

AKD2G EtherCAT Troubleshooting List

Todd Evans, Jimmy Coleman

Rev. A | 8/12/2022

This list is provided to expedite the troubleshooting process by efficiently gathering system data required to troubleshoot common EtherCAT issues such as scaling, PDO mapping, SDO errors, and cycle timing.

1. What is the ECAT master?
2. DRV.INFO (for each drive on the network)
 - Includes: Drive model number
 - Includes: Drive Firmware version
3. Revision of ESI file currently being used.
 - ESI file name, as provided by Kollmorgen,-
 - Or revision number listed in the xml file under Descriptions / Devices / Device / Type / RevisionNo

```
version="1.0" encoding="utf-8"
http://www.w3.org/2001/XMLSchema-instance
EtherCATInfo.xsd
1.2
1213
106
Kollmorgen
424de60000000000000000760000002800000010000000e
520
Drive
424DD60200000000000000360000002800000010000000E
YY
#x11210100
#xa010001
EQ_OR_G
AKD2G Dual Axis FS1
```

4. Revision of Workbench
5. Does the issue occur when running the same profile with Workbench (without EtherCAT control)?
 - Unplug EtherCAT cable and reboot the drive.

6. Master startup script and PDO mappings
7. Mode of Operation used (object 6060h)
 - If object 6060h is not set, it will use the default value of 8 – Cyclic Synchronous Position Mode.
 - Or read object 6061h
8. Object numbers related to the problem
 - Are they used over SDO or PDO?
9. EtherCAT master's ECAT update rate.
10. Is Distributed Clocks (DC) enabled in master?
11. Save new *.akd parameter files.
12. Read-only parameters – read in Workbench Terminal
 - ECAT.INFO
 - Diagnostics Report
 - ECAT.STATE
 - Reads the state of the EtherCAT state machine.
 - Read this or scope this while replicating the problem
 - ECAT.PLLSTATE
 - Reads the state of the PPL
 - ECAT.INPUTSHIFT
 - Reads time offset of PLL.
 - Note: Only valid in OP state.
13. Parameters of special interest – saved in parameter file
 - Related to scaling
 - CANOPEN.WORKBENCHUNITS
 - AXIS#.CANOPEN.FCPRIMARY.FEED
 - AXIS#.CANOPEN.FCPRIMARY.SHAFTREV
 - AXIS#.CANOPEN.GEARPRIMARY.MOTORREV
 - AXIS#.CANOPEN.GEARPRIMARY.SHAFTREV
 - AXIS#.CANOPEN.VELSCALENUM
 - AXIS#.CANOPEN.VELSCALEDENOM
 - AXIS#.CANOPEN.PSCALE

- Related to PLL and cycle timing
 - ECAT.PLLMODE
 - ECAT.USEPLL
 - ECAT.ENRXWARN
 - ECAT.INPUTSHIFTU
 - ECAT.PLLOFFSET

14. Objects of Special Interest – used in the EtherCAT Master

- 6060h – mode of operation
- 6061h – read mode of operation
- 6040h - controlword
- 6041h - statusword
- 6091h subindex 1 – gear ratio numerator
- 6091h subindex 2 – gear ratio denominator
- 6092h subindex 1 – feed constant numerator
- 6092h subindex 2 – feed constant denominator
- 6096h subindex 1 – velocity factor numerator
- 6096h subindex 2 – velocity factor denominator

15. Scope plots

- CSV format is needed, so it can be analyzed in the Workbench scope tool.
- Images (.bmp or .jpg) are useful when several scope plots need to be opened at the same time for quick comparison (just make sure the image shows the pertinent information).

General Motion:

- AXIS#.IL.FB
- AXIS#.VL.FB
- AXIS#.VL.CMD
- AXIS#.PL.ERR
- AXIS#.PL.FB

EtherCAT State:

- ECAT.STATE
- AXIS#.CANOPEN.CONTROLWORD
- AXIS#.CANOPEN.STATUSWORD

EtherCAT PLL and Cycle Timing: (use 16kHz sample rate)

- ECAT.SYNCOTIME
- ECAT.RXDONETIME
- ECAT.POSLOOPTIME
- ECAT.TXDONETIME
- ECAT.PLLSTATE

Scope Sample Rate:

Depending on the ECAT update rate the Scope Time-Base and Trigger tab will need to be setup such that the Scope is sampled fast enough to capture the issue.

In this example the ECAT update rate was 500usec, so the Sampling Frequency was adjusted such that the Sampling Interval was 250usec. The setup goal should be such that the Sampling Interval is at least at the EtherCAT fieldbus rate or faster. The number of samples can be any number but 10,000 is typically a good value.

The screenshot shows the 'Time-base and Trigger' configuration window. The 'Sampling' section on the left includes: Recording time: 2500.0000 ms; Sampling Frequency: 4,000.000 Hz; Number of samples: 10,000; Sampling Interval: 250 μs. The 'Trigger' section on the right includes: Type: 0 - Immediate; Source: IL.FB; Level: 0.000; Position: 10 %; Slope: 0 - Negative. A 'Less <<' button and a 'Repeat Arming' checkbox are also visible.

16. Wireshark

- A Wireshark capture is sometimes needed to determine the sequence and timing of events.