

Document Reference: AN060014H2

Programmable Digital Filter for Analog Signal Sources

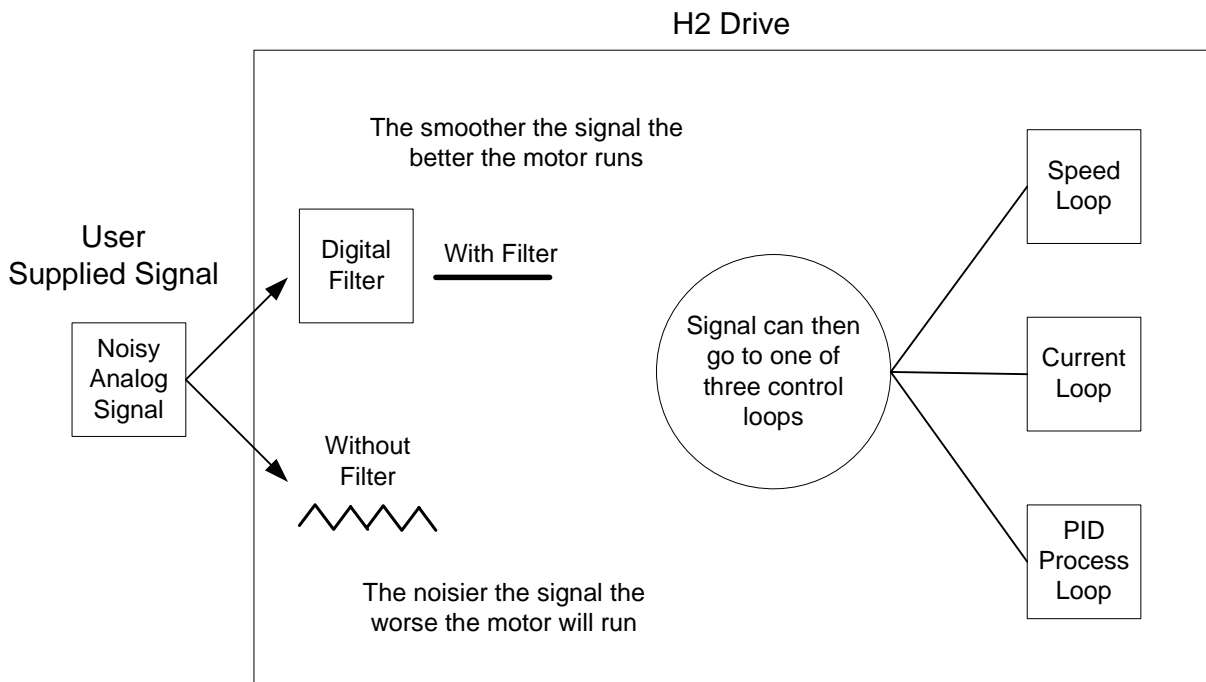
Required Equipment:

- H2 Inverter
- H2 Vector
- H2 Servo

An analog signal feed (voltage or current source) into any of the H2 analog inputs to include the option board inputs for the H2 High Resolution Expansion board EXBHH005A01.

Introduction:

This application note will describe how to use the software filter to reduce or eliminate the effects of noise on analog reference signals used for speed control, torque control, and process control.



Procedure:

The programmable user filter parameters are in:

PROGRAMMING → LEVEL 2 → MISCELLANEOUS

There are six parameters for the programmable digital filter and are listed in table 1.

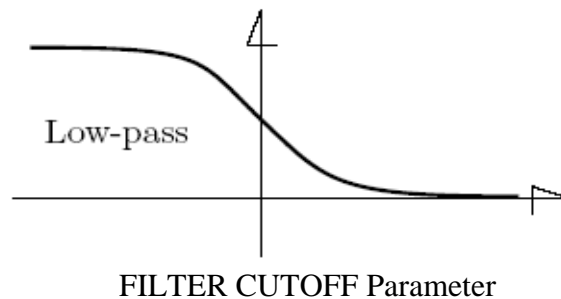
Block Title	Parameter	P#	Adjustable Range
MISCELLANEOUS	FILTER TYPE	2309	0-None 1-Low Pass 2-High Pass 3-Notch
	FILTER SOURCE	2310	0-None 1-Raw Speed 2-Torque 3-Analog Input 1 4-Analog Input 2 5-Opt1 Ana In 1 6-Opt1 Ana In 2 7-Opt2 Ana In 1 8-Opt2 Ana In 2
	FILTER DESTINATION	2311	0-None 1-Speed Loop 2-Torque Loop 3-Speed FFWD 4-Process FBK 5-Process FFWD 6-Process SP
	FILTER CUTOFF	2312	0.00 – 1000.00Hz
	NOTCH CENTER FREQ	2313	0.00 – 500.00Hz
	NOTCH BAND	2314	0.00 – 200.00Hz

Table 1.

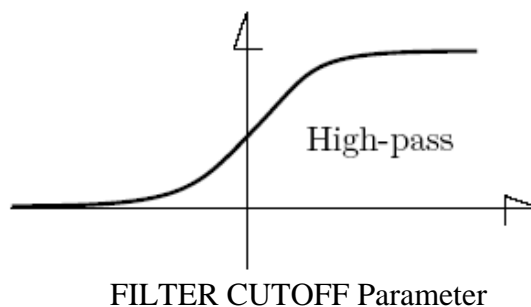
To set up the programmable filter use the following steps:

- Select which signal you want filtered using FILTER SOURCE.
 0. None: This is the default setting and no signal is put into the digital filter
 1. Raw Speed: This is the internal speed reference that the software uses before going to the speed loop no matter where the user sets the reference.
 2. Torque: This is the internal torque reference that the software uses before going to the current loop.
 3. Analog Input 1: This uses the signal on terminal J1-2
 4. Analog Input 2: This uses the signal on terminal J1-4
 5. Opt1 Ana In 1: Selects the signal on terminal J6-2 When the EXBHH005A01 is installed in option port 1

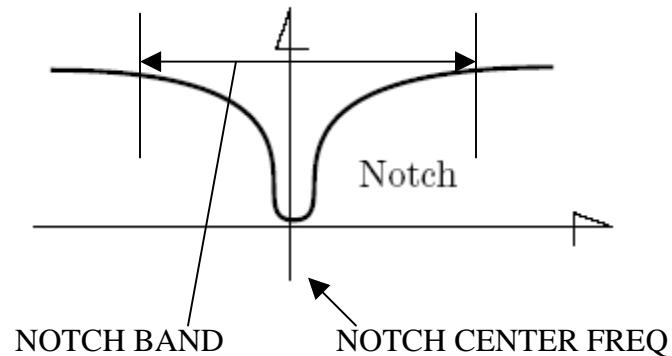
6. Opt1 Ana In 2: Selects the signal on terminal J6-4 When the EXBHH005A01 is installed in option port 1
 7. Opt2 Ana In 1: Selects the signal on terminal J6-2 When the EXBHH005A01 is installed in option port 2
 8. Opt2 Ana In 2: Selects the signal on terminal J6-4 When the EXBHH005A01 is installed in option port 4
- Use **FILTER DESTINATION** to select where you want the **FILTER SOURCE** to go to.
 0. None: The filtered signal is not used
 1. Speed Loop: The filtered signal is sent as the final speed reference to the controls speed loop.
 2. Torque Loop: The filtered signal is sent as the final torque reference to the controls current loop.
 3. Speed FFWD: The filtered signal is sent as the speed reference feedforward signal.
 4. Process FBK: The filtered signal is sent as the PID feedback.
 5. Process FFWD: The filtered signal is sent as the PID feedforward signal.
 6. Process SP: The filtered signal is sent as the PID setpoint signal.
 - Select a **FILTER TYPE**
 0. None: No filter is used.
 1. Low Pass: Only signals with low frequencies below the **FILTER CUTOFF** parameter are passed through the filter.



2. High Pass: Only signals with high frequencies above the **FILTER CUTOFF** parameter are passed through the filter.



3. Notch: This filter will pass only signals that are within the range defined by NOTCH CENTER FREQ and the NOTCH BAND parameter. The NOTCH CENTER FREQ sets the optimum frequency that is allowed from the signal source. The NOTCH BAND will allow frequencies above and below the NOTCH CENTER FREQ set point. The amount of notch band width will depend on how much noise is acceptable.



Summary: Some items to consider when setting up the digital filter:

- Make sure both a source and a destination are specified.
- In selecting the cutoff frequency or notch center and band it may take some parameter tweaking to get it where the process is acceptable. An oscilloscope will be useful in determining hard to find frequencies.
- Filtering may reduce some response time to reference signals. In almost all applications this will be negligible.