

Reliable encoder feedback is critical to proper servo system function. When encoder errors seem to randomly occur, it's extremely important that every effort be made to trace them back to their source and fix the problem rather than try to mask them. Often the source of the encoder error can be traced back to electrical noise and the problem can be resolved through the use of proper shielding of the encoder cables.

If it's not possible to completely fix the source of an infrequent encoder error, then it may be possible to ride through the problem without causing a drive fault. An encoder error filter was added to Copley feature set E drives (aka *plus* drives) starting with firmware version 2.34

### ***Encoder filter operation***

When the encoder error filter is enabled, the drive will calculate an expected position every servo cycle by extrapolating the last 4 positions. It then compares the actual position read from the encoder to the expected position, and if the absolute difference is greater than a programmable limit, it discards the reading from the encoder and uses the extrapolated value.

The calculated position is also used in the event that the drive detects an encoder error when reading the position from the encoder. For example, an absolute encoder which returns a reading with an invalid CRC would have the encoder's reading discarded and replaced with the extrapolated position.

Any time an encoder reading is discarded and replaced with the extrapolated value a counter is increased. Once a programmable number of consecutive errors have been observed, the drive will generate an encoder fault and disable.

### ***Configuration***

The encoder error filter is configured using serial port parameter 0x11D. This parameter can also be accessed over the CANopen / EtherCAT networks as object 0x222B.

The error filter configuration is a 32-bit unsigned value that's bit-mapped as follows:

<b>Bits</b>	<b>Meaning</b>
0-3	Maximum number of consecutive bad samples to allow.
4-15	Reserved for future use.
16-28	Maximum difference between actual and extrapolated reading before treating reading as bad.
29-31	Reserved for future use.

For example, to allow up to 3 consecutive bad readings before generating a fault, and to set the maximum allowed difference between the estimated position and the encoder position to 100 counts (0x64), this parameter would be set to the hex value 0x00640003

At the time of this writing, the encoder error filter parameter has not yet been added to CME2. Until it is, it can be set using the ASCII command line. For example, to set the above value to RAM, use the command:

```
S R0x11D 0x00640003
```

To set that value to flash so it's restored after a power-cycle, use the command:

```
S F0x11D 0x00640003
```

## **Status**

Parameter 0x11E (CANopen object 0x222C) contains status information related to the encoder error filter. This 32-bit unsigned parameter is bit-mapped as follows:

<b>Bits</b>	<b>Meaning</b>
0-3	Number of consecutive readings seen.
4-15	Reserved for future use.
16-31	Total number of times the encoder position has been replaced with the extrapolated position since power-up or the status was cleared.

It's possible to clear the value of the status by setting this parameter to zero.

To read the parameter via ASCII command line and display it in hex, use the command:

```
G R0x11E x
```

## **Conclusion**

There are very few occasions where the encoder error filter should actually be used. Any time encoder errors are occurring the real source of the error should be identified and fixed.

When the error filter is used, it's recommended that the filter status be monitored occasionally so that systems with frequent encoder errors can be identified and investigated.

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## **Revision History**

<b>Date</b>	<b>Version</b>	<b>Revision</b>
2/23/2015	1.0	Initial release