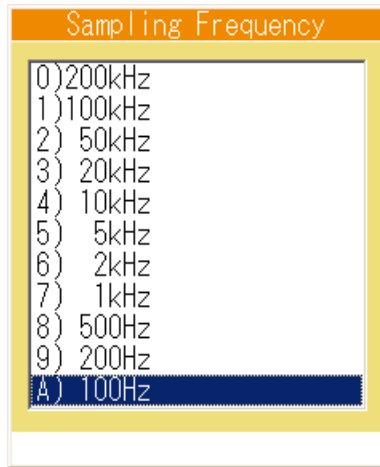


Figure 8. Set Sampling Frequency Window 2

When it is required to set the sampling frequency to less than 100 Hz, it is essential to cancel the setting of the anti-aliasing filter.

To cancel, change the settings of CHs that is set to AUTO in the Low Pass Filter menus to other than AUTO. Then, the setting of anti-aliasing filter is cancelled.

After setting the Low Pass Filter menus of all the CHs to other than AUTO, set the sampling frequency. Then you can select any sampling frequency ranges as shown in Figure 7.

NOTE

- Sampling frequency range

(For EDX-2000A)

When the number of Meas CHs is more than 16, irrespective of the setting of the anti-aliasing filter, the allowable sampling frequency range is up to 100 kHz. Therefore, 200 kHz is not displayed. In the same manner, when the number of Meas CHs is more than 32, the allowable sampling frequency range is up to 50 kHz and sampling frequency higher than 50 kHz is not displayed.

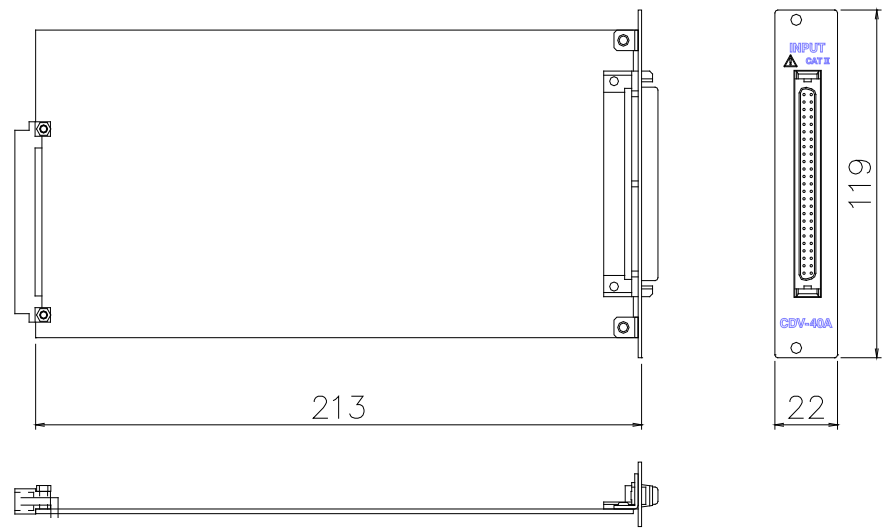
(For EDX-100A)

1 Hz to 100 kHz:	Number of Meas CHs	1CH
1 Hz to 50 kHz:	Number of Meas CHs	Up to 3 CHs
1 Hz to 20 kHz:	Number of Meas CHs	Up to 8 CHs
1 Hz to 10 kHz:	Number of Meas CHs	Up to 16 CHs
1 Hz to 5 kHz:	Number of Meas CHs	32 CHs
1 Hz to 1 kHz:	When recording CAN data	

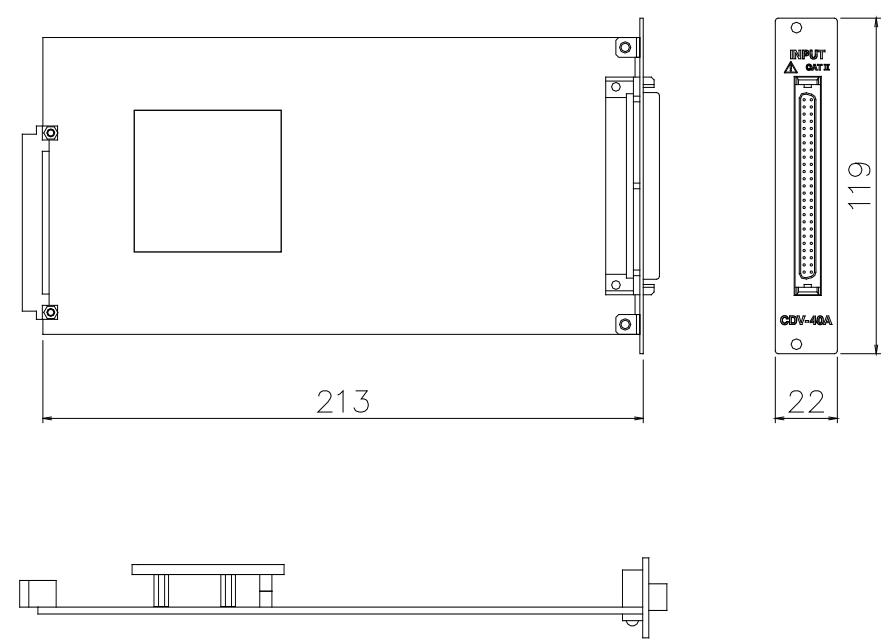
When setting Low Pass Filter to AUTO, the sampling frequency shall be “100 Hz or more.”

8. OUTSIDE DRAWING

CDV-40A/B



CDV-40A/B-F



9. SPECIFICATIONS

Model Name	CDV-40A/B	CDV-40A/B-F
Items	Strain measurement	Voltage measurement
Number of input CHs	8 (Centralized connector)	
Input format	Balance differential input	Unbalance input
Input resistance	Approx. (10 M Ω + 10 M Ω)	Approx. 1 M Ω
Coupling	DC/AC (DC cut)	
Gage factor	2.00	—
Excitation voltage	DC 2.00 $\pm$ 2% (120 to 1 k Ω)	—
Balance adjustment range	Resistance $\pm$ 2.4% ($\pm$ 12000 μ m/m)	—
Measuring range	8 steps: 500, 1k, 2k, 5k, 10k, 20k, 50k μ m/m and OFF	8 steps: 0.1, 0.2, 0.5, 1, 2, 5, 10V and OFF
Range accuracy	Each range: $\pm$ 0.2% FS (When cable length is 1.0 m)	Each range: $\pm$ 0.2% FS
CAL value	Each range: $\pm$ 100%, $\pm$ 50%	
Nonlinearity	$\pm$ 0.1%FS	
Frequency response range	For DC coupling: DC to 50 kHz Deviation: +1 dB, -3 dB DC cut (For AC coupling): 0.2 or 1 Hz to 50 kHz (See High Pass Filter section.)	
Low pass filter	Transfer characteristics 2nd order Butterworth Cutoff frequency 8 steps: 10, 30 100, 300, 1k, 3k, 10 kHz, and FLAT Amplitude ratio of cutoff point -3 dB $\pm$ 1 dB Attenuation characteristics -12 dB/oct $\pm$ 1 dB/oct	
Anti-aliasing filter (*1)	8th order Butterworth Cutoff frequency Automatically set to Sampling frequency $\times$ 0.25 Cutoff characteristics -48 dB $\pm$ 5 dB (When sampling frequency $\times$ 0.5) Note) When [AUTO] is selected in Low Pass Filter setting	
High pass filter (DC cut))	Cutoff frequency 2 steps: 0.2 Hz and 1 Hz Attenuation characteristics -6 dB/oct	
AD converter resolution	16 bits	
Additional function	Read TEDS built-in sensor information	
Compliance (*2)	Directive 2014/30/EU (EMC) Directive 2011/65/EU,(EU)2015/863(10 restricted substances) (RoHS)	

(*1) Only for CDV-40A/B-F

(*2) Only for CDV-40B, CDV-40B-F