

DS-0342 Servo Analysis Software
Simple Operation Manual

-Frequency Characteristics of Filter Amplifier-

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This manual explains how to measure the frequency characteristics of the electric system such as filter or amplifier. The connection example is as follows.

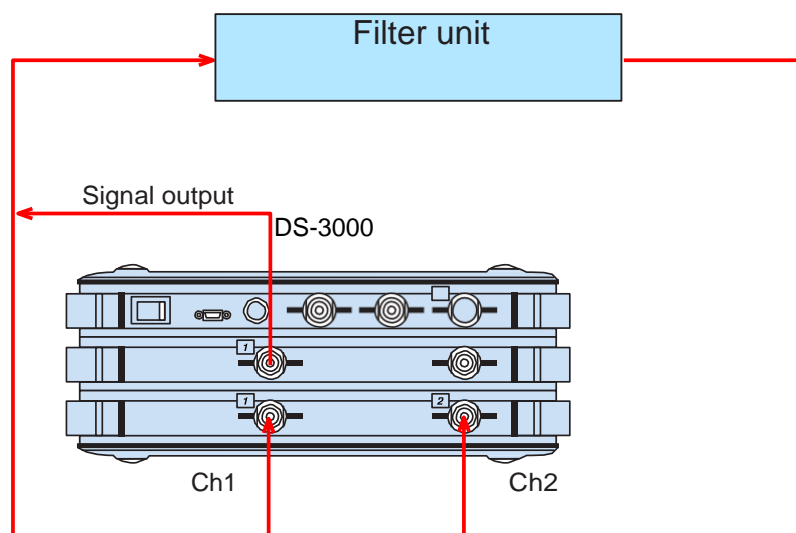


Figure 1: Connection example to measure the filter characteristics

1. FRA mode

1. Select the type of the signal from "Log Sin" or "Lin Sin". Select "Log Sin" in here.
2. Select the frequency range to be swept. Set [Min: 10 Hz, Max: 20000 Hz] in here.
3. Select the direction to be swept. Set [L → H] in here.
4. Select the resolution to be swept. Set [Decade/ Line: 20] in here.
5. Select the number of averaging. Set initial value [2] in here. Select in the following order; [Input/ Output Setting] (menu) > [Servo Measurement Setting] > [FRA Setting] > [Average Num].
6. Select signal output (figure 2). Set in the following order; [Input/ Output Setting] (menu) > [Sig Output Setting]. The output amplitude of sine wave is selected as 0.5 V in here.

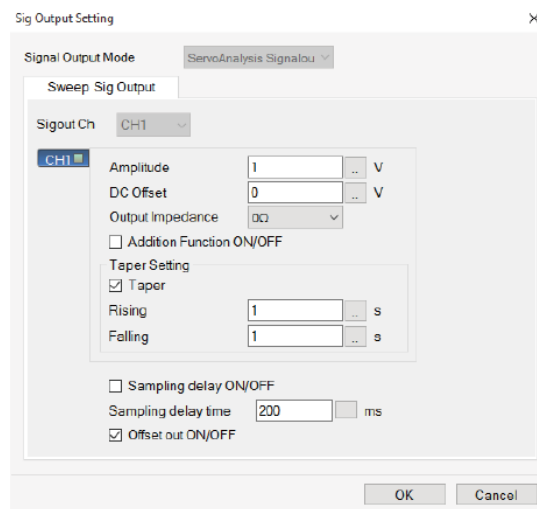


Figure 2: Setting example of signal output

7. Start the measurement by pressing [START] button on the command tool bar. The measurement result is displayed in the figure 3. The measurement time is approx. 24 seconds in this condition.

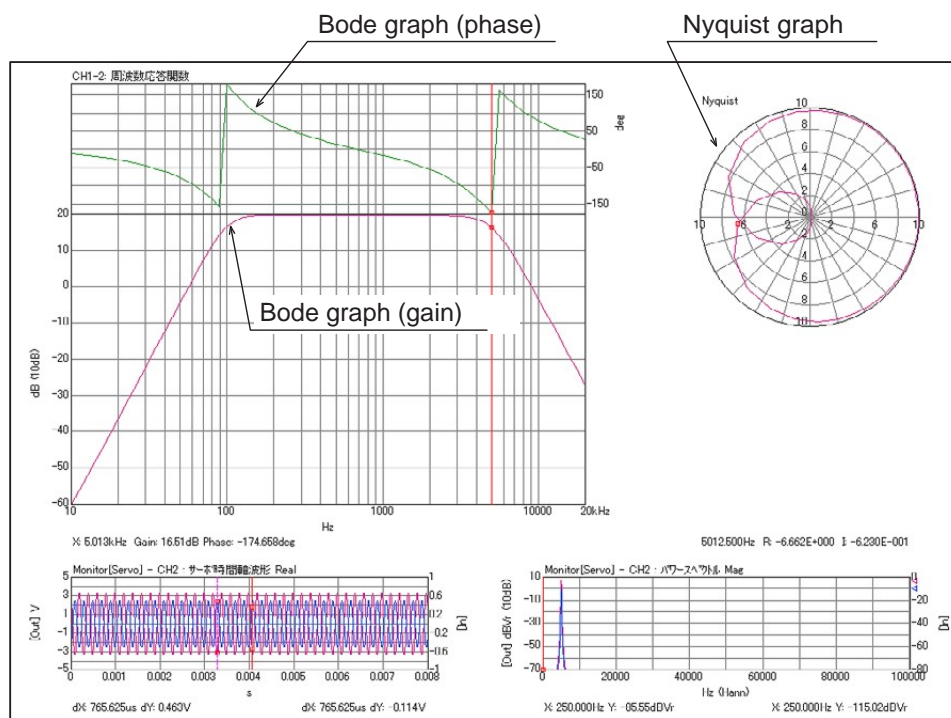


Figure 3: Example of filter frequency characteristics (FRA mode)

The characteristics of this filter from the measurement results:

- Band pass filter of 100 Hz low cut, 5 kHz high cut
- Gain of passing band : 20 dB (10 times)
- As the phase is rotated for 360 deg (2 pi), the filter characteristics is forth order (± 24 dB/ Oct).

2. FFT mode

1. Select the type of signal other than "Log Sin" or "Lin Sin". Select "Pseudo" in here.
2. Select the frequency range to be analyzed. Set [Max. 20000 Hz, measureable frequency range: 25 Hz to 20 kHz] in here.
3. Select the number of FFT sampling points. Set the initial value [2048] in here.
4. Select the number of averaging. Set initial value [100] in here. Set it in the following order; [Input/ Output Setting] (menu) > [Servo Measurement Setting] > [FFT Setting] > [Total Averaging Count].
5. Select the signal output (figure 2). Set it in the following order; [Input/ Output Setting] (menu) > [Sig Output Setting]. Set it as same as FRA mode.
6. Start the measurement by pressing [START] button on the command tool bar. Display the measurement result in figure 4. The measurement time is approx. 3 seconds in this condition.

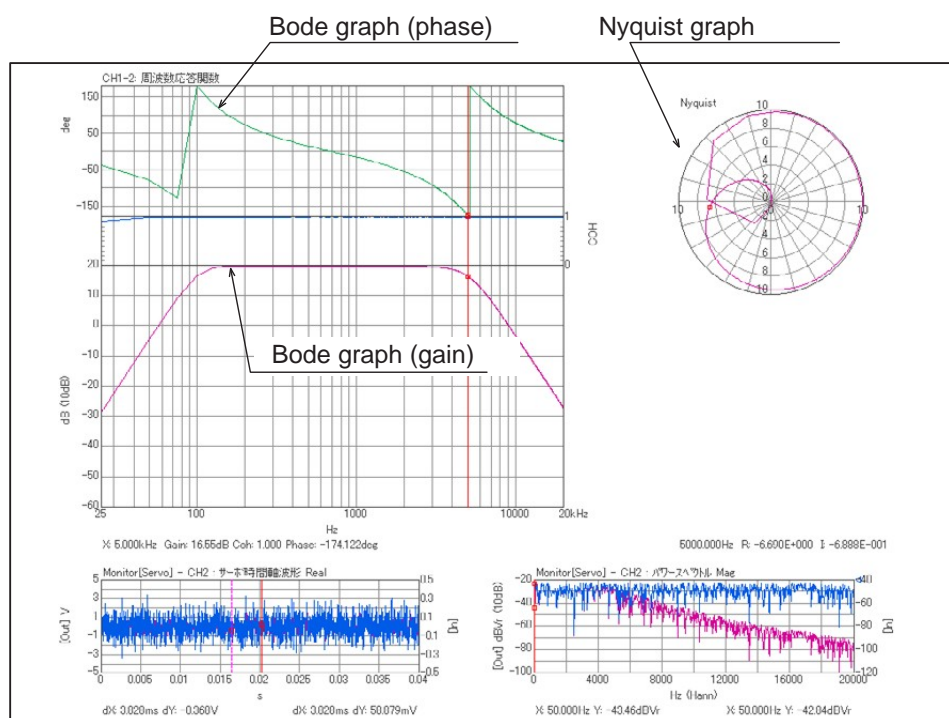


Figure 4: Example of filter frequency characteristics (FFT mode, single range)

FFT mode has linear resolution (800 lines, $\Delta f = 25$ Hz in here), and it is displayed logarithmic to horizontal axis. As you can see from the Nyquist graph, the resolution of the low range is coarse. To avoid the problem of coarse resolution of the low range, use the "Pair Range" mode which measures the frequency range with two bands of high frequency and low frequency.

Set the Pair Range to 1/5;

- Low band: 5 Hz to 4 kHz, $\Delta f = 5$ Hz
- Hi band: 4 kHz to 20 kHz, $\Delta f = 25$ Hz

The measurement results are displayed in the figure 5. The measurement time is approx. 8 seconds in this condition.

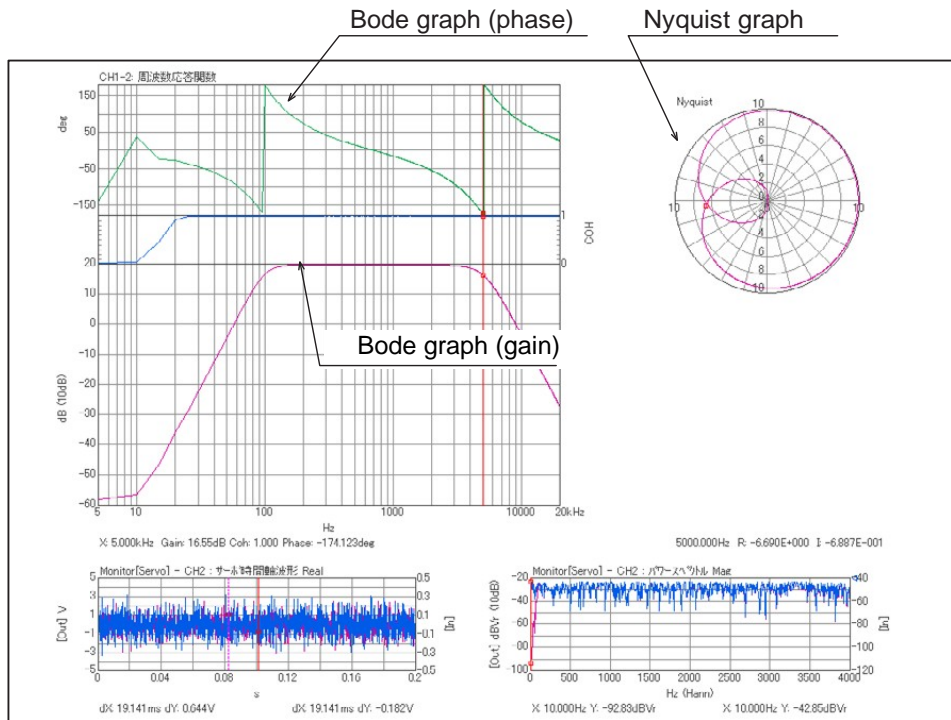


Figure 5: Example of filter frequency characteristics (FFT mode, using Pair Range)

It is clear that the resolution of the low range is improved.

Also, the advantage of the FFT mode is that the measurement time is overwhelmingly short compared with the FRA mode.

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