QSB Application Examples

Version 1.5

This document shows some examples of the low-level commands necessary to activate some of the basic functions available on the QSB product. This is not a comprehensive list of all features, just a selection of what may initially be the most desired. See the "QSB Command List" for a complete list of the commands. NOTE: Each command below is terminated with a carriage-return and/or line feed character.

1. Setting Up to Read a Quadrature Encoder
    1.1   Enter Quadrature Encoder mode (default)   **Command – "W0000"**
    1.2   Setting Count Direction
            Count Up (default):   **Command – "W04000"**
            Count Down: **Command – "W04100"**
    1.3   Activating Sync Index Mode (count reset on index)   **Command – "W0363"**
    1.4   Setting Count Range (between 0 and DTR)   **Command – "W034F"**
    1.5   Setting DTR Value = 499 (decimal)   **Command – "W081F3"**
    1.6   Read an Encoder Value   **Command – "R0E"**

2. Setting Up to Read an Analog Encoder
    The input voltage range is limited to 0 – 5 V.
    2.1   Enter Analog Encoder Mode   **Command – "W0002"**
    2.2   Read an Encoder Value   **Command – "R0E"**

3. Setting Up to Read a PWM Encoder
    The MA3 series 10-bit and 12-bit Encoders are supported.
    3.1   Enter PWM Encoder Mode   **Command – "W0001"**
    3.2   Read an Encoder Value   **Command – "R0E"**
    3.3   Read the MA3 encoder resolution (bit#4)   **Command – "R00"**

4. Setting Encoder Streaming Value Mode Output
    Encoder values are automatically output when the Threshold and Interval Rate conditions are met.
    4.1   Activate Streaming Encoder Value Output   **Command – "S0E"**
    4.2   Setting Output Value Threshold = 1   **Command – "W0B0001"**
    4.3   Setting Output Interval Rate = 9.5ms   **Command – "W0C0005"**

5. Capturing an Encoder Value With an External Event Trigger
   Use the Digital I/O, bit 0, or a counter triggered event to capture an encoder value.

5.1	I/O Event Trigger on (H->L) I/O BIT 0	**Command – "W02011"**
5.2	Counter Index Activated Event Trigger	**Command – "W04010"**
5.3	Read the Captured Encoder Value	**Command – "R05"**

6. Reading and Writing to the 4-bit Digital I/O Port

6.1	Setting the I/O Direction (all inputs)	**Command – "W02000"**
6.2	Setting the I/O Direction (all outputs)	**Command – "W02F00"**
6.3	Reading an Input Value	**Command – "R01"**
6.4	Writing an Output Value (0x0A)	**Command – "W01A"**
6.5	Digital I/O Input Value Streaming	**Command – "S01"**

7. Stepper Motor Control
   Motor step and direction signals are generated and used to control a MDS2 stepper motor driver.

   Setup for Motor Move

8.1	Select the motor step rate (example, 1000 steps/sec)	**Command – "W0F3E8"**
8.2	Select motor acceleration (example, 100K steps/sec^2)	**Command – "W10186A0"**
8.3	Number of Move Steps (example, 2000 steps)	**Command – "W117D0"**

   Setup for Motor Jog

8.4	Jog Rate (example, 1000 steps/sec)	**Command – "W123E8"**

   Execute

7.1	Activate Motor Control (I/O pins assigned to motor)	**Command – "W162"**
7.2	Motor Jog	**Command – "W169"**
7.3	Motor Move Selected Number of Steps	**Command – "W168"**
7.4	Deactivate Motor Control	**Command – "W160"**

8. Formatting the Output
   The QSB data output can be formatted to include any combination of the following: time-stamp, spaces between data fields, a carriage-return and /or line feed termination.

9.1	Acknowledgement, Time-Stamp, CR, LF and Spaces	**Command – "W15F"**

9. Saving the QSB Configuration Parameters
   These parameters can be saved and automatically reloaded at the next power cycle.

   The following parameters can be saved: **Command – "W163"**

   - Encoder Mode – (Quadrature, PWM, Analog)
   - Encoder Update Method – poll, stream, none

- Digital I/O Configuration
- Counter Mode Register 0
- Counter Mode Register 1
- Input Transfer Register (DTR)
- Encoder Count Threshold
- Data Output Interval Rate
- EOR Termination Format
- Motor parameters: Step Count, Move Step Rate, Jog Step Rate, Acceleration
- Communication Baud rate

10. Baud Rate Selection

Communication Baud rates of 9600, 19200, 38400, 56000, 115200, 128000, 230400 and 256000 are selectable.

10.1	Select 230400 bits/sec	**Command – "W1660A"**
10.2	Select 115200 bits/sec	**Command – "W1640A"**
10.3	Select 9600 bits/sec	**Command – "W1600A"**

11. Solutions to Known Bugs – (Firmware version 11 and earlier)

11.1 Bug:

The quadrature counter value is initialized incorrectly, when setting the counter to a value other than zero, with the "invert count direction" feature enabled.

Solution:

A way around this error is to set the QSB back to the non-inverting count direction before initializing the quadrature counter value. After the counter is initialized, then switch back to the inverting count direction mode.

Procedure:

1. Clear bit 8 in register 4 if it is set. (W040xx, where xx are the current values of the lower 7 bits)
2. Write the desired counter preset value to the DTR register 8. (W08xxxxxxxx, where xxxxxxxx is the counter preset value)
3. Transfer the counter preset value to the counter. (W0A0)
4. Reset the DTR register 8 to its original value previous to step #2. (W08xxxxxxxx, where xxxxxxxx is the original DTR value before it was changed in step #2)
5. Set bit 8 in register 4 if it was previously set. (W041xx, where xx are the current values of the lower 7 bits)