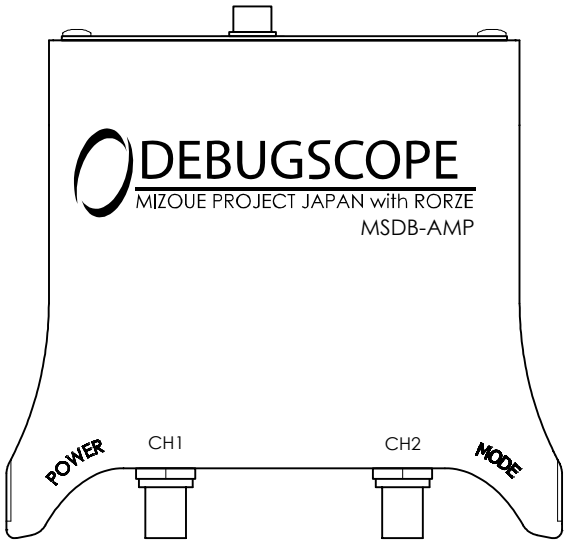
DEBUGSCOPE
MIZOUE PROJECT JAPAN with RORZE

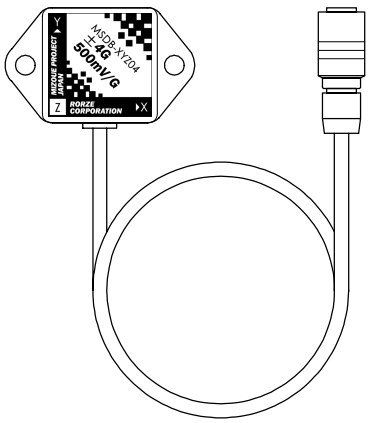
DEBUGSCOPE OPTION

Instruction Manual

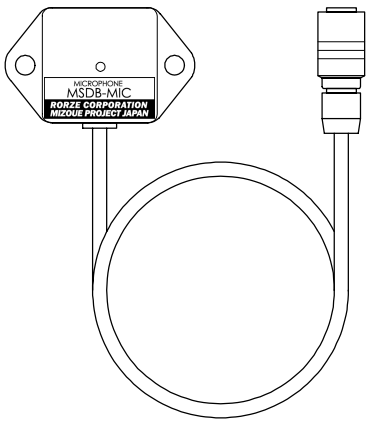
3-Axis Accelerometer (±4G)	MSDB-XYZ04
3-Axis Accelerometer (±12G)	MSDB-XYZ12
Microphone	MSDB-MIC
Sensor Amp	MSDB-AMP



Sensor Amp
MSDB-AMP



3-Axis Accelerometer
MSDB-XYZ04
MSDB-XYZ12



Microphone
MSDB-MIC

Contents

1. Disclaimer

RORZE CORPORATION and MIZOUE PROJECT JAPAN CORPORATION (referred to as "we" hereinafter) would like you to understand in advance that we are not responsible for the damage which is caused by the use or the unavailability of this product to customers or the third party.

We also have no legal responsibilities for the damaged which is caused by negligent use, use without paying attention to descriptions in caution or warning or act of providence. Even though we are informed such usage in advance, we are not responsible for the damage.

Screen of PC in this English manual is different from the actual one in some cases. We do not compensate the damage resulting from wrong descriptions in this manual.

Prior to using this product, for the purpose of correct and safe usage, please be sure to read this manual thoroughly.

2. Safety precautions

In this manual, the warnings are classified according to severity of danger, as shown in the following table.

⚠ WARNING	Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury or damage to the product.
⚠ CAUTION	Indicates a potentially hazardous situation which, if ignored, may result in medium or slight injury or damage to the product and other property.

WARNING

■ Safety precautions

●Do not use the products by connecting other than DEBUGSCOPE.
Connecting to other apparatus may cause a fire or a damage.

●Do not use the products in high humidity or in a dusty environment.
If foreign materials, such as a piece of metal, water or dust invade, it causes ignition or damage or electric shock in some cases.

●Do not use the products by wet hand.
There is a possibility of electric shock.

●The products should not be used where there is flammable gas, combustible gas or explosive gas because there is a possibility of ignition.

●Do not disassemble or modify the products. This may cause a fire, an electric shock, a damage and injuries.

●When abnormal odor, smoke, sound or heat is confirmed, please stop using it immediately and disconnect USB cable and AC adaptor of main body of DEBUGSCOPE
Using the products without correcting the cause may cause a fire and an electric shock.
After confirming smoke has stopped, please contact us or our distributors for repair.
Do not try to repair the products under any conditions.

CAUTION

■ Safety precautions

●Please do not use the products for applications other than measurement.

●Do not use the products by connecting to the cable other than the attached.
It may cause a damage of the product.

■ Handling

●In order to prevent the products from over heat, the products should be used with keeping ventilation around them.

●Store in a place avoiding direct sunlight and use them.

⚠ CAUTION (continued)

●Measurement should be done after setting the range to observe the whole waveform.
The products cannot measure precisely even though the voltage is within rating in some cases if waveform is flame out.

●Turn off the power supply, and connect/disconnect cables to the products.
There is a risk of damaging the products or electric shock.

●It is recommended that the products be operated under low noise conditions.
Measures against noise should be taken if the products are used where a lot of noise from peripheral device or electromagnetic radiation is expected.

●If the products are placed on unstable place, they may fall and be broken.
Use the sensor head fixed with the screw.
Use the sensor amp after inserting its slide into the slide slot of DEBUGSCOPE.

■When not using

●If this product will not be used for a long time, the sensor cable, the BNC cable and the EXT cable should be disconnected.

■Maintenance and inspection

●Please contact us or our distributors for maintenance check or failure is confirmed.

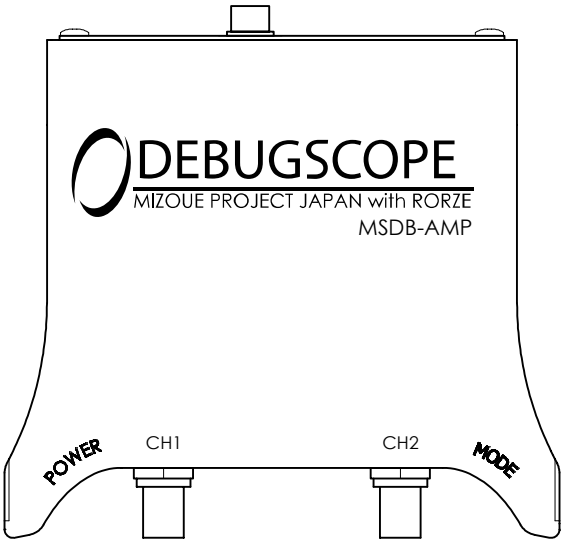
We shall not be liable for any damages to human body (death or injury) if the damages were caused due to not following rules listed in the WARNING and CAUTION sections.

3. Device and accessories

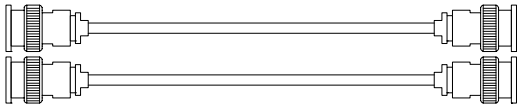
The carton of each product contains the following accessories. Make sure that all items listed below are provided.

◇Sensor Amp

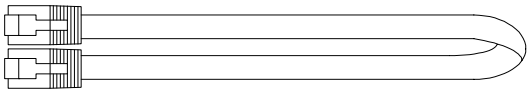
MSDB-AMP ····· 1



BNC Cable (Length: 0.16m) ····· 2



EXT Cable (Length: 0.5m) ····· 1

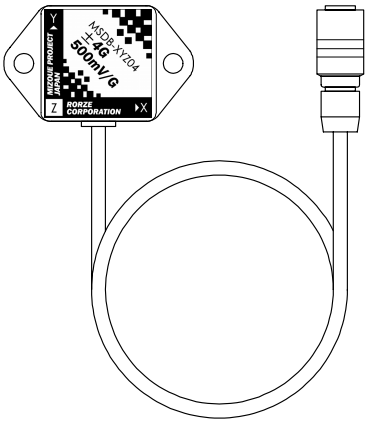


Instruction manual (this document) ··· 1

Warranty ····· 1

◇3-Axis Accelerometer

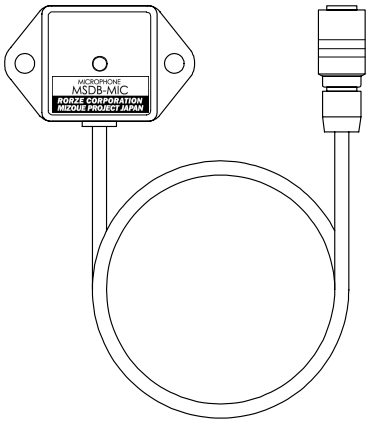
MSDB-XYZ04 or MSDB-XYZ12 ····· 1



Warranty ····· 1

◇Microphone

MSDB-MIC ····· 1



Warranty ····· 1

4. Outline

3-Axis Accelerometer (MSDB-XYZ04,MSDB-XYZ12), Microphone (MSDB-MIC), Sensor Amp (MSDB-AMP) are the options of DEBUGSCOPE (MSDB01R).

In a measurement object like a vibration and a sound, the magnitude of the signal level can be judged by using a vibration meter or a sound-level meter. However, it is difficult to investigate the cause of generation of the vibration and the sound, etc.

If the continuous voltage signal outputs from the products are displayed as the spectrum on FFT viewer screen of DEBUGSCOPE, you can find which frequency is changed and examine in what the frequency originates.

Please do the tuning of the servo motor and the investigation of the cause of generation of the vibration and the abnormal noise etc. by using DEBUGSCOPE and these products.

5. Specification

(1) 3-Axis Accelerometer

<table>
<tr><td>Type</td><td>MSDB-XYZ04</td><td>MSDB-XYZ12</td></tr>
<tr><td>Operating temperature</td><td colspan="2">0 to +50℃</td></tr>
<tr><td>Operating humidity</td><td colspan="2">5 to 85 % (non-condensing)</td></tr>
<tr><td>Number of axes</td><td colspan="2">3</td></tr>
<tr><td>Acceleration detection range</td><td>±4G (*2)</td><td>±12G (*2)</td></tr>
<tr><td>Sensitivity(*1)</td><td>500mV/G ±6% (*2)</td><td>135mV/G ±10% (*2)</td></tr>
<tr><td>(*1)
Zero-g output
(TA=25℃)</td><td colspan="2"><table>
<tr><td></td><td>Min.</td><td>Typ.</td><td>Max.</td></tr>
<tr><td>X,Y</td><td>-0.14V</td><td>0V</td><td>+0.14V</td></tr>
<tr><td>Z</td><td>-0.24V</td><td>0V</td><td>+0.14V</td></tr>
</table></td></tr>
<tr><td>Response frequency</td><td colspan="2">X,Y：DC to 400Hz　Z : DC to 300Hz</td></tr>
<tr><td>Outside dimensions</td><td colspan="2">Sensor head : 44.5(W)×27(D)×20(H)mm
Cable length : 3m</td></tr>
<tr><td>Weight</td><td colspan="2">Approx. 90g</td></tr>
</table>

*1　Sensitivity and zero-g output indicate the output value from sensor amp.

*2　1G=9.80665m/s^2

5. Specification (continued)

(2) Microphone

Type	MSDB-MIC
Operating temperature	0 to +50℃
Operating humidity	5 to 85%(non-condensing)
Microphone transducer	Electret condenser microphone
Directivity	Omni-directional
Sensitivity	Lo: -9.14dB, Hi: 0.67dB (0dB=1VPa,1kHz) (*3)
Frequency characteristics	200Hz to 16kHz
Outside dimensions	Sensor head : 44.5(W)×27(D)×20(H)mm Cable length : 3m
Weight	Approx. 80g

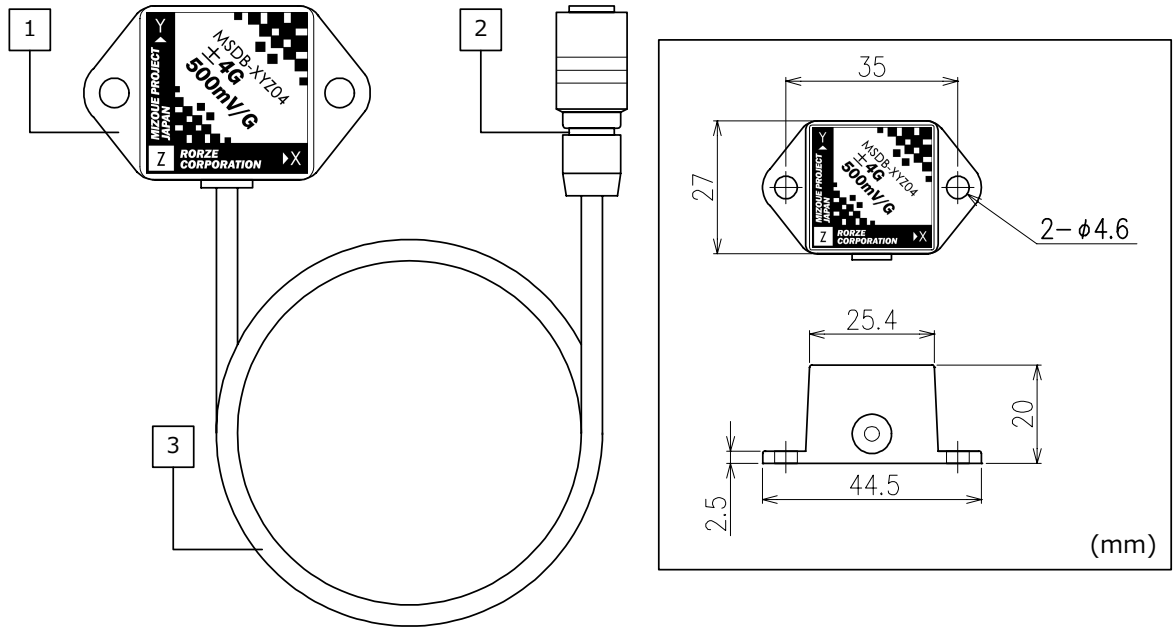
*3 Sensitivity indicates the output value from sensor amp.

(3) Sensor Amp

Type	MSDB-MIC	
Supply voltage	5VDC Input from DEBUGSCOPE(MSDB01R) EXT (extended terminal)	
Consumption current	3-Axis Accelerometer + Sensor Amp	40mA(typ.)
	Microphone＋Sensor Amp	35mA(typ.)
Operating temperature	+5 to +35℃	
Operating humidity	5 to 85% (non-condensing)	
Voltage output range of sensor signal	-3 to +3V	
Outside dimensions	117.5(W)×36.9(H)×131(D)mm (excluding the protrusion of the back and the bottom)	
Weight	Approx. 200g	

6. Names and functions of each part

(1) 3-Axis Accelerometer (MSDB-XYZ04/MSDB-XYZ12)



1 Sensor head

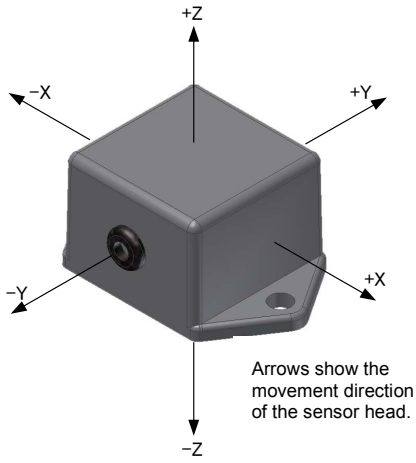
Fix this to the surface that you want to measure.

2 Connector

Connect this to "SENSOR" connector of sensor amp (MSDB-AMP).

3 Cable

Flexible robot cable (about 3m)



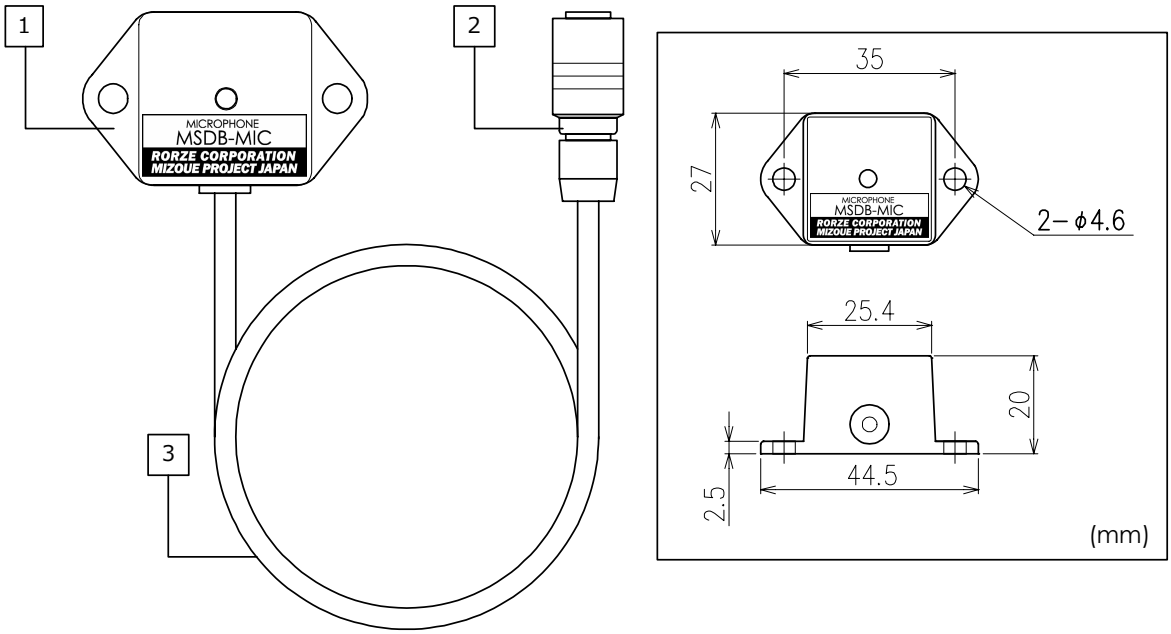
When the sensor head stands still and gravity is not applied to it, the signal of each axis output from the sensor amp shows 0V.

If it moves in either direction or gravity is applied to it, the voltage proportional to the acceleration is output.

For example, in case of SDB-XYZ04, when gravity is applied to it in the direction of -Z, that state is equivalent to accelerating by 1G in the direction of +Z, so 500mV is output to the output channel of Z.

6. Names and functions of each part (continued)

(2) Microphone (MSDB-MIC)



1 Sensor head

Be careful not to close the hole at the center of the microphone.

2 Connector

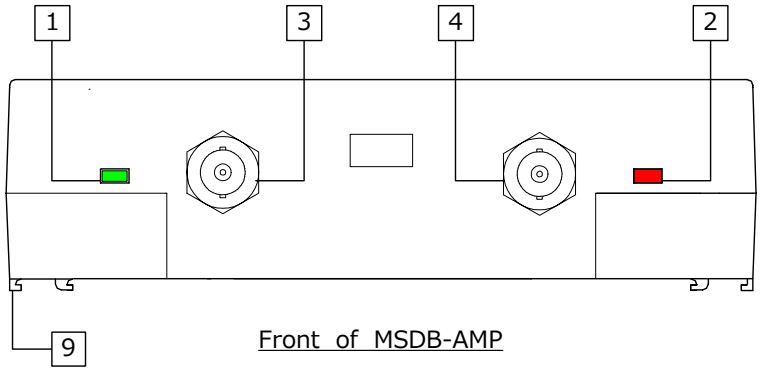
Connect this to "SENSOR" connector of sensor amp (MSDB-AMP).

3 Cable

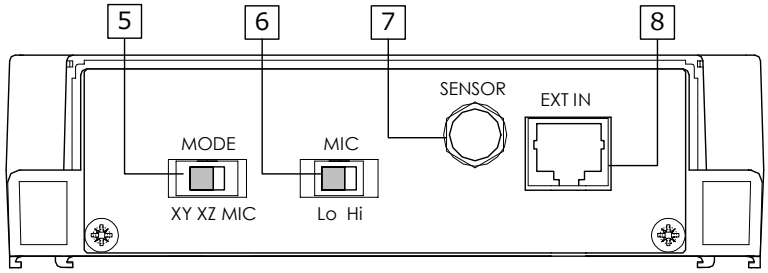
Flexible robot cable (about 3m)

6. Names and functions of each part (continued)

(3) Sensor Amp (MSDB-AMP)



Front of MSDB-AMP



Back of MSDB-AMP

1 POWER indicator (green)
Lights when the power is turned on.

2 MODE indicator (red/orange/yellow)

3 CH1 signal output connector
Connect this terminal with the terminal of analog input (CH1) of DEBUGSCOPE through the attached BNC cable.

4 CH2 signal output connector
Connect this terminal with the terminal of analog input (CH2) of DEBUGSCOPE through the attached BNC cable.

5 MODE switch (XY/XZ/MIC)
Switch the signal that you want to output.

6 MIC switch (Lo/Hi)
Switches the microphone sensitivity to high or low. Effective when MODE switch is MIC.

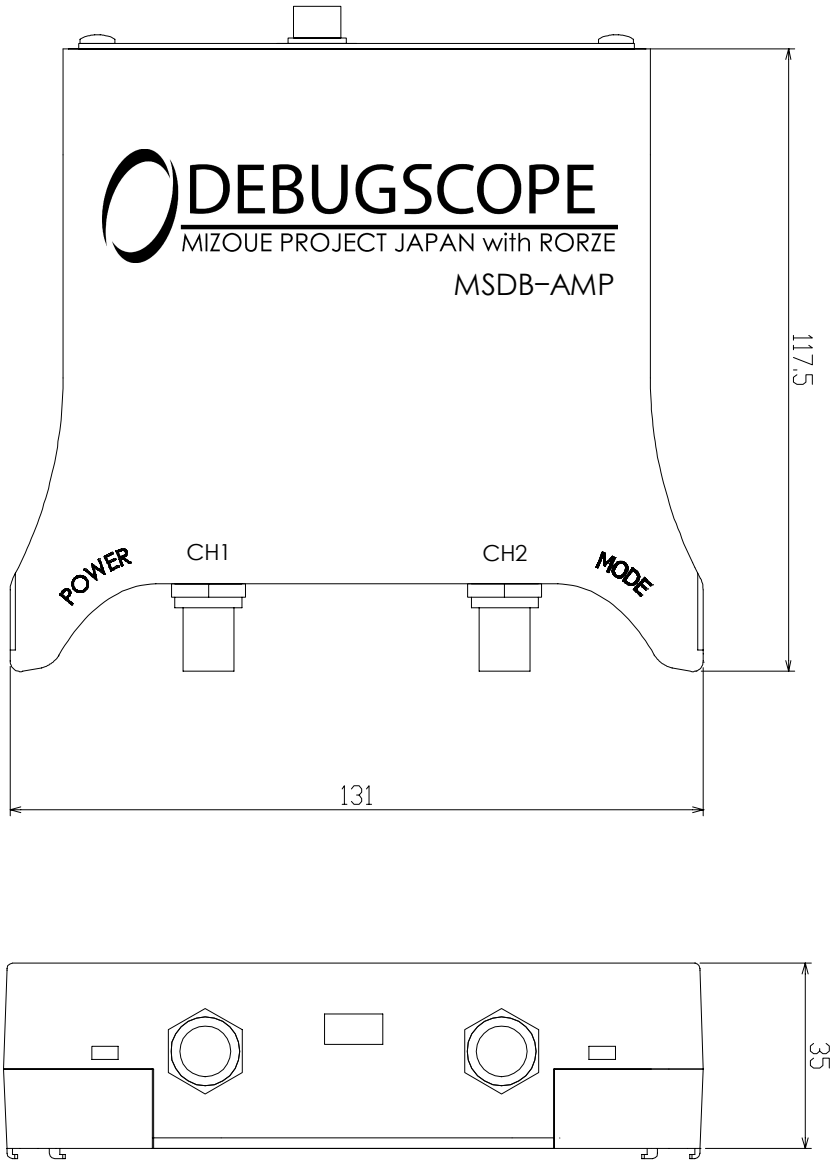
7 SENSOR connector
Connect either the accelerometer or the microphone.

8 EXT IN connector
Connect this terminal with the EXT terminal of DEBUGSCOPE through the attached EXT cable.

9 Protrusion for connection
Insert this into the slot on DEBUGSCOPE to unite.

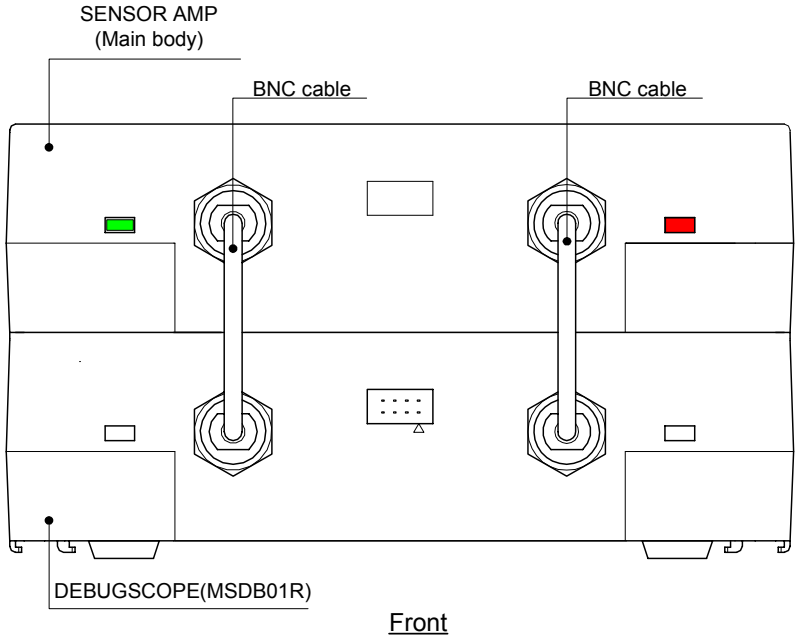
5 MODE switch	Signal output		2 MODE Indicator
	3 CH1	4 CH2	
XY	Acceleration(X)	Acceleration(Y)	Red
XZ	Acceleration(X)	Acceleration(Z)	Orange
MIC	Microphone	–	Yellow

6. Names and functions of each part (continued)

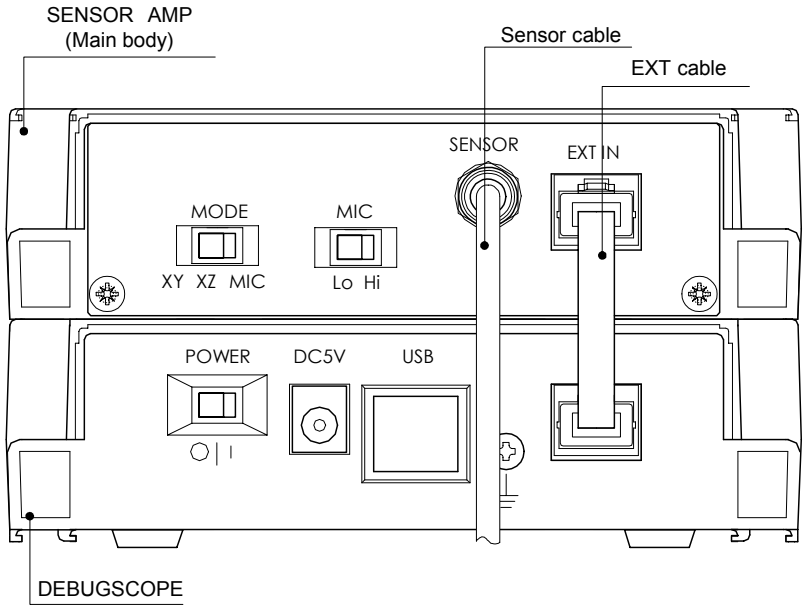


(mm)

7. Connection



Front



Back

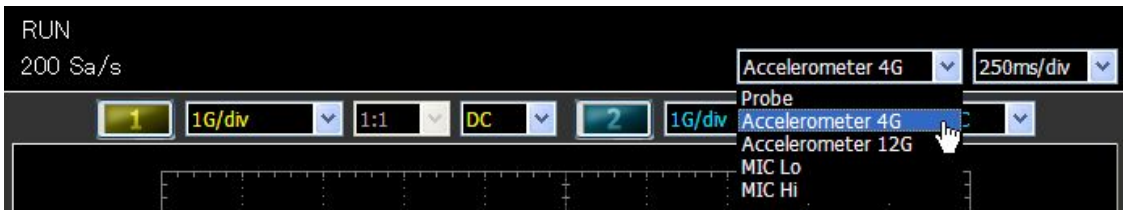
⚠ Cautions when connecting

Do not turn on power to DEBUGSCOPE until all connections are completed.

8. Standard setting

The following table shows the standard setting when using this product.

Sensor type	Sensor amp setting		DEBUGSCOPE input type setting
	MODE switch	MIC switch	
3-Axis Accelerometer ±4G (MSDB-XYZ04)	XY or XZ	—	Accelerometer 4G
3-Axis Accelerometer ±12G (MSDB-XYZ12)			Accelerometer 12G
Microphone (MSDB-MIC)	MIC	Lo	MIC Lo
		Hi	MIC Hi



* When using an accelerometer and removing a DC component caused by gravity, set input coupling of DEBUGSCOPE to "AC."

9. Measurement of vibration using accelerometer

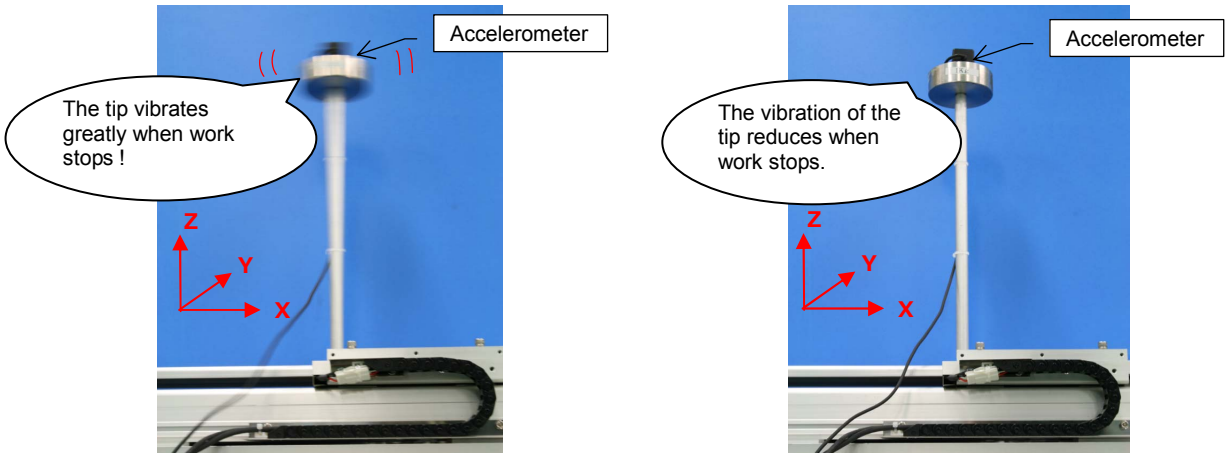
The following shows the example in which vibration of the tip of the work was reduced by using the vibration control function of the servo amp in the low stiffness system.

< Flow of servo adjustment >

① The vibration frequency at the tip of the work is measured by the accelerometer during positioning.

② Set the measured vibration frequency to the servo amp (vibration control frequency).

③ Enable the vibration control function, operate the work, and measure the vibration during positioning.



(a) Before adjustment (b) After adjustment

Fig. 9.1 Vibration state of the work

(a) Before adjustment (b) After adjustment

Fig. 9.2 Vibration waveform of the work

9. Measurement of vibration using accelerometer (continued)

< Measurement procedure of vibration >

1 Connect 3-axis accelerometer (MSDB-XYZ04) to sensor amp (MSDB-AMP), and fix a sensor head at the tip of the work. (Fig. 9.1)

2 Set the MODE switch of the sensor amp to "XY".
(CH1 and CH2 display the vibration waveform in the X-direction and the Y-direction of the sensor head, respectively.)

3 Turn on power to DEBUGSCOPE and start the software.

4 Click "Measurement" -> "BOTH", "Calculation" -> "FFT" in menu.

5 Operate the system, and if the vibration waveform when the work stops is displayed on the screen, stop measurement by "STOP" button ■.

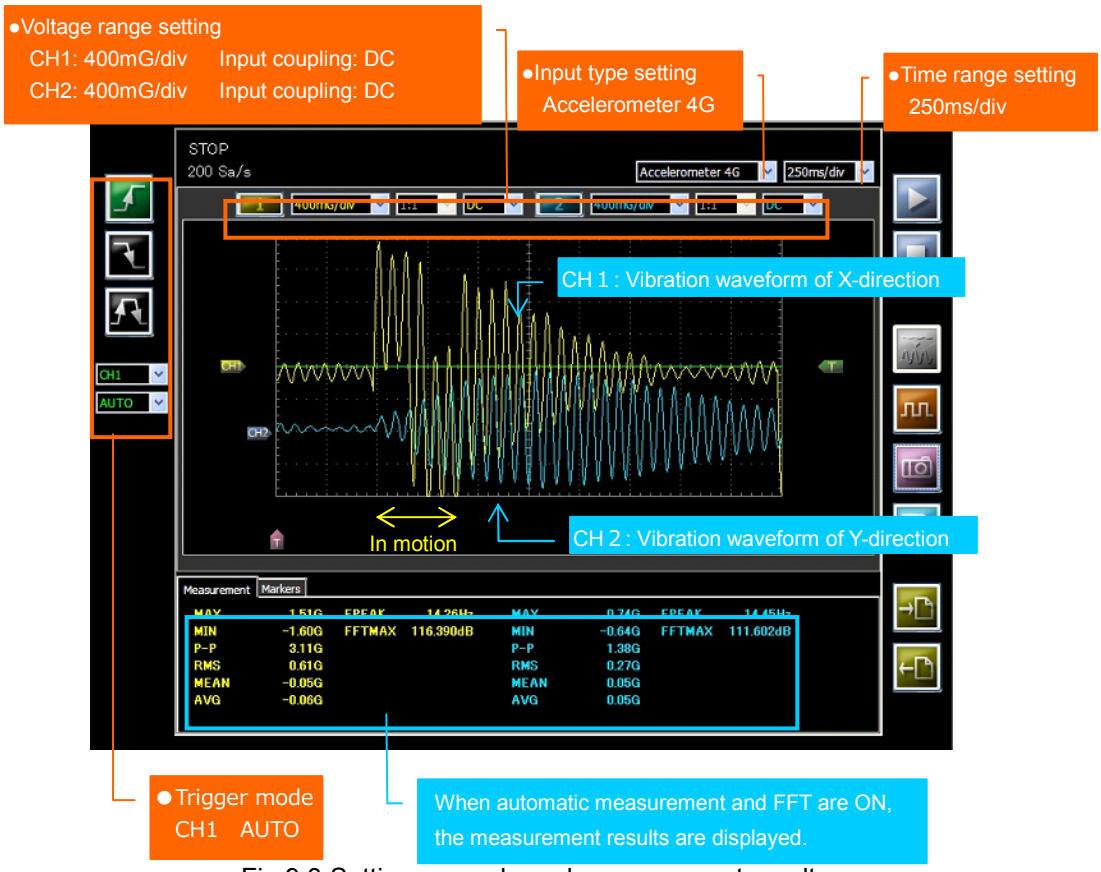
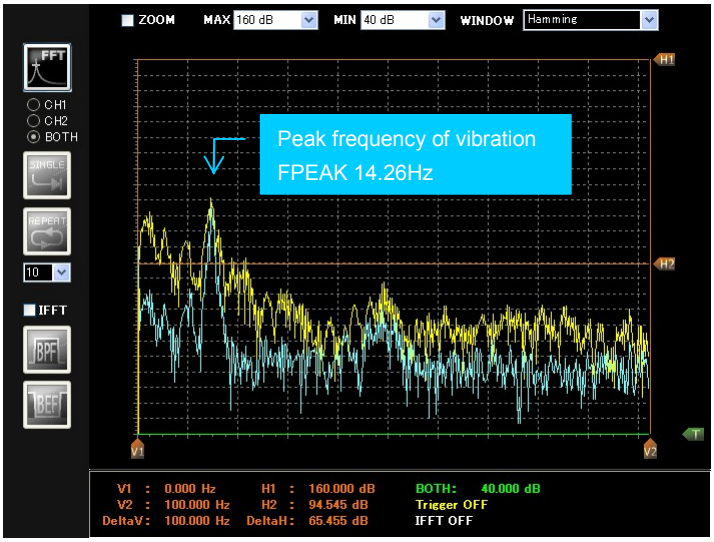


Fig 9.3 Setting example and measurement results

●Set input coupling to "AC" to remove DC component, such as gravity.

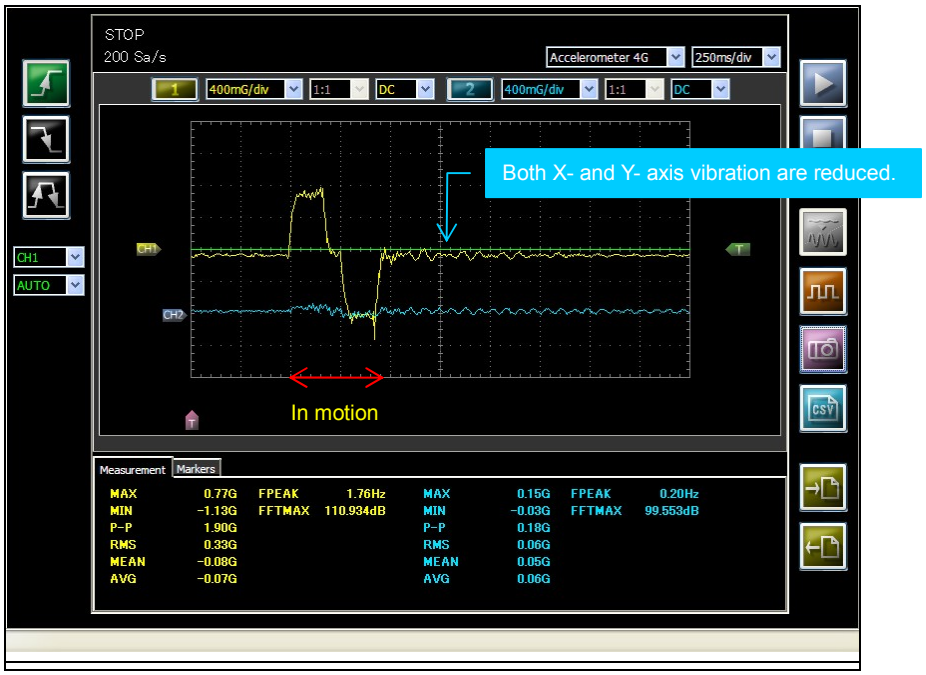
9. Measurement of vibration using accelerometer (continued)

6 Check vibration frequency spectrum by FFT viewer.



7 Set the measured frequency to the servo amp (vibration control).

8 Operate the system, enable the vibration control function of the servo amp, and measure the vibration when the system stops.



- When it is difficult to obtain the vibration frequency from the FFT spectrum, measure the frequency from the vibration waveform using cursor (marker).
- About the details of FFT function or measurement function, refer to DEBUGSCOPE instructions manual.

10. Measurement of sound using microphone

The following shows the example in which abnormal noise from the motor was reduced at the time of servo adjustment.

< Measurement procedure of sound >

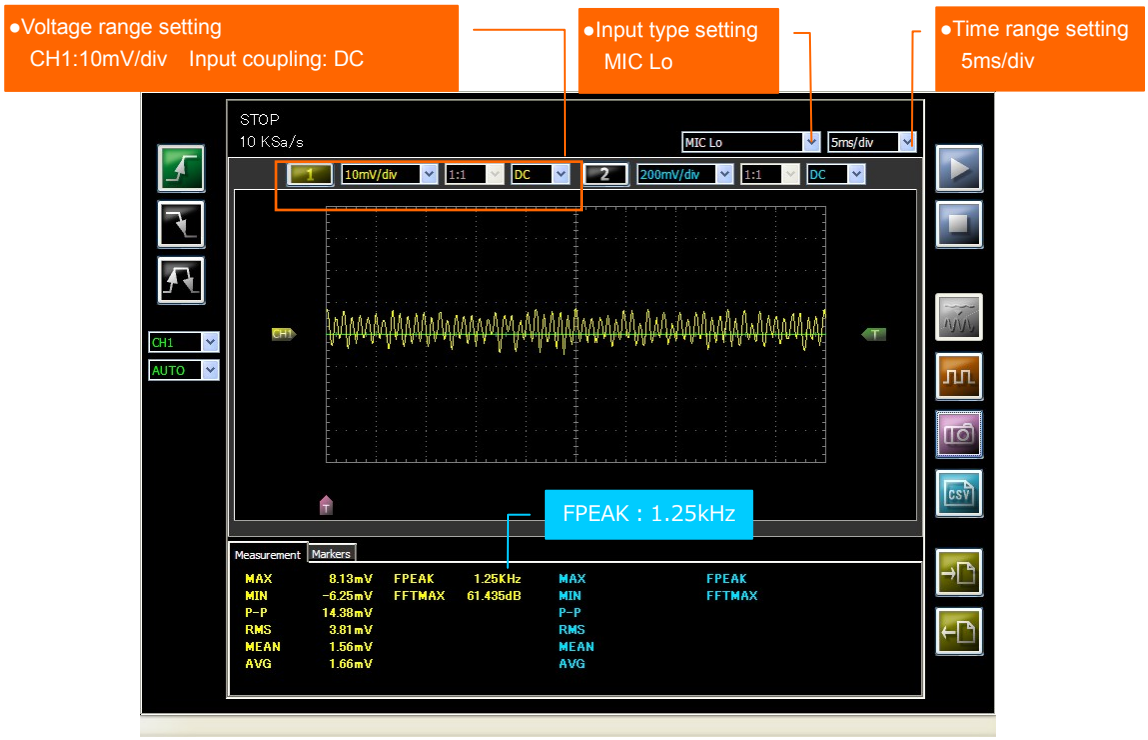
1 Connect Microphone (MSDB-MIC) to sensor amp (MSDB-AMP).

2 Set MODE switch of the sensor amp to "MIC" and MIC switch to "Lo".
(CH1 displays the sound waveform which collected from Microphone.)

3 Turn on power to DEBUGSCOPE and start the software.

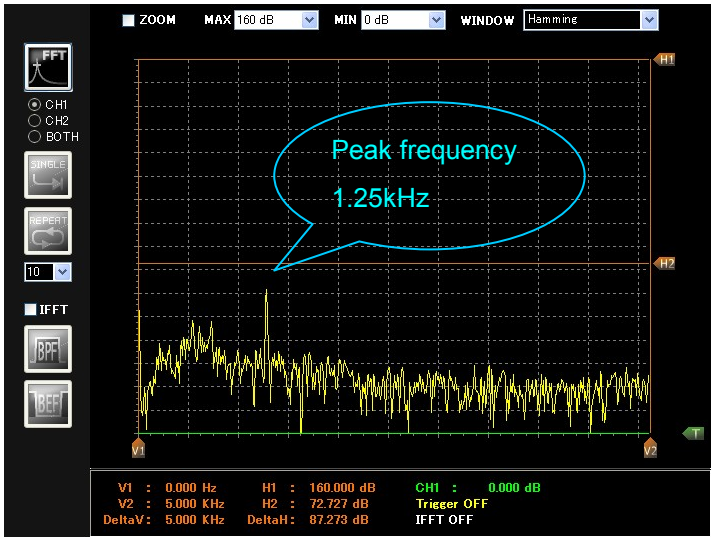
4 Click "Measurement" -> "CH1", "Calculation" -> "FFT" in menu.

5 Measure the motor sound after setting the oscilloscope mode screen.



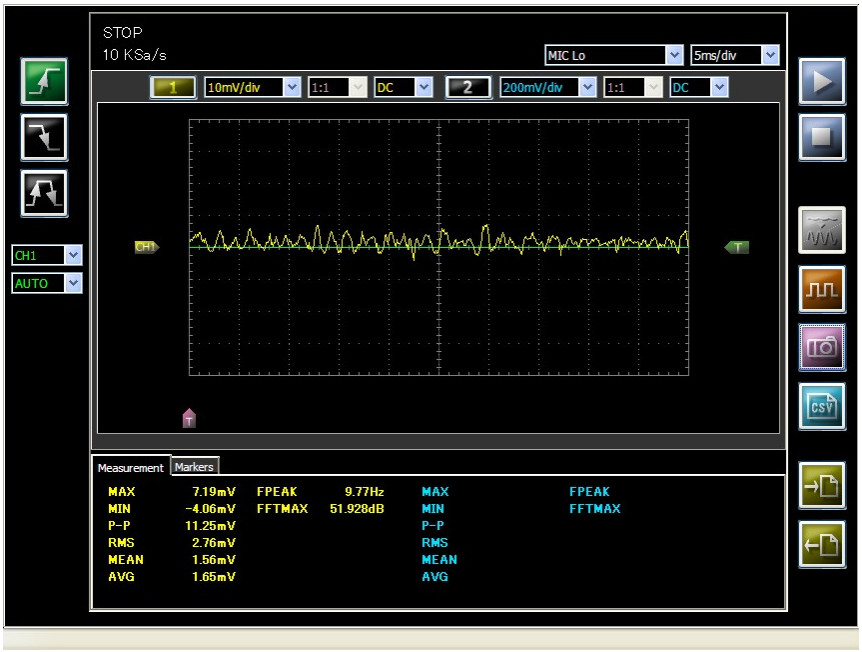
10. Measurement of sound using microphone (continued)

6 Check frequency spectrum by FFT viewer.



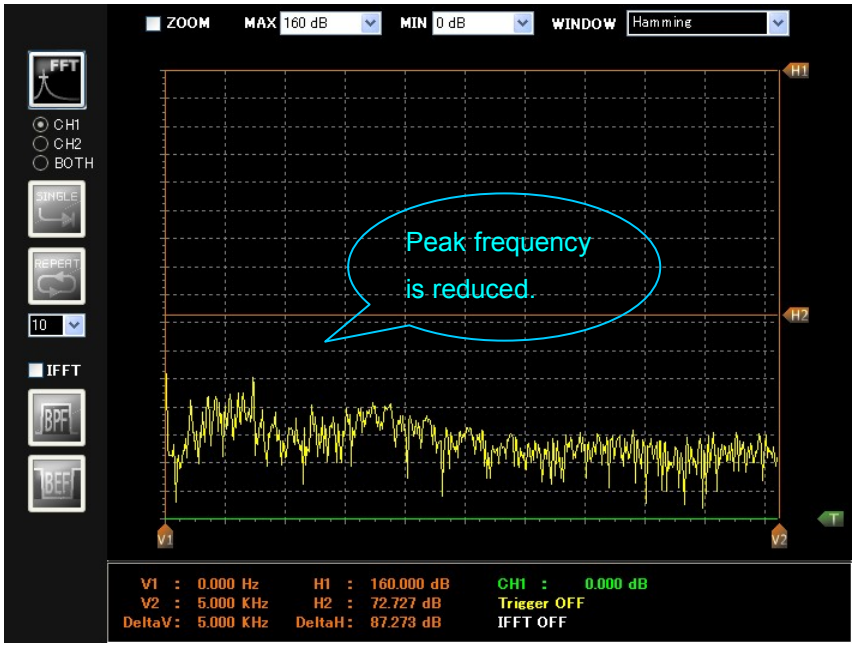
7 Set the frequency of the measured sound to the servo amp (notch filter).

8 Measure the motor sound after setting the notch filter.



10. Measurement of sound using microphone (continued)

9 Check frequency spectrum by FFT viewer.



● About the details of FFT function, refer to DEBUGSCOPE instructions manual.

RORZE CORPORATION

1588-2 Michinoue, Kannabe-cho, Fukuyama-shi, Hiroshima 720-2104 Japan

TEL +81-84-960-0001　FAX +81-84-960-0200

Mail Address　infomail@rorze.com

HP Address　http://www.rorze.com

MIZOUE PROJECT JAPAN CORPORATION

305-1 Takagi-cho, Fuchu-shi, Hiroshima 726-0013 Japan

TEL +81-847-44-6151　FAX +81-847-44-6152

Mail Address toiawase@mizoueproject.com

HP Address　http://www.mizoueproject.com

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