

DS-0342 Servo Analysis Software
Simple Operation Manual
-Resonance frequency measurement using
Amplitude control function-

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-Resonance frequency measurement using Amplitude control function-

This manual describes how to measure the resonance frequency with the exciter using the amplitude control function which swept the sine wave with constant acceleration amplitude to be excited.

As shown in figure 1, attaching the electronic board to the accelerometer, mount the accelerometer to the mounting jig to control the vibration acceleration amplitude (CH1) of this part to be constant. Then, sense the response of the vibration of the component (such as condenser) attached to the electronic board. In this example, the Laser Doppler Vibrometer senses the response vibration speed (CH2) of the part in a non-contact manner.

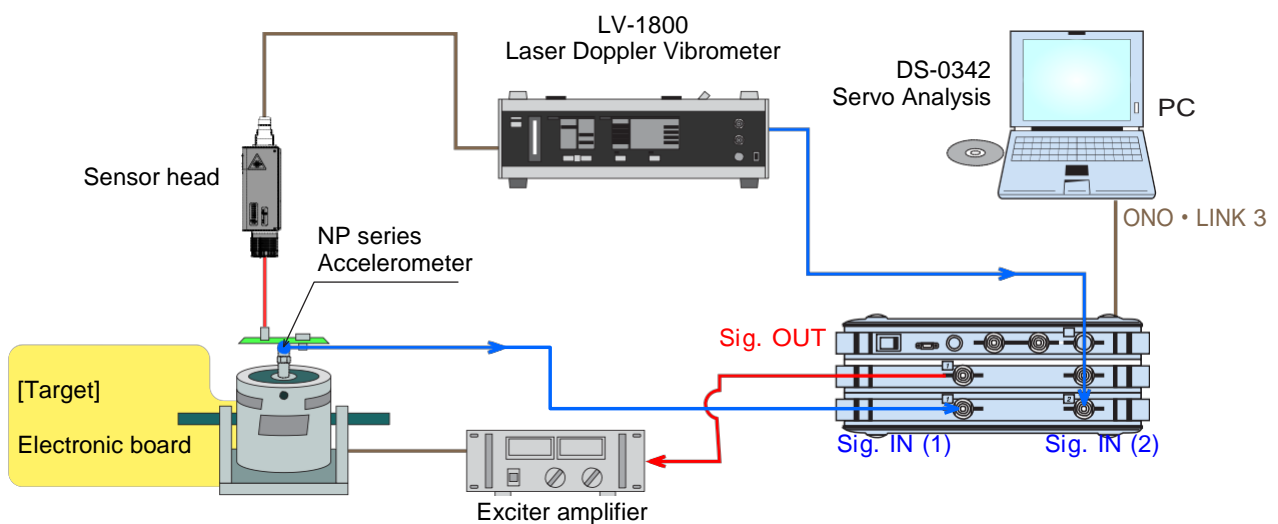


Figure 1: Resonance frequency measurement example
using the amplitude control function

Operation method

1. Select the signal type of "Log Sin", and measure with the log sine sweep mode.
2. Select the frequency range to be swept. Set [Min: 10 Hz, Max: 1 kHz] in here.
3. Select the frequency resolution. Set [Decade/ Line: 40] in here.
4. Select the direction to be swept. Set [L→H] in here.

5. Select the sensitivity of the physical quantity of the input signal. Set in the following order; [Input/ Output Setting] (menu) > [Unit/Cal Setting] > [Cal Setting]. Set each value as follows in here.

Ch1	Accelerometer (m/s ²)	Sensitivity value: 0.001 V/EU
Ch2	Speed (m/s)	Conversion value: 0.1 EU/V

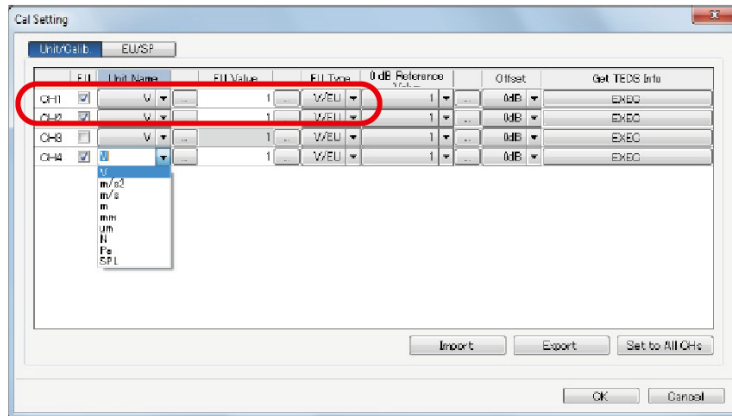


Figure 2: Setting screen of unit calibration

6. Select the output control amplitude. Click Open in the following order; [Input/ Output Setting] > [Servo Analysis Setting] > [Output Amplitude Control].

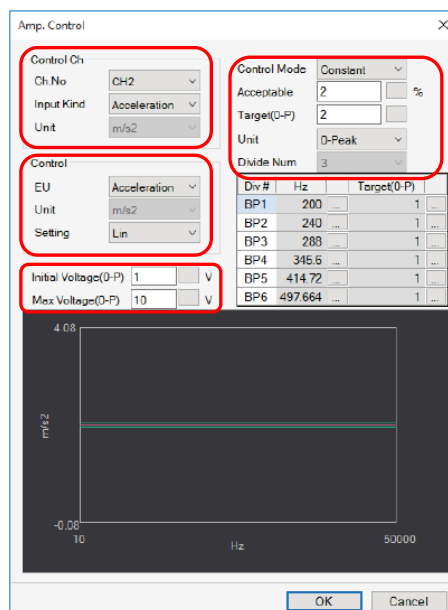


Figure 3: Output amplitude control setting screen

Select each value as follows in here.

- ① Control ch No: Ch1 (Input sensor is acceleration)
- ② Control ch Input Kind: Acceleration (If the sensor unit of the control channel and physical quantity unit to be control are the same, it is controlled according to the setting value. However, if it is different, control amount is calculated (as a unit of acceleration, speed or displacement))

and controlled.

- ③ Control Setting (Lin/Log): Lin (Select whether the set value is linear value or dB value.)
- ④ Control Mode (constant/ division): Constant (Set constant or division at the frequency band to be swept.)
- ⑤ Acceptable: 2% (Set how much tolerance is acceptable to the target value.)
- ⑥ Target: 10 m/s² (Set the target value to be controlled. Follow the setting method of above 3. Select 10 m/s² (approx. 1 G) in here. This value is half amplitude value (0-p value), so when you want to set rms value, input the value which multiplies $\sqrt{2}$ (1.414).
- ⑦ Divide number: 3 (Enabled when the control mode is set as division.)
- ⑧ Initial Voltage: 0.1 V (Select the initial output voltage value when start measurement. Recommend to set at a low voltage not to destroy the target object.)

7. Select signal output. Set in the following order as figure 4; [Input/ Output Setting] (menu) > [Signal Output Setting].

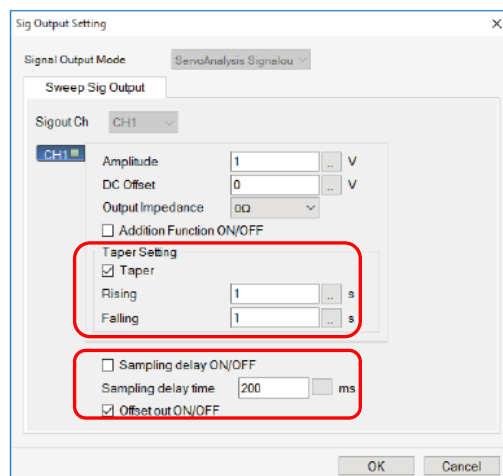


Figure 4: Signal output setting

(Note) This amplitude setting is ignored when the amplitude control setting function mode

- I. Taper setting: This is a function to apply taper to the rising and falling when applying the amplitude of the sine wave to the exciter (see figure 5). Set time in the unit of s (second). Rising time is 500 ms and falling time is 10 ms in here.

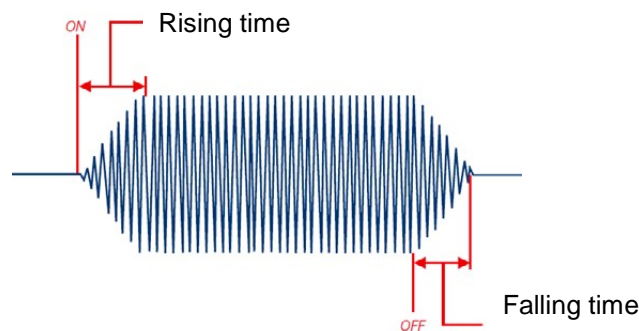


Figure 5: Rising and falling

- II. Sampling delay time: This is a function to delay the start of recording frequency when the signal output reaches to the target value. It is 100 ms in here.

- Press the [START] button of the command tool bar and start measurement. The figure 6 is the power spectrum of reference acceleration (Ch1, blue line) and frequency vibration speed (Ch2, pink line). The vibration is performed at an almost the constant value (20 dB, 10 m/s²).

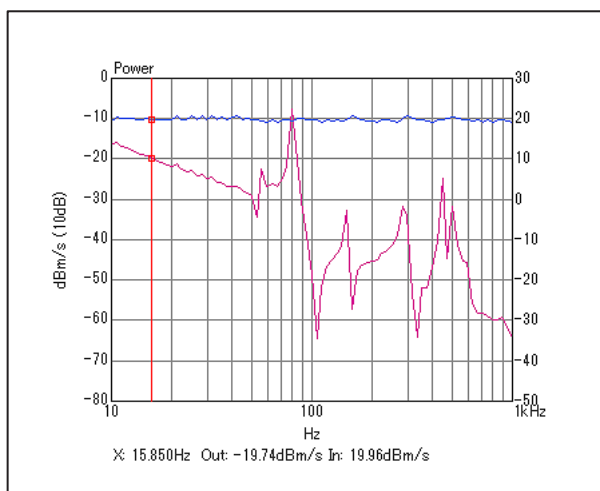


Figure 6: Power spectrum of Ch1 and Ch2 of sine sweep

Transfer function is as figure 7. This transfer function is speed/ acceleration, so it is a graph in which the gain is downwards and the phase is integrated with a phase delay of 90 degrees. Perform first order differential to this data and show as a transfer function of acceleration/ acceleration is in figure 8. You can check several sharp resonance frequencies with this graph.

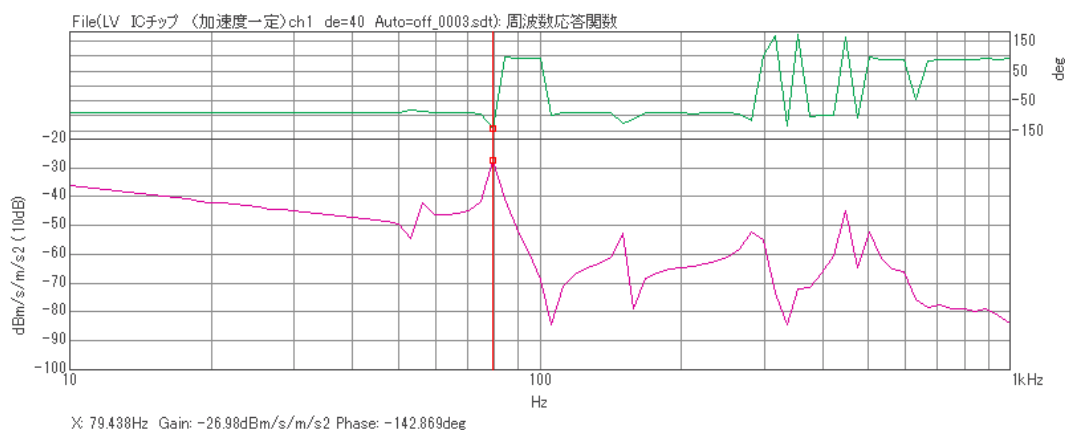


Figure 7: Transfer function of measurement result (Speed/ acceleration)

- Perform the first order differential to the transfer function. Select in the following order; [Analysis setting] > [Frequency calculus] > [First order differential]

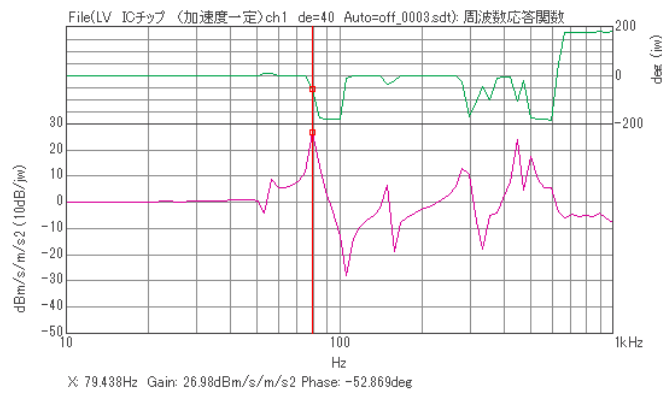


Figure 8: The result of operating first order differential to the measurement result (Acceleration/ acceleration)

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