

Idiots guide to running a Copley Amplifier over Ether CAT using the Trio motion controller.

Looking for an alternative to Mint programming....

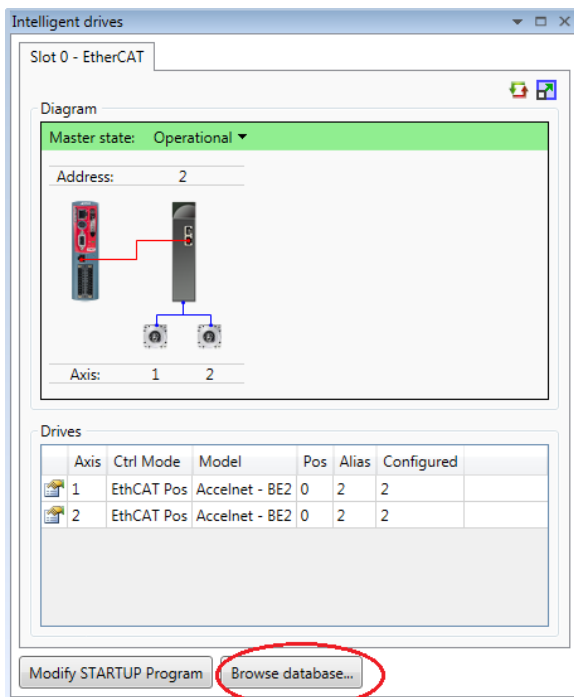


Trio is a general purpose motion controller which is capable of interfacing to many servo drive types. Servo Components and Systems in conjunction with Copley Motion control and Trio have integrated many Copley drive models into the Motion Perfect programming environment as standard, but others are possible by using the EC_EXTEND function.

Motion Perfect V4.3.1 onwards contains many Copley drives as standard as shown below, and are accessed via the tab highlighted:



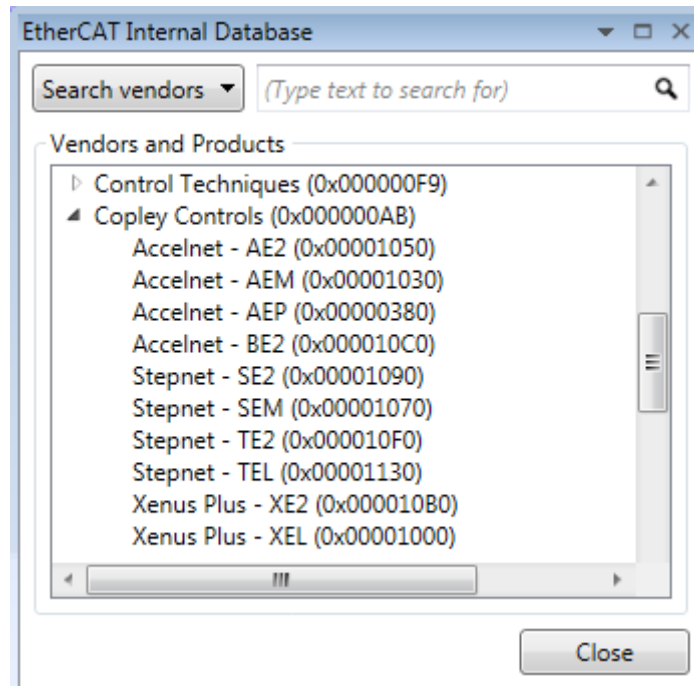
This displays the current Ether CAT network, and allows further modules to be added.



Click on Browse Database to add additional Nodes..

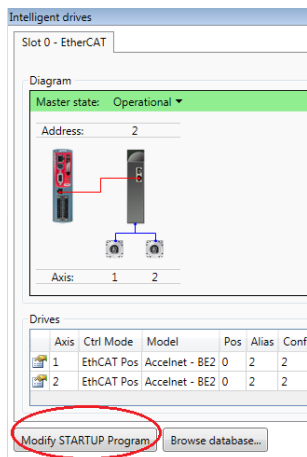
Search or scroll down to Copley to find the following pre-programmed drives.





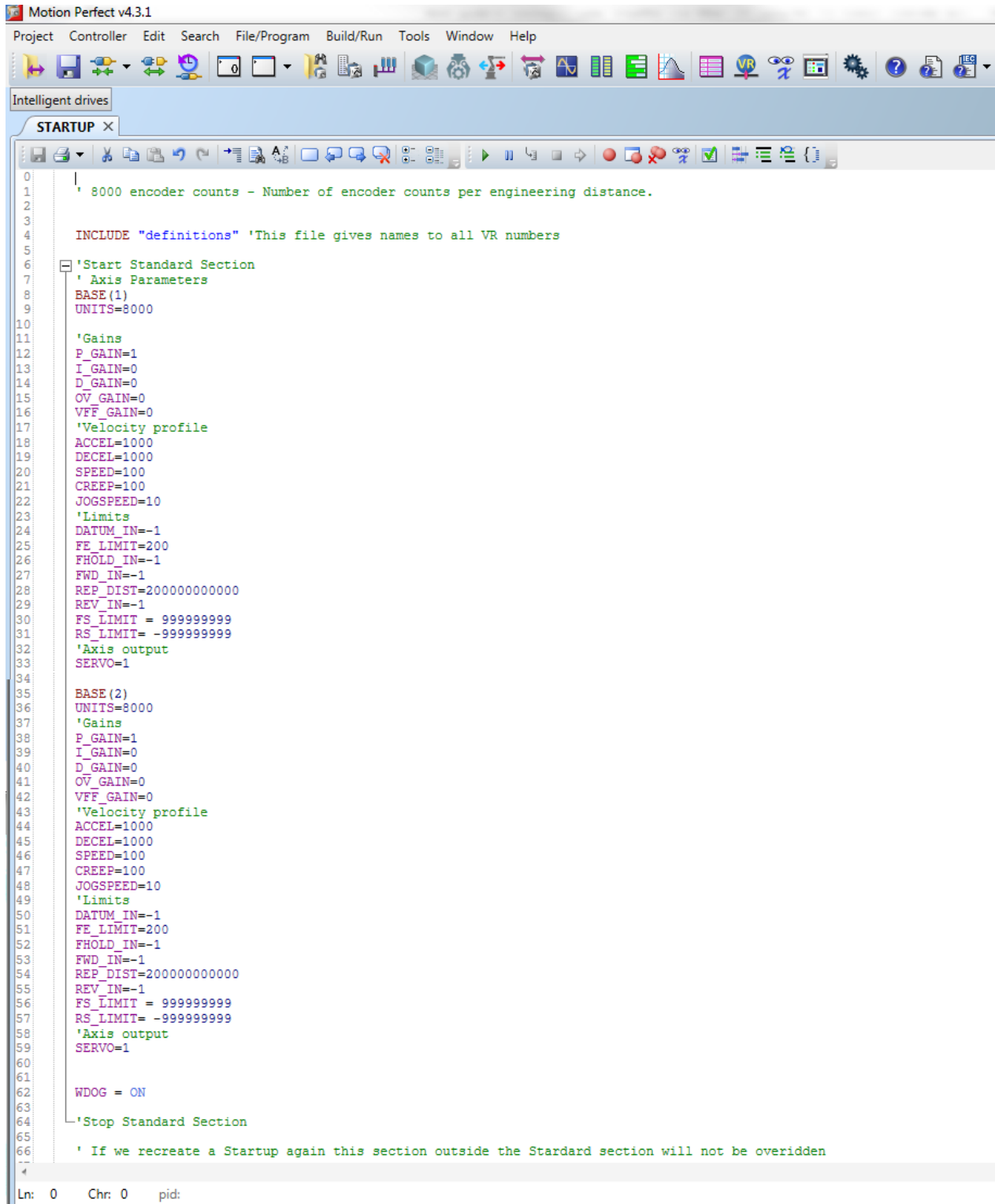
The drives already displayed (BE2) are not shown in the list. These are two axis drives and currently need an Extension file called EC EXTEND to use them. Appendix A shows a number of these files for devices not in the list.

Once all the drives have been added to the list, it is possible to generate a START UP file to get you started.



This generates the following....

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```
0 |
1 | ' 8000 encoder counts - Number of encoder counts per engineering distance.
2 |
3 |
4 | INCLUDE "definitions" 'This file gives names to all VR numbers
5 |
6 | 'Start Standard Section
7 | ' Axis Parameters
8 | BASE(1)
9 | UNITS=8000
10 |
11 | 'Gains
12 | P_GAIN=1
13 | I_GAIN=0
14 | D_GAIN=0
15 | OV_GAIN=0
16 | VFF_GAIN=0
17 | 'Velocity profile
18 | ACCEL=1000
19 | DECEL=1000
20 | SPEED=100
21 | CREEP=100
22 | JOGSPEED=10
23 | 'Limits
24 | DATUM_IN=-1
25 | FE_LIMIT=200
26 | FHOLD_IN=-1
27 | FWD_IN=-1
28 | REP_DIST=200000000000
29 | REV_IN=-1
30 | FS_LIMIT = 999999999
31 | RS_LIMIT= -999999999
32 | 'Axis output
33 | SERVO=1
34 |
35 | BASE(2)
36 | UNITS=8000
37 | 'Gains
38 | P_GAIN=1
39 | I_GAIN=0
40 | D_GAIN=0
41 | OV_GAIN=0
42 | VFF_GAIN=0
43 | 'Velocity profile
44 | ACCEL=1000
45 | DECEL=1000
46 | SPEED=100
47 | CREEP=100
48 | JOGSPEED=10
49 | 'Limits
50 | DATUM_IN=-1
51 | FE_LIMIT=200
52 | FHOLD_IN=-1
53 | FWD_IN=-1
54 | REP_DIST=200000000000
55 | REV_IN=-1
56 | FS_LIMIT = 999999999
57 | RS_LIMIT= -999999999
58 | 'Axis output
59 | SERVO=1
60 |
61 |
62 | WDOG = ON
63 |
64 | 'Stop Standard Section
65 |
66 | ' If we recreate a Startup again this section outside the Stardard section will not be overridden
67 |
68 |
```

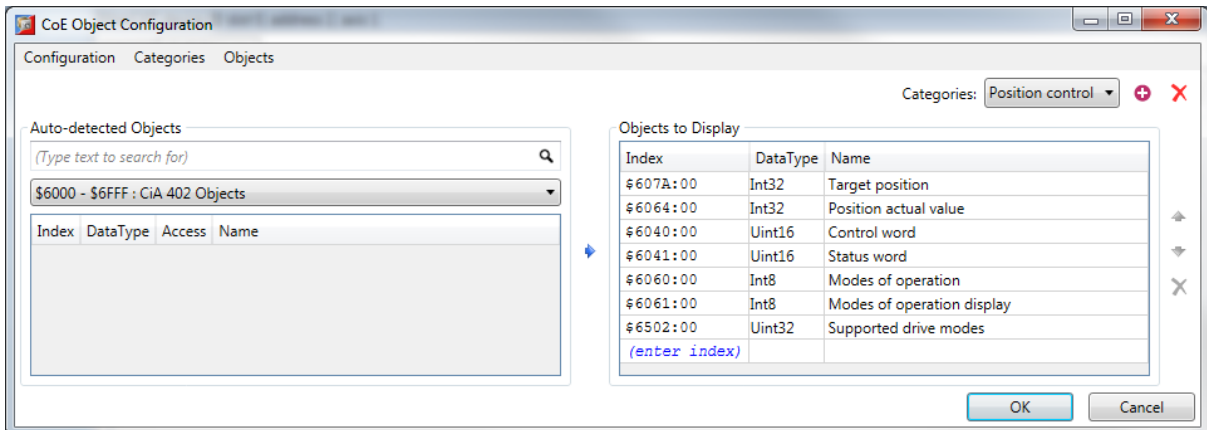
Ln: 0 Chr: 0 pid:

If the file already exists then any code outside the brackets will be retained.



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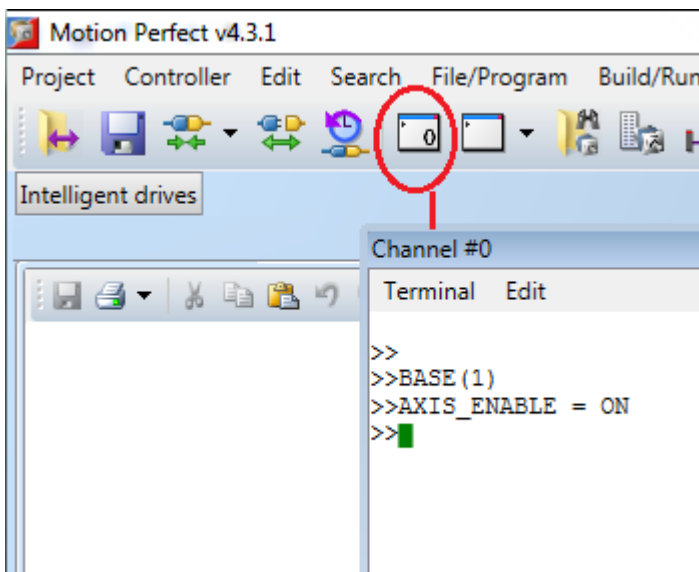
The Can over EtherNet (CoE) conforms to CiA402 and this drive has the following connections;



In this application the BE2 only requires one Ether CAT connection. The Drive must be setup first in the normal way, entering the correct motor details and tune as in any other system. It must also be placed into Ether CAT mode for the command source.

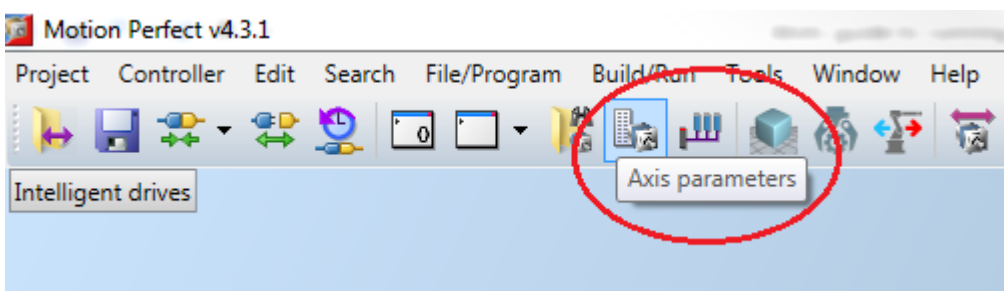
When connection is made, we need to enable the drive over Ether CAT

To test the link, we can enable the drive using the Terminal mode...



Here we used BASE (1) to command the Drive on Axis 1, and then the AXIS_ENABLE = ON command.

This AXIS parameters can be view and modified using the AXIS Parameter tag:

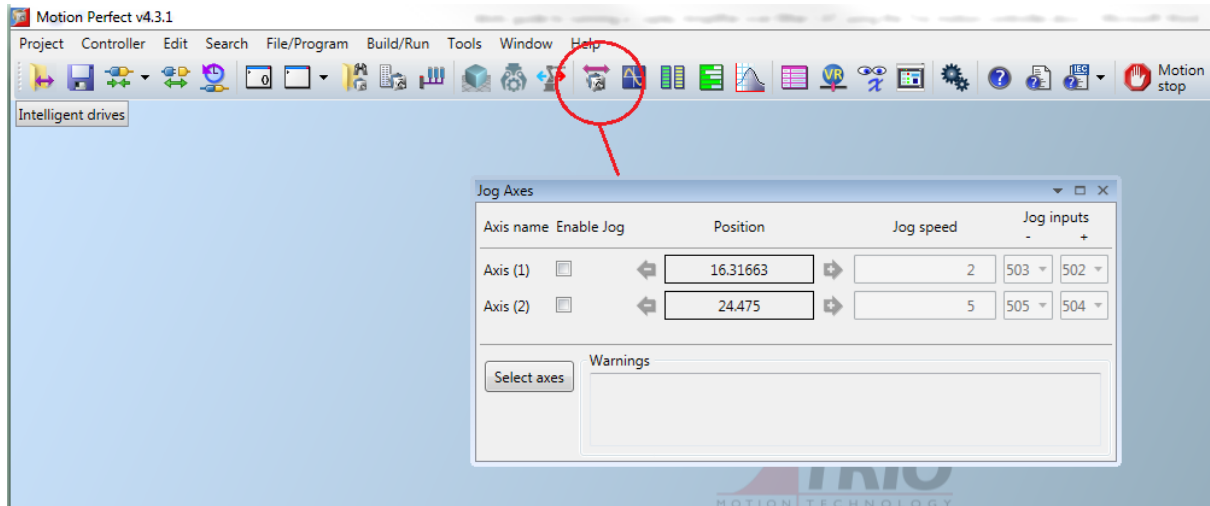


This opens the following

▲ Gains		
P_GAIN	1.0	1.0
I_GAIN	0.0	0.0
D_GAIN	0.0	0.0
OV_GAIN	0.0	0.0
VFF_GAIN	0.0	0.0
▲ Velocity profile		
ACCEL	100.0	100.0
DECEL	100.0	100.0
SPEED	10.0	10.0
CREEP	100.0	100.0
MERGE	0	0
SRAMP	0	0
MSPEED	-9.37500	9.75000
VP_SPEED	9.60000	9.60000
▲ Limits		
DATUM_IN	-1	-1
FE_LIMIT	1.0	1.0
FE_RANGE	1.25000	1.25000
FHOLD_IN	-1	-1
FWD_IN	-1	-1
REP_DIST	200000000000.0	200000000000.0
REP_OPTION	0	0
REV_IN	-1	-1
FS_LIMIT	999999999.0	999999999.0
RS_LIMIT	-999999999.0	-999999999.0
▲ Positions		
DPOS	0.56288	4.08500
ENCODER	4535	32850
ENDMOVE	0.47250	0.61750
MPOS	0.56688	4.10625
REMAIN	0.09038	3.46750
▲ Axis output		
DAC	0	0
SERVO	1	1
▲ Status		
AXISSTATUS	None	None
FE	-0.00187	-0.02075
LINK_AXIS	-1	-1
MTYPE	MOVEABS	MOVEABS
NTYPE	Idle	Idle
TABLE_POINTER	0.0	0.0
▲ Registration		
MARK	0	0
REG_POS	0.0	0.0
▲ Jogging		
FAST_JOG	-1	-1
FWD_JOG	502	504
REV_JOG	503	505



Without any other code it is possible to Jog each axis using the Jog commands:



The JOG inputs must be set to either a REAL or VIRTUAL inputs, and the Enable box ticked to be able to JOG.

APPENDIX A

TYPE 1 Twin Axis COPLEY AccelNET BE2 amplifier EC EXTEND file.

```
<?xml version="1.0" encoding="utf-8"?>
<EtherCAT>
  <Version>1.0.0</Version>
  <RxPdos>
    <RxPdo>
      <Index>0</Index>
      <Name>RXPDO_PROFILE</Name>
      <Entry>
        <Name>CTRL_WORD</Name>
        <Length>2</Length>
        <Flags>0</Flags>
      </Entry>
      <Entry>
        <Name>TARGET_POS</Name>
        <Length>4</Length>
        <Flags>0</Flags>
      </Entry>
      <Entry>
        <Name>NULL</Name>
        <Length>0</Length>
        <Flags>0</Flags>
      </Entry>
    </RxPdo>
  </RxPdos>
  <TxPdos>
    <TxPdo>
      <Index>0</Index>
      <Name>TXPDO_PROFILE</Name>
      <Entry>
        <Name>STATUS_WORD</Name>
        <Length>2</Length>
        <Flags>0</Flags>
      </Entry>
      <Entry>
        <Name>ACTUAL_POS</Name>
        <Length>4</Length>
        <Flags>0</Flags>
      </Entry>
      <Entry>
        <Name>NULL</Name>
        <Length>0</Length>
        <Flags>0</Flags>
      </Entry>
    </TxPdo>
  </TxPdos>
  <SdoInitCmds>
    <SdoInitCmd>
```



```
<Index>0</Index>
<Name>SDO_APP_CSP</Name>
<Entry>
  <Index>0x1C12</Index>
  <SubIndex>0</SubIndex>
  <Length>1</Length>
  <Data>0</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x1C13</Index>
  <SubIndex>0</SubIndex>
  <Length>1</Length>
  <Data>0</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x1600</Index>
  <SubIndex>0</SubIndex>
  <Length>1</Length>
  <Data>0</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x1600</Index>
  <SubIndex>1</SubIndex>
  <Length>4</Length>
  <Data>0x60400010</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x1600</Index>
  <SubIndex>2</SubIndex>
  <Length>4</Length>
  <Data>0x607A0020</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x1600</Index>
  <SubIndex>0</SubIndex>
  <Length>1</Length>
  <Data>2</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
```



```
<Index>0x1A00</Index>
<SubIndex>0</SubIndex>
<Length>1</Length>
<Data>0</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
<Index>0x1A00</Index>
<SubIndex>1</SubIndex>
<Length>4</Length>
<Data>0x60410010</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
<Index>0x1A00</Index>
<SubIndex>2</SubIndex>
<Length>4</Length>
<Data>0x60640020</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
<Index>0x1A00</Index>
<SubIndex>0</SubIndex>
<Length>1</Length>
<Data>2</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
<Index>0x1C12</Index>
<SubIndex>1</SubIndex>
<Length>2</Length>
<Data>0x1600</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
<Index>0x1C12</Index>
<SubIndex>0</SubIndex>
<Length>1</Length>
<Data>1</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
<Index>0x1C13</Index>
<SubIndex>1</SubIndex>
<Length>2</Length>
```



```
<Data>0x1A00</Data>
<Flags>NONE</Flags>
<Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x1C13</Index>
  <SubIndex>0</SubIndex>
  <Length>1</Length>
  <Data>1</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
<Entry>
  <Index>0x6060</Index>
  <SubIndex>0</SubIndex>
  <Length>1</Length>
  <Data>8</Data>
  <Flags>NONE</Flags>
  <Transition>2</Transition>
</Entry>
</SdoInitCmd>
</SdoInitCmds>
<EscCfgs>
  <EscCfg>
    <Index>0</Index>
    <Sm>
      <Index>0</Index>
      <Startaddress>0x1000</Startaddress>
      <Size>40</Size>
      <Controlbyte>0x26</Controlbyte>
      <Enable>1</Enable>
      <Function>MBOXOUT</Function>
    </Sm>
    <Sm>
      <Index>1</Index>
      <Startaddress>0x1100</Startaddress>
      <Size>40</Size>
      <Controlbyte>0x22</Controlbyte>
      <Enable>1</Enable>
      <Function>MBOXIN</Function>
    </Sm>
    <Sm>
      <Index>2</Index>
      <Startaddress>0x1200</Startaddress>
      <Controlbyte>0x64</Controlbyte>
      <Enable>1</Enable>
      <Function>OUTPUTS</Function>
    </Sm>
    <Sm>
      <Index>3</Index>
      <Startaddress>0x1800</Startaddress>
```



```
<Controlbyte>0x20</Controlbyte>
<Enable>1</Enable>
<Function>INPUTS</Function>
</Sm>
</EscCfg>
</EscCfgs>
<SlvCfgs>
<SlvCfg>
  <Index>0</Index>
  <SlaveType>SERVO</SlaveType>
  <Axes>2</Axes>
  <Din>0</Din>
  <Dout>0</Dout>
  <Ain>1</Ain>
  <Aout>0</Aout>
  <CycData>
    <Atype>POSITION</Atype>
    <CtrlMode>CSP</CtrlMode>
    <UseLrdLwr>FALSE</UseLrdLwr>
    <Cmd>LRW</Cmd>
    <State>DEVICE_STATE_SAFEOP,DEVICE_STATE_OP</State>
  </CycData>
  <Dc>
    <Mode>0x0330</Mode>
  </Dc>
  <MbxStartupProtocol>CoE</MbxStartupProtocol>
  <MbxProtocols>CoE</MbxProtocols>
  <MbxRate>100</MbxRate>
  <EscCfgIndex>0</EscCfgIndex>
  <SdoInitCmdIndex>SDO_APP_CSP</SdoInitCmdIndex>
  <RxPdoIndex>RXPDO_PROFILE</RxPdoIndex>
  <TxPdoIndex>TXPDO_PROFILE</TxPdoIndex>
</SlvCfg>
</SlvCfgs>
<Profiles>
<Profile>
  <Index>0</Index>
  <Vid>0x000000ab</Vid>
  <Pid>0x000010c0</Pid>
  <Rev>65539</Rev>
  <ProfileIndex>0</ProfileIndex>
  <Atype>POSITION</Atype>
  <Name>Accelnet - BE2v1</Name>
  <SlvCfgIndex>0</SlvCfgIndex>
</Profile>
</Profiles>
<Vendors>
<Vendor>
  <Vid>0x000000ab</Vid>
  <Name>Copley Controls</Name>
</Vendor>
```



</Vendors>
</EtherCAT>

