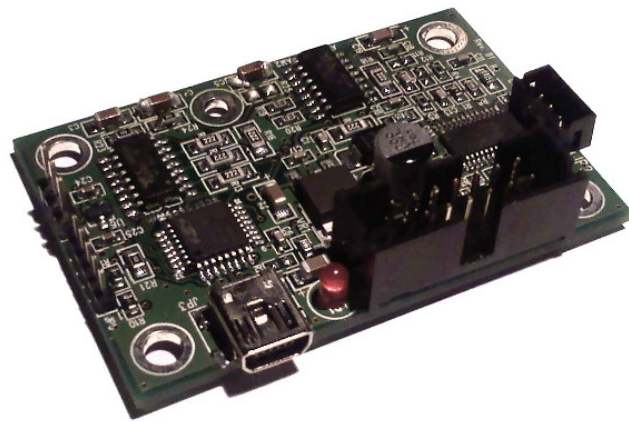


# ACE-SDC-V3

## Stepper Driver +Controller with USB 2.0 Communication



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**Revision History:**

- 1.00 - First revision
- 1.01 - Added ASCII command table

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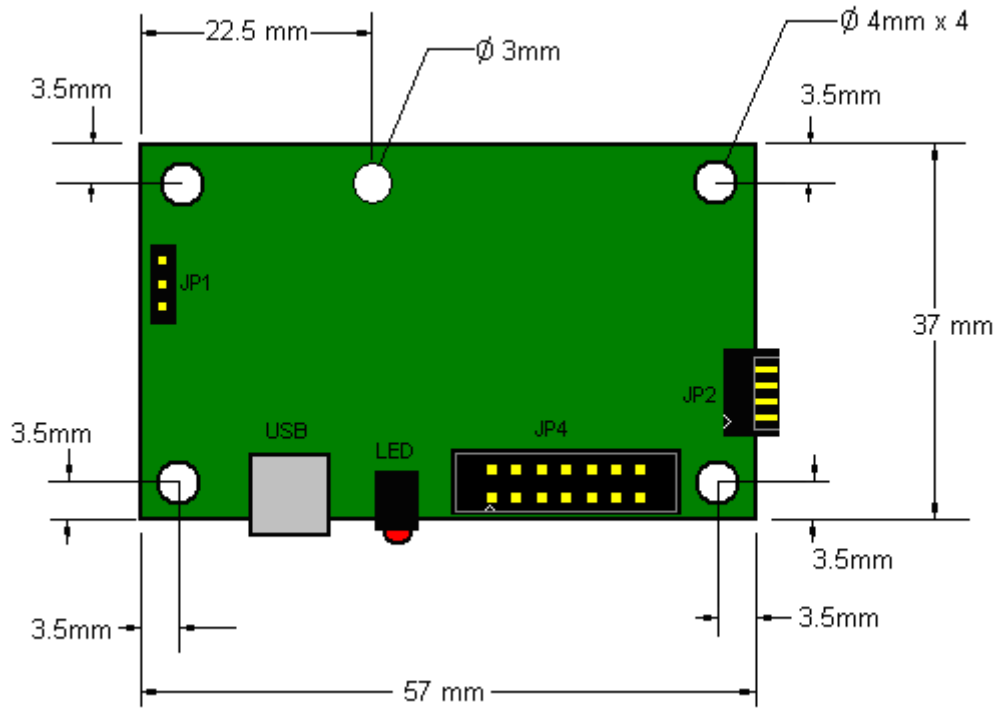
# 1. Introduction

ACE-SDC-V3 is a single board cost-effective stepper driver and controller with USB 2.0 communication.

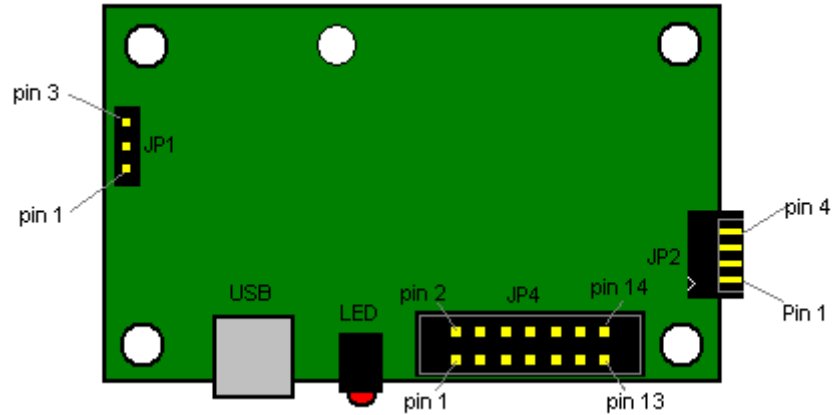
## ACE-SDC-V3 Features

- USB 2.0 Communication
- 12-24VDC voltage input
- Different configurable current settings from 0 mA to 2.0A peak current (100 mA resolution)
- Selectable Full, 1/2, 1/4, 16 microstep
- 6 Opto-isolated Digital inputs
- 2 Opto-isolated Digital outputs
- 1 Analog input
- Three different control modes:
  - o DIO Control – motion is done using the digital inputs and outputs
  - o USB Control – motion is done from PC using USB communication
  - o Analog Control – speed control is done from analog input

## 2. Dimensions



### 3. Connectors

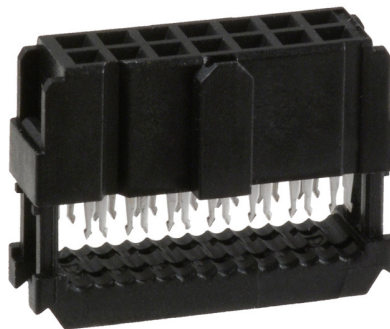


***JP4 - 14 pin Connector Pin-outs***

Description	Pin	Pin	Description
Opto-Common	1	2	DI1
DI2	3	4	DI3
DI4	5	6	DI5
DI6	7	8	DO1
DO2	9	10	No Connection
GND	11	12	+24V
GND	13	14	+24V

***14 pin Mating Connector Information***

Description: Female 14 pin 0.1 dual row  
 Manufacturer: AMP  
 Part Number: 1658621-2



***\*Use both pin 12 and 14 for 24V power supply and pin 11 and 13 for GND.***

### ***JP2 - 4 pin connector Pin-outs***

<b>Pin</b>	<b>Description</b>
1	A
2	/A
3	B
4	/B

### ***4 pin Mating Connector Information***

Description: Female 10 pin 2mm single row

Manufacturer: HIROSE

Part Number: DF3-4S-2C (4 pin female connector)

DF3-2428SC (female pin)



**Warning: Do not disconnect the motor connector while power is on.  
This can damage the product!  
Turn off the power before disconnecting the motor connector.**

### ***JP1 - 3 pin header Pin-outs***

<b>Pin</b>	<b>Description</b>
1	3.3V Out
2	Analog Input
3	GND

### ***3 pin Mating Connector Information***

Description: Female 3 pin 0.1 inch single row

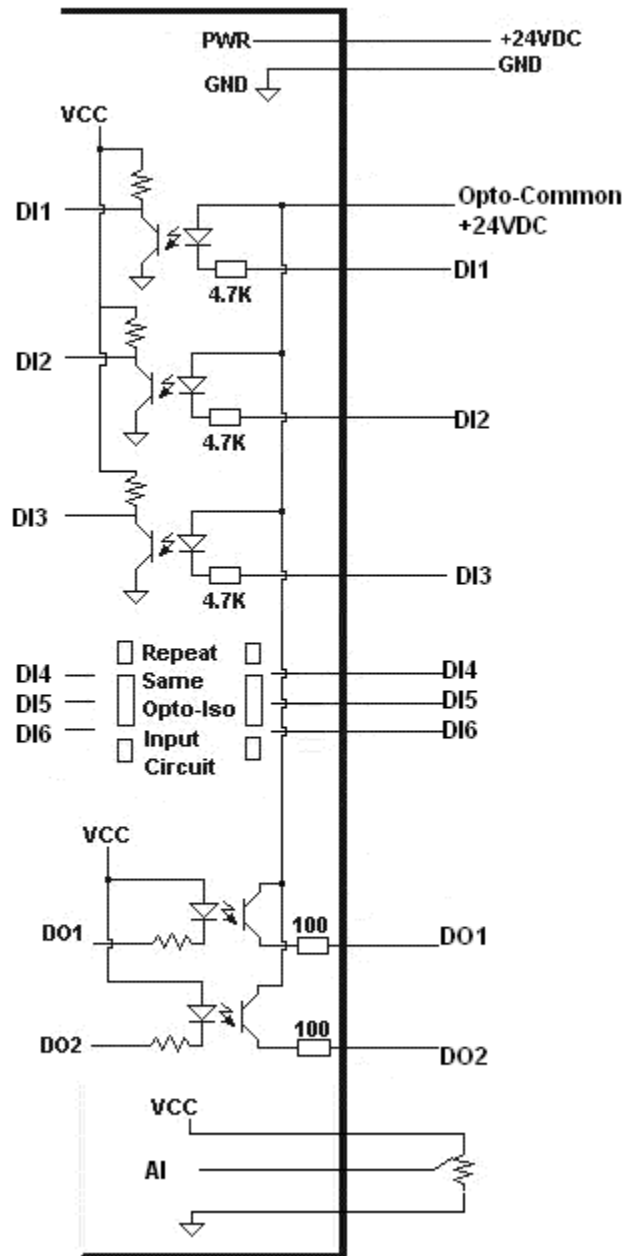
Manufacturer: Tyco/AMP

Part Number: 770602-3 (Connector)

770666-1 (Pin)

## 4. Electrical Specifications

### Internal Interface Circuit Overview

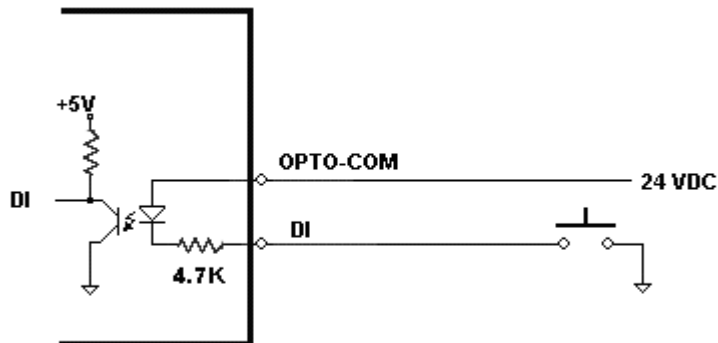


### Power Input

Regulated Supply Voltage Range: **12 - 24 VDC**  
 Recommended Current for power supply: **2.0 Amp**

### Limits, Home and Digital Inputs

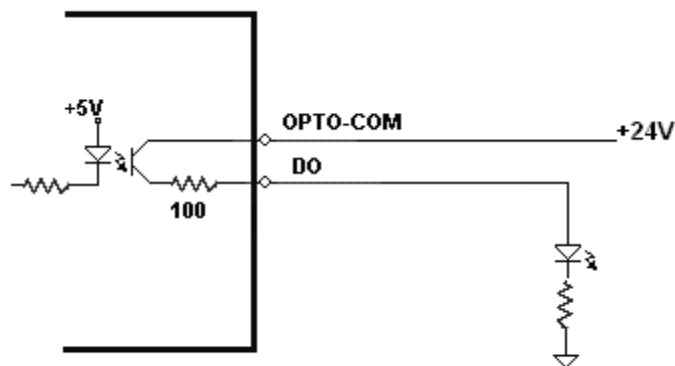
Type: **Opto-isolated inputs**  
 Opto voltage supply input: **+24 VDC**  
 Maximum diode forward current: **50mA**



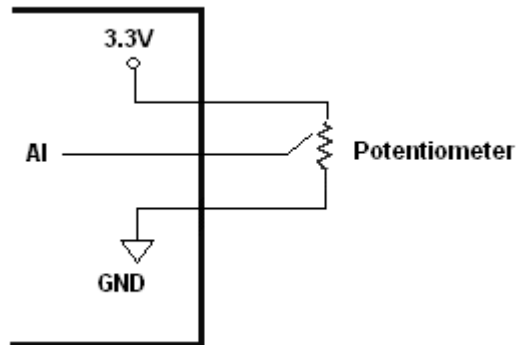
4.7K resistor is built in to the digital inputs to limit the current across the diode of the opto-isolator.

### Digital Outputs

Type: **Opto-isolated open-emitter transistor output**  
 Maximum emitter current: **50 mA**



## Analog Input



Analog input resolution:	<b>10 bit</b>
Analog input range:	<b>0 to 3.3V (corresponding 0 to 1023)</b>
Recommended Potentiometer Range:	<b>1KOhm - 10KOhm</b>

## Communication

Communication:	<b>USB 2.0</b>
Connector:	<b>Mini-B to A</b>

## Microstep

Microstep Value:	<b>Full, 1/2, 1/4, 16 microstep</b>
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## Driver Current

Configurable driver current value:	<b>0mA - 2.0 A (100 mA resolution)</b>
------------------------------------	--

*Note: Setting the driver current higher than the maximum rated current will overheat the motor and the driver and potentially damage the unit. Recommendation is to use the current setting that is in the range of 60-80% of the maximum rated current of the motor.*

**Warning: Do not disconnect the motor connector while power is on. This can damage the product! Turn off the power before disconnecting the motor connector.**

## Operating Temperature

Electronic components used in ACE-SDC-V3 have maximum ambient operating temperature of **85 degree Celsius**.

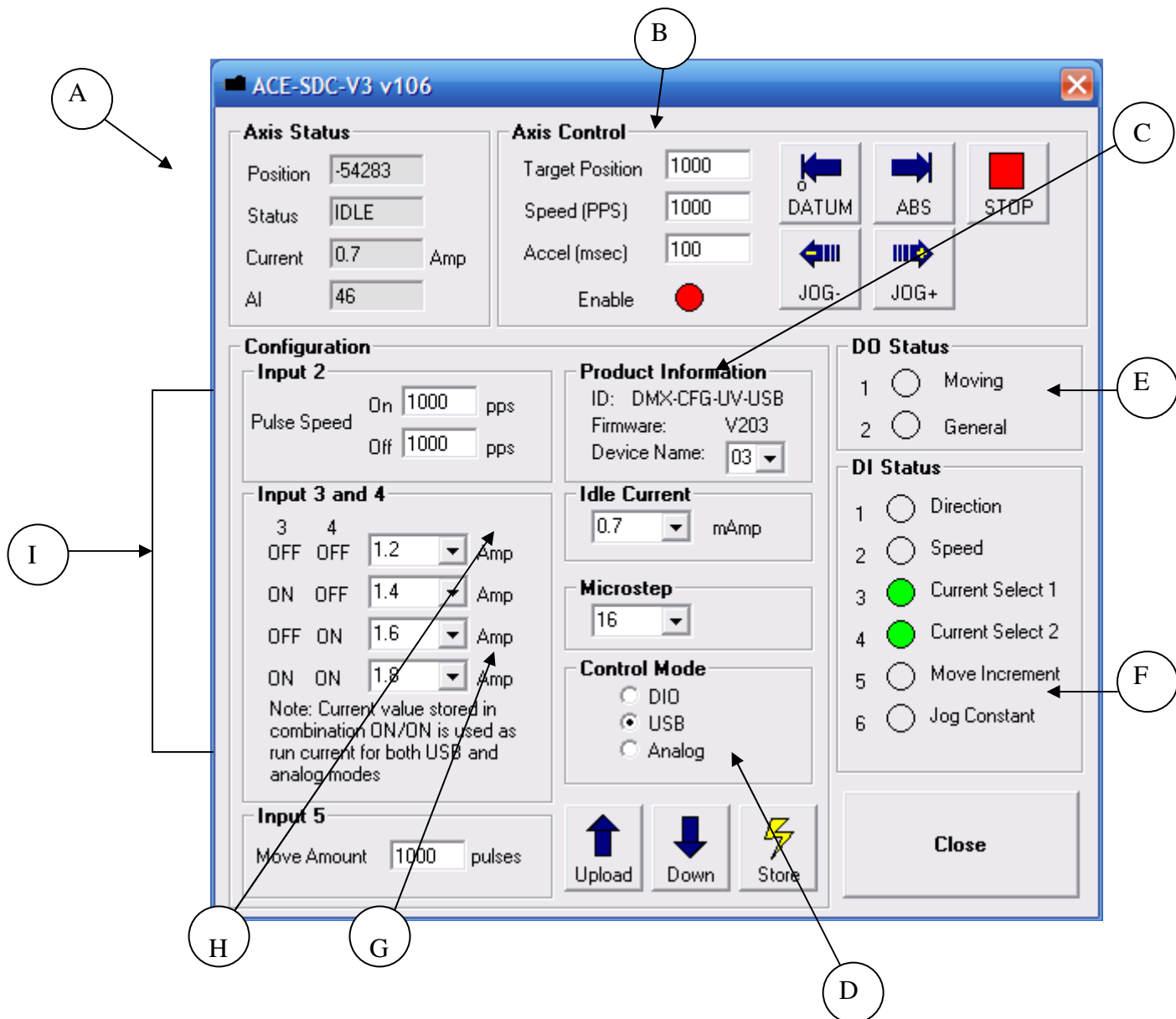
## 5. Windows GUI

ACE-SDC-V3 comes with Windows GUI program to test, download, and debug the controller.

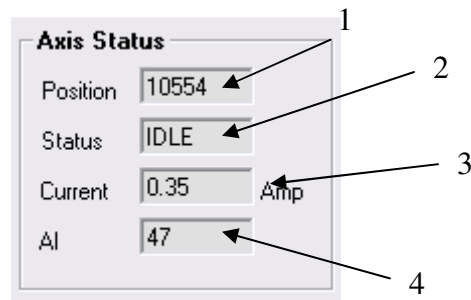
**Important Note: In order to communicate with ACE-SDC-V3 through USB, proper driver must be installed first. Before connecting the ACE-SDC-V3 device or running any program, please go to the Arcus web site and download the USB driver installation instruction and run the USB Driver Installation Program.**

Make sure that the USB driver is installed properly before running the controller.

Startup the ACE-SDC-V3 GUI program and you will see following screen:



## A. Axis Status



1. Position Value

2. Motor Status:

IDLE – motor is idle and not moving

ACCEL – motor is accelerating

DECEL – motor is decelerating

CONST – motor is moving at constant speed

3. Current

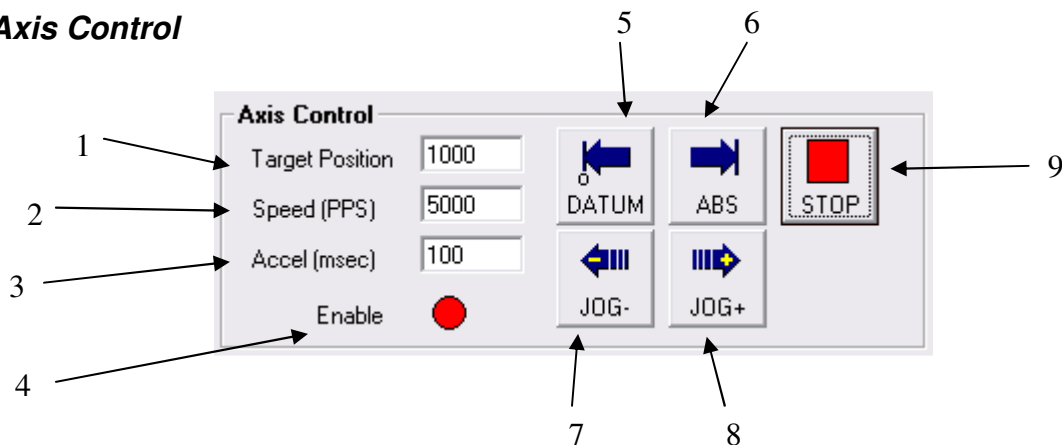
Displays active current value

4. AI

Displays current analog input value (10 bit)

Range is 0 to 1023 which corresponds to 0 to 3.3V

## B. Axis Control



1. Target Position – used to move the motor to the target position
2. Speed – Set high speed setting of the motor (up to 16Kpps)
3. Accel – Set acceleration time (up to 300 ms)
4. Enable Status – displays the energized status of the motor
5. Datum – moves the motor back to zero position
6. ABS – moves the motor to the target position
7. JOG- - jogs the motor in minus direction
8. JOG+ - jogs the motor in plus direction
9. STOP – stops the motor

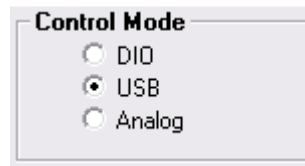
## C. Product Information



Displays the product ID and the version number.

1. To change the device name select a new one from the drop down list. In order to for the setting to take effect download the device name, store it to flash memory and then perform a power cycle.

## D. Control Mode



There are three control modes:

1. DIO – DIO mode controls the motor through the digital inputs.  
See details of the digital IO assignment for the DIO control mode.
2. USB – motor control is done through the PC using USB communication.

**Important Note:**

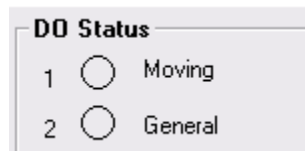
- \* All moves using the USB command uses current setting when input 3 and 4 are on.
- \* Idle current is used when the motor is idle in USB control mode.

3. Analog – Speed control is done using the analog input.

**Important Note:**

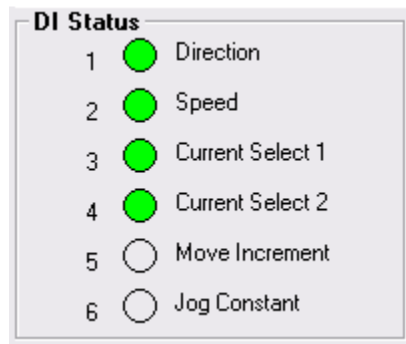
- \* Speed control moves using the Analog input uses current setting when input 3 and 4 are on. Initial current setting for the analog speed control is used when the controller is powered initially. If the current is changed, download the new current, store to flash and power cycle the controller for the new current to take effect.
- \* Idle current is not used when in analog control mode.

## E. DO Status



Displays the current digital output status. DO1 is reserved as a moving output. When the motor is in motion, DO1 is turned on. DO2 is a general purpose output.

## F. DI Status



Displays the current digital input status. When used in DIO control mode, each input is designated for specific use:

Digital Input	Description
1	Direction
2	Speed
3	Current Select 1
4	Current Select 2
5	Move Increment
6	Jog Constant

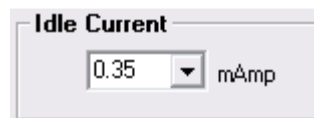
**Note:** When in analog mode, only DI1 (direction input) is used.

## G. Microstep



The following micro-step values are available: Full, 1/2, 1/4, 1/16.

## H. Idle Current



Idle current is used when the motor is not moving. If the idle current is set to 0, the driver is disabled. Only the DIO control mode and USB control mode use the idle current setting. For analog speed control mode, idle current is not used.

## I. DIO Control Mode Settings

Input 2	
Pulse Speed	On <input type="text" value="16000"/> pps
	Off <input type="text" value="5000"/> pps

Input 3 and 4		
3	4	<input type="text" value="1.3"/> Amp
OFF	OFF	
ON	OFF	<input type="text" value="0.2"/> Amp
OFF	ON	<input type="text" value="1.6"/> Amp
ON	ON	<input type="text" value="1.5"/> Amp
Note: Current value stored in combination ON/ON is used as run current for both USB and analog modes		

Input 5	
Move Amount	<input type="text" value="10000"/> pulses

Different move settings are selected through the digital inputs when in DIO control mode.

Digital input 1 is used to select the direction of the motion. [For analog speed control mode, digital input 1 is also used for the direction of the motion.](#)

Digital input 2 is used to select speed of the motion. There are two values, when the DI 2 is on and when the DI2 is off.

Digital input 3 and 4 are used to select the current setting when in motion. Two bits allow four different settings of the current. Current setting selections are: 0 mA to 2.0 A (100 mA resolution). [For analog USB control and analog speed control mode, current setting when input 3 and 4 are on is used.](#)

Digital input 5 is used to move in incremental amount. Direction of the incremental move is determined by Digital input 1.

Digital input 6 is used to jog the motor. Direction of the jogging is set by digital input 1. There is no configuration value associated with digital input 6.

## **J. Upload/Download/Store to Flash**



The following parameter settings can be uploaded or downloaded from the controller:

- Control Mode Selection (DIO, USB, or Analog)
- Idle Current
- Microstep
- DIO Motion Parameters (Speed, Current, and Increment amount)

When ever the parameter is changed, it must be downloaded to be take effect. For example, if the idle current is changed from 0.35A to 0A, the new idle current will go into effect only after download. If the control mode is changed form DIO to USB from the screen, it must be downloaded for the new control mode to be used.

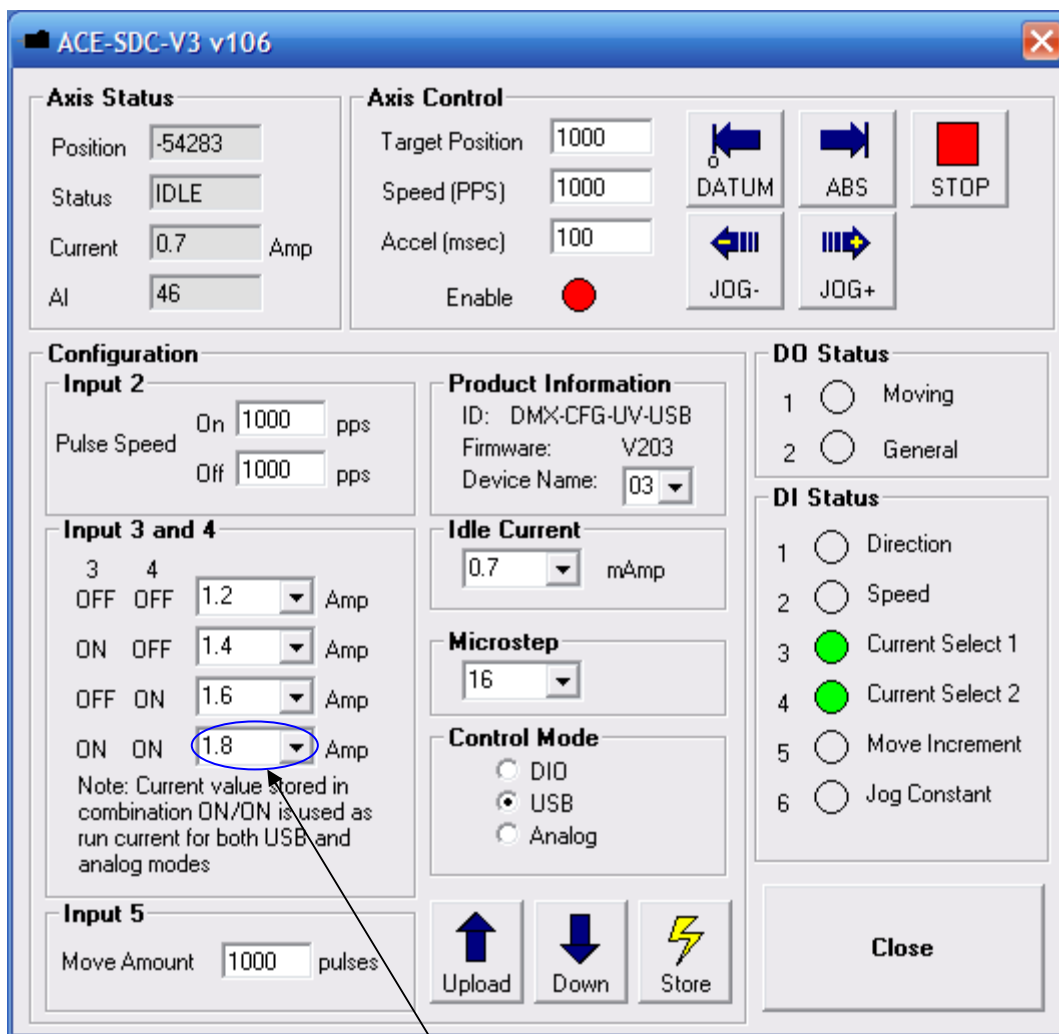
Once the parameters are downloaded, they can be permanently store to the flash memory so that when the controller is powered, the stored parameters are used.

## 6. Analog Speed Control

In analog speed control mode, the speed of the motor is determined by the analog input value [0-1023]. The direction of the motor is determined by the status of digital input 1.

### **Current used for Analog Speed Control**

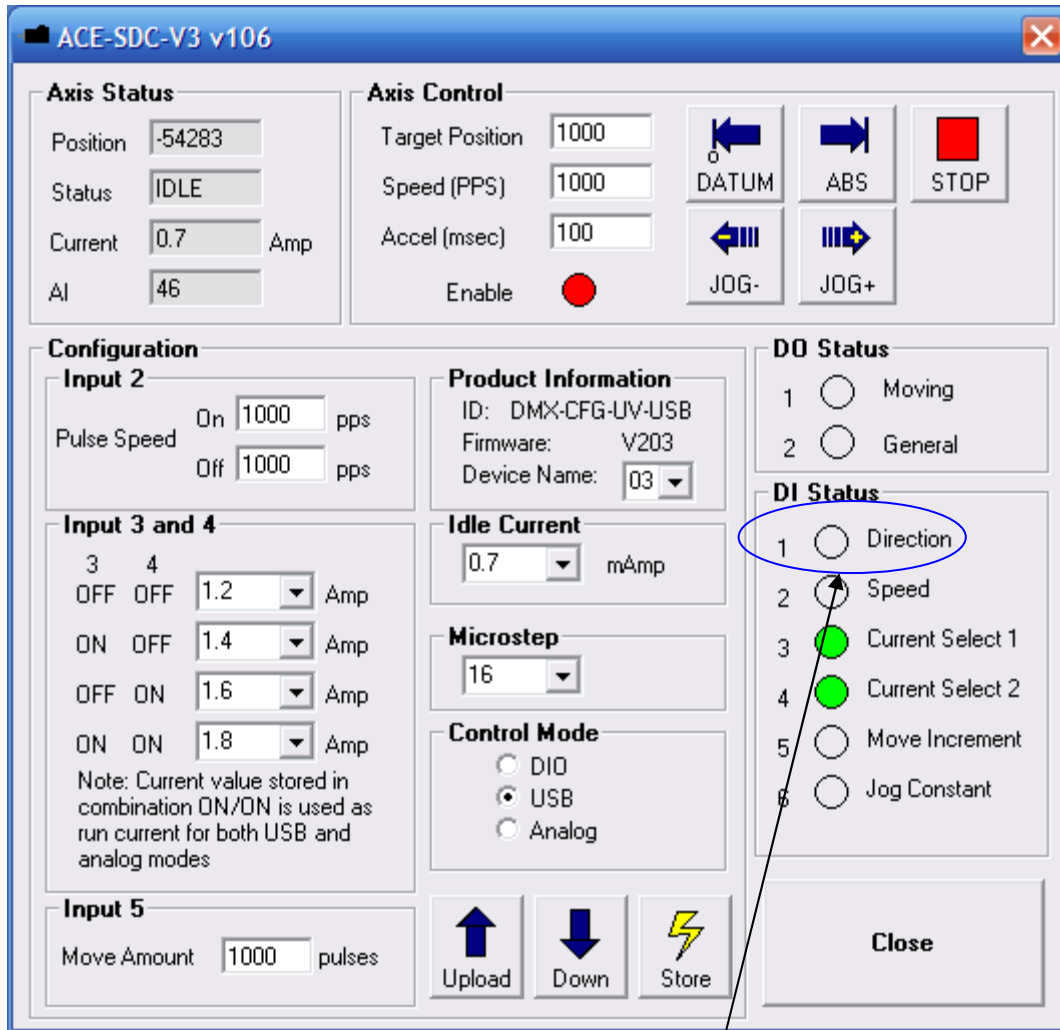
There is only one current value used for the analog speed mode as shown below. Other current values including idle current are NOT used for analog speed control. Digital inputs 3 and 4 for current selection is NOT used for analog speed control.



Current value used for Analog Speed Control

## Digital IO used for Analog Speed Control

There is only one digital input for direction used for the analog speed as shown below. Other digital IO must be turned OFF for proper analog speed control.



Only the direction input is used in analog speed control.

## 7. ASCII Language Specification

ACE-SDC language is case sensitive. All command should be in capital letters.  
Invalid command is returned “?”. Always check for proper reply when command is sent.

For **USB communication**, send commands identical to the ones in the following table.

Command	Description	Return
ABORT	Immediately stops the motor if in motion. For decelerate stop, use STOP command. This command can also be used to clear a StepNLoop error	OK
ACC	Returns current acceleration value in milliseconds.	Milli-seconds
ACC=[Value]	Sets acceleration value in milliseconds. Example: ACC=300	OK
AI	Get analog input status	0-1022
DI[1-6]	Get individual bit status of digital inputs	0 – on Non-zero - off
DO	Return status of digital outputs	2-bit number
DO[1-2]	Get individual bit status of digital outputs	0,1
DO[1-2]=[Value]	Set individual bit status of digital outputs	OK
DN	Get device name	[CFG01-CFG99]
DN=[Value]	Set device name	OK
EO	Returns driver power enable.	1 – Motor power enabled 0 – Motor power disabled
EO=[0 or 1]	Enables (1) or disable (0) motor power.	OK
HSPD	Returns High Speed Setting	PPS
HSPD=[Value]	Sets High Speed.	OK
ID	Returns product ID	DMX-CFG-UV-USB
J+	Jogs the motor in positive direction	OK
J-	Jogs the motor in negative direction	OK
LSPD	Returns Low Speed Setting	PPS
LSPD=[Value]	Sets Low Speed	OK
MST	Returns motor status	Bit 0 – constant speed Bit 1 – accelerating Bit 2 – decelerating Bit 3 thru 8 – motor current (centi-A)
P1	Get pulse speed with DI2 = 0 [DIO mode only]	OK
P1=	Set pulse speed with DI2 = 0 [DIO mode only]	PPS
P2	Get pulse speed with DI2 = 2 [DIO mode only]	OK
P2=	Set pulse speed with DI2 = 2 [DIO mode only]	PPS
P3	Get run current when DI3 = 4, DI4 = 8 [DIO mode only]	1: 100 mA 2: 200 mA .... 20: 2000 mA
P3=	Set run current when DI3 = 4, DI4 = 8 [DIO mode only]	OK
P4	Get run current when DI3 = 0, DI4 = 8 [DIO mode only]	1: 100 mA 2: 200 mA .... 20: 2000 mA
P4=	Set run current when DI3 = 0, DI4 = 8 [DIO mode only]	OK
P5	Get run current when DI3 = 4, DI4 = 0 [DIO mode only]	1: 100 mA 2: 200 mA

		.... 20: 2000 mA
P5=	Set run current when DI3 = 4, DI4 = 0 [DIO mode only]	OK
P6	Get run current when DI3 = 0, DI4 = 0 [DIO mode only] Note: This is the run current value used in joystick and USB mode.	1: 100 mA 2: 200 mA .... 20: 2000 mA
P6=	Set run current when DI3 = 0, DI4 = 0 [DIO mode only] Note: This is the run current value used in joystick and USB mode.	OK
P7	Get move amount when DI5 = 0 [DIO mode only]	32-bit
P7=	Set move amount when DI5 = 0 [DIO mode only]	OK
P8	Get idle current	1: 100 mA 2: 200 mA .... 20: 2000 mA
P8=	Set idle current	OK
PA	Get move mode	0 – DIO 1 – USB 2 – Joystick
PA=	Set move mode	OK
PX	Returns current position value	32-bit number
PX=[value]	Sets the current position value	OK
STORE	Store settings to flash	OK
VER	Get firmware version	VXXX
X[value]	Moves the motor to absolute position value using the HSPD, LSPD, and ACC values	OK

## **Contact Information**

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