Weigl Control via CANopen

This application note demonstrates how to configure a SilverSterling S2 & S3 controller, SilverNugget X-series controller, and SilverMax X-series integrated servos to read show parameter data from either internal or external non-volatile memory on power-up. Once show parameter data is read, the controller configures itself to interface with a Weigl device via CANopen.

Associated Files:

Init + App - Show Parameters from Internal Memory.qcp
This initialization and application program file acquires show parameter data from internal non-volatile memory. Program file is compatible with SilverSterling S2/S3, SilverNugget X-series controllers, and SilverMax X-series integrated servos.

Init + App - Show Parameters from External Memory.qcp
This initialization and application program file acquires show parameters from external non-volatile memory when using QCI's backplane/card cage QCI-BO-BP8. Program file is only compatible with SilverSterling S2/S3 & SilverNugget X-series controllers.

List of Motor and Show Parameters.xlsx
This spreadsheet is used to export show parameters as a CSV file.
- Worksheets
  - **List**: Lists each show parameter with a brief description.
  - **Axis 1-8 Data**: User enters data for up to eight axes.
  - **Export Axis 1-8**: Extracts show parameters from previous worksheet for eight axes. This sheet is formatted to be exported as a CVS file.
  - **Export Axis 1 Only**: Extracts show parameters from previous worksheet for only Axis 1. This sheet is formatted to be exported as a CVS file.

Import Show Parameters.txt
This file links the CSV file to the QCP file.
Downloading "**Init…Internal Memory.qcp,**" downloads a copy of the CSV file into local non-volatile memory.
Downloading "**Init…External Memory.qcp,**" does **NOT** download the CSV file into local non-volatile memory.

Show Parameters.csv – Exported show parameters for a single axis in a 64-row x 2-column table. Each row holds a show parameter. The first column is the target QCI register and the second column is the show parameter data intended for the target QCI register. *Do not manually edit this file.*

Mandatory Reading

Refer to Technical Document:QCI-TD090 for a detailed description of all show parameters. The technical document provides instructions on how to initialize external card cage memory and how to modify parameters stored show parameters on the fly.

Accessing Show Parameters from External Memory

The SilverSterling S2-IGx or S3-IGx may be used with QuickSilver Controls' eight-slot card cage QCI-BO-BP8. The backplane supports up to eight SilverSterling controllers with both power and communications (serial + CANopen) on a common bus. The backplane includes a 1-wire external memory chip for each slot, which is used to

Figure 1 - QCI-BO-BP8 with 8x QCI-S2-IGH

store show parameter data. The show parameter data is read from the 1-wire chip on power-up. For more information refer to backplane datasheet QCI-DS038_QCI-BO-BP8.

1. It is presumed user has written show parameter data to card cage memory.
    a. Refer to Technical Document:QCI-TD090 for show parameter details and instructions on how to write show parameters to card cage memory.
2. Open "**Init + App - Show Parameters from External Memory.qcp**" file in QuickControl and click Download/Restart.
3. On power-up, the controller accesses external card cage memory to read show parameter data.

For applications that do not use the card cage, show parameters can be saved to a controller's internal EEPROM memory chip.

Accessing Show Parameters from Internal Memory

1. Open the **List of Motor and Show Parameters.xlsx** spreadsheet in Microsoft® Excel.
2. Go to the "Axis 1-8 Data" worksheet and modify the show parameter data for Axis 1. Note that only parameters under the *Axis 1* column will be exported.
    a. Refer to Technical Document:QCI-TD090 for show parameter details.
3. Go to the "Export Axis 1 Only" worksheet and ensure that the data displayed is the data wished to be exported.
4. File → Export → Change File Type → Select CSV (Comma delimited) (*csv) → click Save As → Show Parameters.csv
    a. If Excel warns that the file type does not support multiple sheets, click OK.
    b. This will only export the current worksheet.
    c. The exported CSV file should be formatted as 64-rows x 2-columns.
5. Ensure all three of the following files are in the same directory:
    a. **Init + App - Show Parameters from Internal Memory.qcp**
    b. **Import Show Parameters.txt**
    c. **Show Parameters.csv**
6. Open "**Init + App - Show Parameters from Internal Memory.qcp**" file in QuickControl and click Download/Restart.
7. On power-up, the controller accesses its internal EEPROM memory to read show parameter data.

CANopen Configuration

Both internal and external QCP program files configure the controller's CAN controller as follows:

- TPDO2: Sent once per second
    - 32 bits: Motor target
    - 32 bits: Motor Measured Positions
- TPDO3: Sent once per second
    - 16 bits: Motor Temperature: C*16
    - 16 bits Processor Temperature: C*10
    - 16 bits Power Supply voltage: V*100
    - 16 bits Status state of power up – Not yet defined
- TPDO4: Sent once per second
    - 32 bits: Copy of CAN Errors reported 2002
    - 32 bits: Spare, not currently in use, may be 2 x 16 registers
- RPDO1: Received asynchronous, update immediately (Receive type 254)
    - 16 bits: Target position
- RPDO4: Received asynchronous, update immediately (Receive type 254)
    - 32 bits: Clear bits in object 0x2002
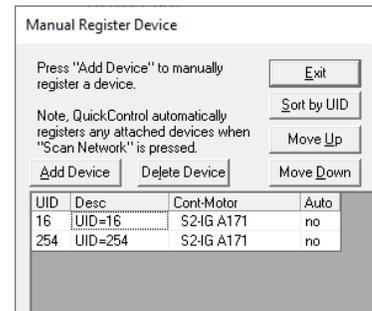
Contact Weigl for technical support with Weigl hardware and software configuration.

Troubleshooting Notes

Communication

Two of the show parameters obtain from memory are serial unit ID and CAN ID. If the controller cannot access either internal or external memory, due to memory not initialized or possibly due to corrupt data, the controller's serial ID defaults to 254 and CAN ID defaults to 127. These default IDs enable the controller to transmit an EMCY error message reporting a memory failure.

Ensure that no two devices share the same serial unit ID nor CAN ID.

By default, QuickControl scans serial unit IDs 1 through 20. To increase the scan range, go to Setup → Options.

During software development, it is suggested to manually register a device with serial Unit ID 254. This configures QuickControl to periodically poll for this ID number. If a device fails to access memory, it will default to serial Unit ID 254 and QuickControl will be able automatically establish communications with the device to troubleshoot the device. To manually register a device, go to Setup → Register Devices → Add Device and enter unit ID and controller/motor types.

Program Status

As the controller configures itself, Program Status[29] register is incremented when configuration milestones in the QCP program are reached. Use Register Watch to read Program Status[29] register to track where in the program the controller is currently operating. If there is a fault, Program Status[29] will be overwritten with a negative number to indicate a fault and fault code.

Below is a partial list of fault codes and suggestions to correct faults.
      -1: Show parameter memory not initialized → Initialize external or internal memory
      -2: Checksum invalid → Ensure that the CSV file is exported from spreadsheet
      -3: Homing method invalid → Verify QCP program supports homing method
      -4: Show method invalid → Verify QCP program supports show method
      -6: Issue reading motor memory → Verify motor is connected.
      -7: Motor memory mismatch → Ensure motor ID is correct in show parameters spreadsheet.
      -11: QCP program incompatible with show parameter data in memory → Update QCP
      -12: Controller firmware incompatible with show parameter data in memory → Update firmware
      -15: Does not support external memory chip:
            SilverMax and SilverNugget X-series:
            • External Memory QCP is not compatible → Download Internal Memory QCP
            SilverSterling S2 & S3:
            • Requires minimum firmware revision 37 → Update firmware

Show Parameter Data

We highly recommended using Microsoft® Excel to modify and export the spreadsheet. Other spreadsheet editors have not been tested and may not properly export CSV file.

Debug

While connected to the controller via serial, open the QCP program file and click the Debug checkbox. While in debug, QuickControl highlights the active command.
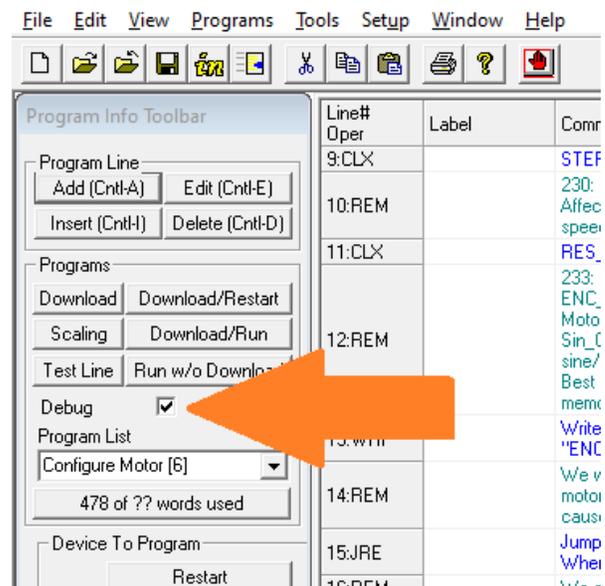
System Tuning

When first tuning a system, we suggest downloading our factory
default initializing file and starting off with one of our preset
tuning parameters under the Tuning Wizard tab. Preset tuning
parameters include, Factory Default, Light Load, Heavy Load,
Belt/Conveyor.

In the Basic tab select one of the presets and with the Control
Panel tool open, issue test moves that match the desire show
motions. Iterate between the Tuning Wizard and Control Panel
until the desired performance is achieved. Use the Intermediate
and Advanced tabs for greater tuning control.
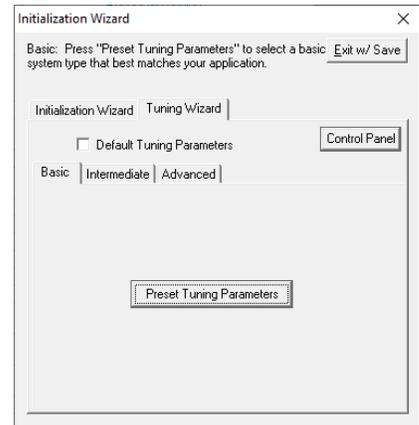
Once tuned, go to the Advanced tab, and record the CTC and FLC parameters. Enter the CTC
parameters in the spreadsheet. For the FLC parameters, refer to page 79 of our SilverLode
User Manual v5.00 for formula to scale FLC parameters from Hz to our native filter units.

Refer to Technical Document:QCI-TD054 – Servo Tuning for a thorough explanation on
QuickSilver Controls' system tuning, a Tuning Wizard guide, and a 12 step-by-step guide on
tuning a 100:1 high inertial mismatch system.