AD5820 Evaluation System QuickStart Guide

Introduction
Welcome to the AD5820 Evaluation System. Please follow the steps below to get your evaluation systems up and running.

Before you connect your evaluation board to the PC please ensure that the AD5820 Evaluation Software has been installed. This will install the necessary evaluation software and also ensure that the PC will recognize the evaluation board when it is connected via the USB port.

Software Installation
Install the AD5820 evaluation software version 1.0 using the attached CD. After inserting the CD, the "AutoRun" software should install the software for you. If this does not happen, then 'double-click' the **installer\setup.exe** file to install LabView based evaluation software. You are now ready to connect the evaluation board to the PC via the USB port.

Hardware Setup
Please refer to Figure 1 below for evaluation board setup.
If the jumpers are set as in figure 1 below, the AD5820 will be powered from the USB port.

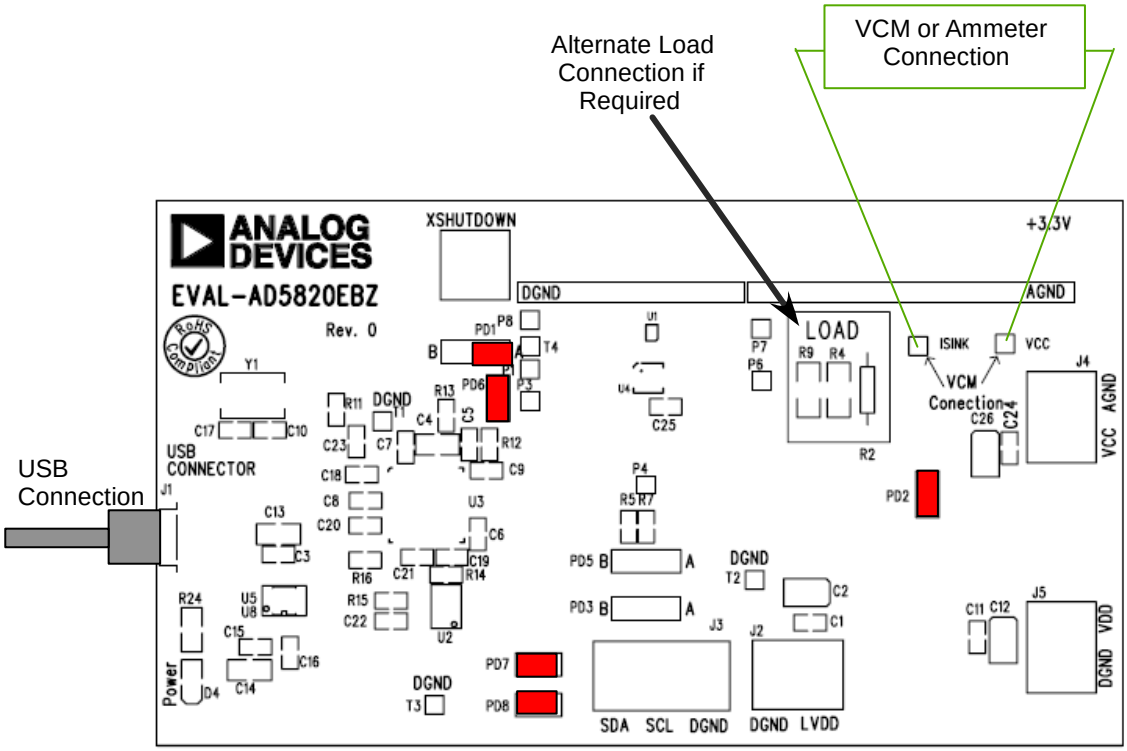

Figure 1. Board configuration and jumper setting.

OUTPUT SLEW RATE CONTROL

The AD5820 is designed to drive both spring preloaded and nonspring linear motors used in applications such as lens autofocus, image stabilization, or optical zoom. The operation principle of the spring-preloaded motor is that the lens position is controlled by the balancing of a voice coil and spring.

The requirement to reduce optical module form factors has led to a reduction in the size of VCM actuators. As VCM actuators reduce in size, the preloaded balance spring strength also reduces. When large current transitions occur, the momentum of the lens can often lead to overshoot and VCM can take some time to settle to its final position. This phenomenon, often described as mechanical ringing, varies with output current step size and for large lens displacements can lead to unacceptably long auto focus times. The AD5820's unique and proprietary output slew rate control design allows the user to overcome the mechanical limitations associated with reductions in VCM form factor.

The AD5820 uses an innovative and proprietary scheme to provide the user with the option of three slew rate control modes. These control modes are exercised via the I2C bus and are controlled by bits S3 to S0 (bit 3 to bit 0) in the data byte. Table 8 describes the AD5820 slew rate control modes. The AD5820 contains an 20kHz integrated clock generator and divider circuitry. This clock generator controls the transition step duration when the Slew Rate Control bits S2 to S0 are used.

Table 9 shows the truth table and current transition step size for the slew rate control options. The slew rate control mode feature of the AD5820 allows the user to customise output transition times and where mechanical ringing is an issue the AD5820 output can be programmed to effectively decelerate the lens movement as it approaches its target position; thereby reducing the overshoot and minimising mechanical ringing.

Table 1. Slew Rate Control Modes

Mode 0 **Direct Load Mode**

When S2, S1 and S0 are zero (code 0 and code 8 in the table below), the output will go to the target code within the AD5820 settling time. This is software compatible with the AD5398 and the AD5821.
S3 has no effect when S2 to S0 are zero.

Mode 1 **Linear Ramp Mode**

When S3 is zero and S2 to S0 are non-zero (code 1 to code 7 in the table below), the output will increment/decrement to the target code in single code steps. The code step duration is selected by S2 to S0 to be 50us to 3.2ms per step

Mode 2 **64/16 Ramp Mode**

When S3 is 1 and S2 to S0 are non-zero (code 9 to code 15 in the table below), the output will transition to the new value in multi-code steps.

- If the Target DAC Code is greater than 128 codes from current DAC code, the AD5820 DAC will increment in 64 DAC code steps.
- When the current position DAC code is between 16 codes and 128 codes from the target position, the DAC will increment in 16 Code Steps.
- When the current position DAC code is less than 16 codes from the target, it will step directly

to the desired code and therefore the desired current.

Example: If the user wishes to perform a Full Scale Transition of 1023 code the output of the AD5820 will increment by fourteen 64-code steps (until it is between 16-128 codes from target value). The AD5820 will then effectively decelerate in terms of output current step size and approach the target output current in seven 16-code steps followed by one final step to fullscale.
*(64 Code Steps * 14) + (16 Code Steps * 7) + (Step to Final DAC code * 1) = 22 steps. See Figure 16 below.*

Table 2. Slew Rate Control Mode and Single Step Transition Time Truth Table.

Mode	S3	S2	S1	S0	Single Step Transition Time	*Full Scale Transition Time*
Mode 0	X	X	X	X	TBD µs	*TBD µs*
Mode 1	0	0	0	1	50µs	*51.15ms*
	0	0	1	0	100µs	*102.30ms*
	0	0	1	1	200µs	*204.6ms*
	0	1	0	0	400µs	*409.2ms*
	0	1	0	1	800µs	*818.4ms*
	0	1	1	0	1.6ms	*1636.8ms*
	0	1	1	1	3.2ms	*3273.6ms*
Mode 2	1	0	0	0	TBD µs	*TBD µs*
	1	0	0	1	50µs	*1.1ms*
	1	0	1	0	100µs	*2.2ms*
	1	0	1	1	200µs	*4.4ms*
	1	1	0	0	400µs	*8.8ms*
	1	1	0	1	800µs	*17.6ms*
	1	1	1	0	1.6ms	*35.2ms*
	1	1	1	1	*3.2ms*	*70.4ms*

64/16 Ramp Mode

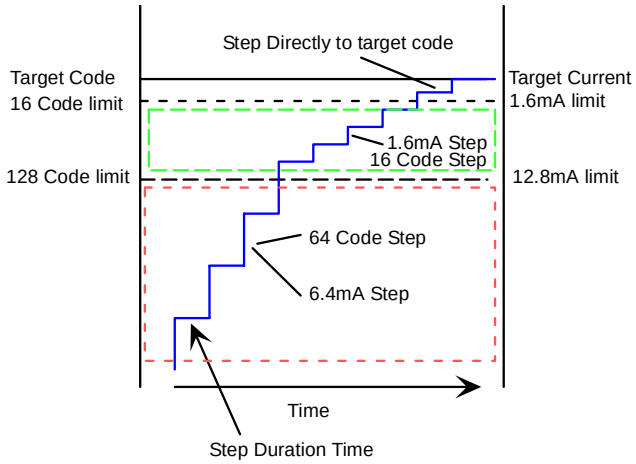

Figure 2. Mode 2 operation of AD5820's unique slew rate control.

Mode 0 – Direct Load

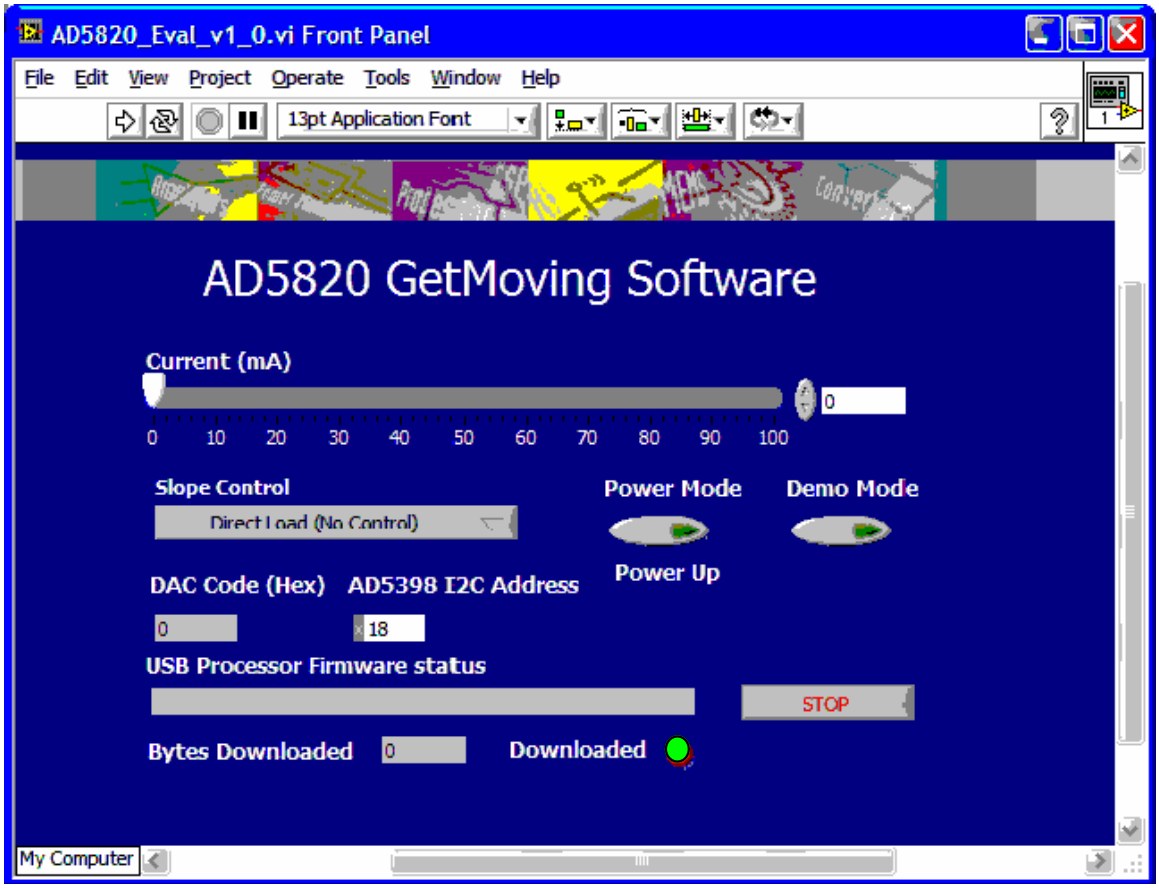

Figure 3 – Mode 0, direct load – slope control not employed.

Figure 3 shows the default window for the AD5820 GetMoving Software. In this mode there is no slope control employed and the AD5820 output moves and settles in the same manner as previous VCM driver offers from ADI (the AD5398 and AD5821).

Mode 1 (Slow Ramp Mode) **and Mode 2** (Fast Ramp Mode)

Figure 4 shows the options for Mode 1 and Mode 2. Mode 1 is labeled Slow ramp Mode and allows the user to set the time between LSB steps at the output. Mode 2 is labeled Fast Mode and allows the user to employ the 64/16 ramp mode described in the text preceeding this section. When Modes 1 or Mode 2 are employed the output is controlled automatically by the AD5820 and further I2C writes from the user are not required.

Demo Mode

The GetMoving software allows the user to go to demo mode. This is a feature which allows the user to set the maximum and minimum current limits at the ouput and the time between each step. Again in this mode the user is allowed the flexibility to employ all output modes. Figure 4 shows the default window in demo mode, Figure 5 shows options in demo mode for ramp control. To exit demo mode the user must hit STOP to return to the GetMoving Front Panel.

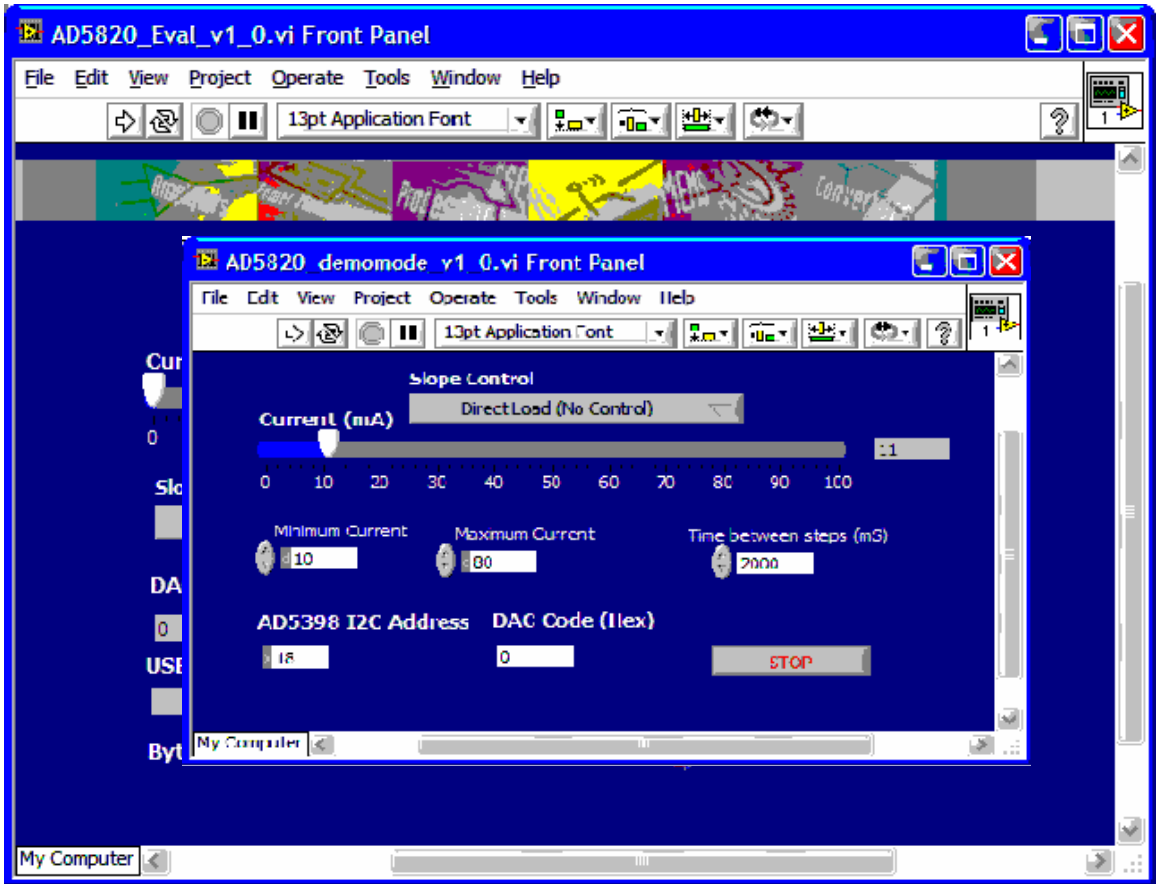

Figure 4. Demo Mode Panel

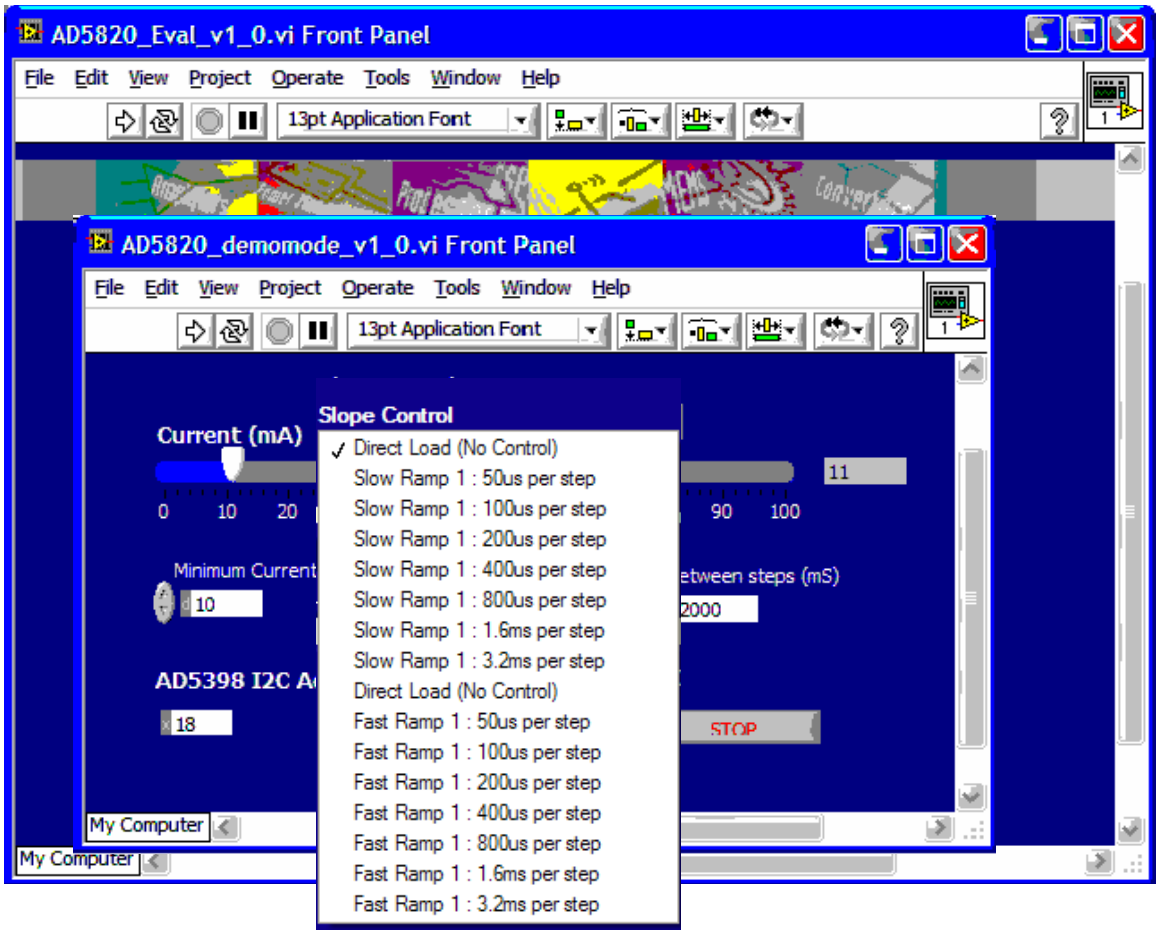

Figure 5. Demo Mode Panel with Slope Control options displayed.