Tech Note

Tuning a Low-Inertia System

How to use the gain scaling registers for PID tuning
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Ever have a problem tuning a lower inertia system? For example you may have found that a P gain value of 3 is not enough but a value 4 will cause your system to go unstable. Or perhaps an Integral gain of 1 is not enough but 2 is too much. Well the BlueFusion has a gain scaling register that will take care of this issue. This register will affect all the gain values including P, I and D for the specified servo axis.

Register 16169, 16179, 16189, and so on are the gain scaling registers for axis 1, 2 and 3 respectively. The default value for these registers is set to 8, so when you find you don't have enough "resolution" in your gain values, simply lower this value.

On the other hand, perhaps you have a very high inertia system and a P gain of 255 (the maximum allowed value) does not give you enough gain. In this case simply increase the 16169 register value and you will get more gain out of your system.

Note: This register should be set before you profile your motor with your PID values.
A simple
Store 7 to reg_16169
will make a P gain of 8 half of what it is by default on axis 1.

In other words:

If p=8 when 16169=8 then to achieve the same gain results,
p=4 when 16169 is 9 or
p=2 when 16169 is 10 or
p=16 when 16169 is 7 or
p=32 when 16169 is 6

Let's take a closer look at the case where we find that a P Gain of 3 is not enough and 4 is too much. Here's how decreasing the Scaling Register affects our available adjustment range on the P gain.

Scaling Register 16169 set to	P gain settings		Available Adjustment Range
	Too Low	Too High	
(default setting) 8	3	4	0
7	6	8	1
6	12	16	3
5	24	32	7
4	48	64	15
3	96	128	31
2	192	255	62