SilverDust Open Loop

This document details how to operate the SilverDust in open loop. In other words, it describes how to use the SilverDust as a traditional stepmotor controller/driver.

NOTE: QCI does not recommend using the SilverNugget in this configuration as it is not optimized for open loop operation.

NOTE: Using the SilverDust in open loop is only recommended for low speed operation of less than 1000RPM.

Hardware

Motor

Select a bipolar (4 wire), microstep rotary or linear motor.

SilverDust

All the SilverDust controllers will run a step motor in open loop. Choose the controller based on system requirements such as I/O and mounting options. See Technical Document "QCI-TD059 Controller Selection Matrix" for a good summary of the controller's features.

Cables/Breakouts

With controller off, refer to the controller and motor datasheets to wire motor to controller. Only the four motor leads are required (A+, A-, B+, B-) plus the optional chassis ground.

Note, the SilverDust MG (QCI-D2-MG) has a removable terminal strip for landing the motor leads. For the other controllers, use QCI's Motor I/F Breakout (QCI-BO-M1) to breakout the controllers DB15HD motor I/F connector. See Technical Document "QCI-TD057 QCI-BO-M1" for details.
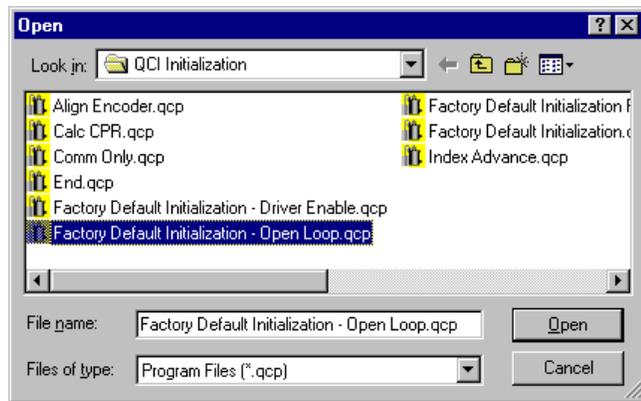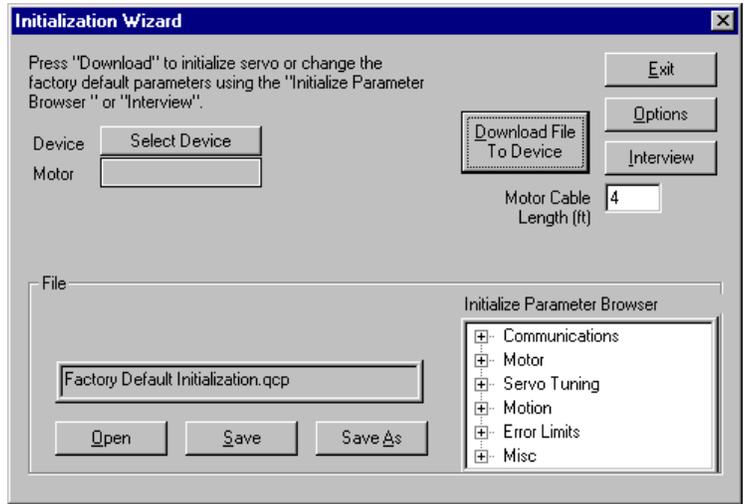
Initialize SilverDust For Open Loop

The following example uses QuickControl® Rev 4.63 (051408).

1) Launch Initialization Wizard from the Tools menu.

NOTE: It is usually best to launch the wizard with the controller turned off to ensure a previously downloaded program is not running.
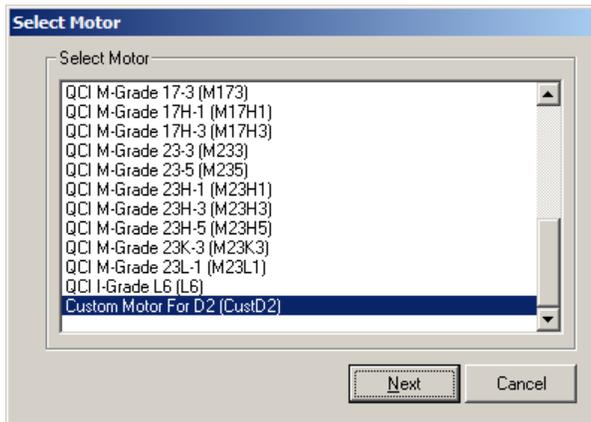
2) Press Open

3) Select
"Factory Default Initialization - Open Loop.qcp"

4) Press Open.

7) Press "Download File to Device". If controller was turned off, the Unknown Device Wizard will appear. Follow the instructions until you get to this dialog box and press Finish.
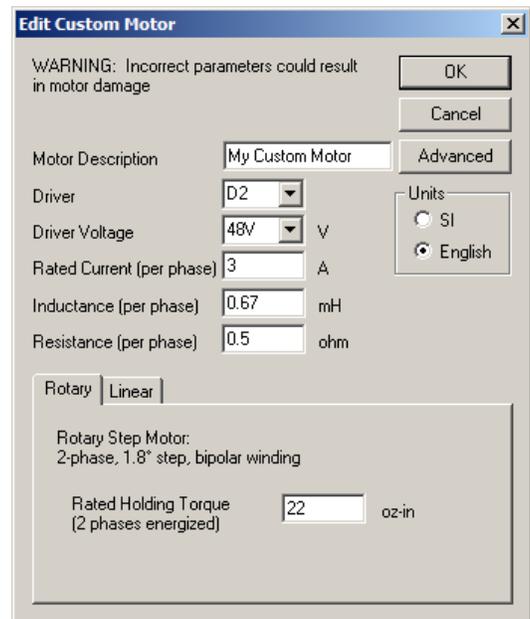
8) Select "Custom Motor…" from list.

9) Enter the motor parameters using the motor's datasheet.

10) Press OK.

11) Enter the number of Counts/Revolution (CPR). This is the number of discrete positions per revolution. The higher the number, the smoother the motion.

12) Follow the instructions, if any. QuickControl® will notify you when the download is complete.

Initialization Details
Factory Default Initialization - Open Loop.qcp
The open loop initialization file differs from the standard initialization file in the following ways:

- Error Limits (ERL): Moving and Holding limits are set to 0 as they have no meaning. Delay to Holding parameter set to 30ms to allow the motor to stay at the Open Loop Moving torque level until settled.
- Kill Motor Conditions (KMC): Moving/Holding Errors Disabled
- Startup Phase Align move (startup wiggle): Not required for open loop operation.
- Torque Limits (TQL): Open Loop Holding 75%, Open Loop Moving 100%.
- The following commands have no meaning in open loop and were deleted:
  - Anti-Hunt Constants (AHC)
  - Anti-Hunt Delay (AHD)
  - Control Constants (CTC)
  - Filter Constants (FLC)

Usage
Almost all of the commands and features are useable in open loop. The main difference operating in open loop are:
- Reduced torque and speed
- No feedback to know motor's position. Stalls and jams are not detected.
- Controller/driver and motor will run hotter as a result of the high Open Loop Moving/Holding torque.
- Registers: The Target Position register (reg 0) will show the commanded position of the motor, but the Actual Position register (reg 1) and Velocity 1 | Velocity 2 register (reg 7) will always read 0. The Max Position Error | Current Position Errror register (reg 6) will show large errors.
- Moving Motor: The motor can be commanded to move using the standard commands (i.e. MAT, MAV, MRT, MRV, PMC, PMC,VMP, PIM, SSD, …). In open loop operation, the Torque Limits (TQL) Open Loop Holding and Open Loop Moving parameters set the torque.
- Electronic Gearing/Step and Direction: An external encoder or step and direction signal can be used to command the SilverDust. See application note QCI-AN019 Electronic Gearing for more details.
- Drag Mode does not work in open loop.