Application Bulletin

Utilizing the CANOpen Master
HE-COM650

Overview.

This document provides a general overview of using the Horner APG HE-COM650 CANOpen master module. Basic connections, configurations, and diagnostics within Cscape and HSyCon software are covered. CANOpen protocol parameters are explained in a limited sense to keep things simple.

Equipment and software used for this application note are:

Hardware: HE-NX251, HECOM650, HE-XE10X.
           Belden cable 3084A.
Software: Cscape 8.10.b, HSyCon.
Other: EDS file for XLe.

Section 1: Cscape Configuration

1. In Cscape, click '**Controller**', then '**I/O configure'** which opens the I/O configuration window. Click '**Auto Config Base'** if the NX/COM650 is connected. Or, select the COM650 for slot 1 in the Main tab. If configuring the COM650 in an empty slot, the COM650 is found in the COMM tab by clicking the config button to the right of the slot closest to the base.
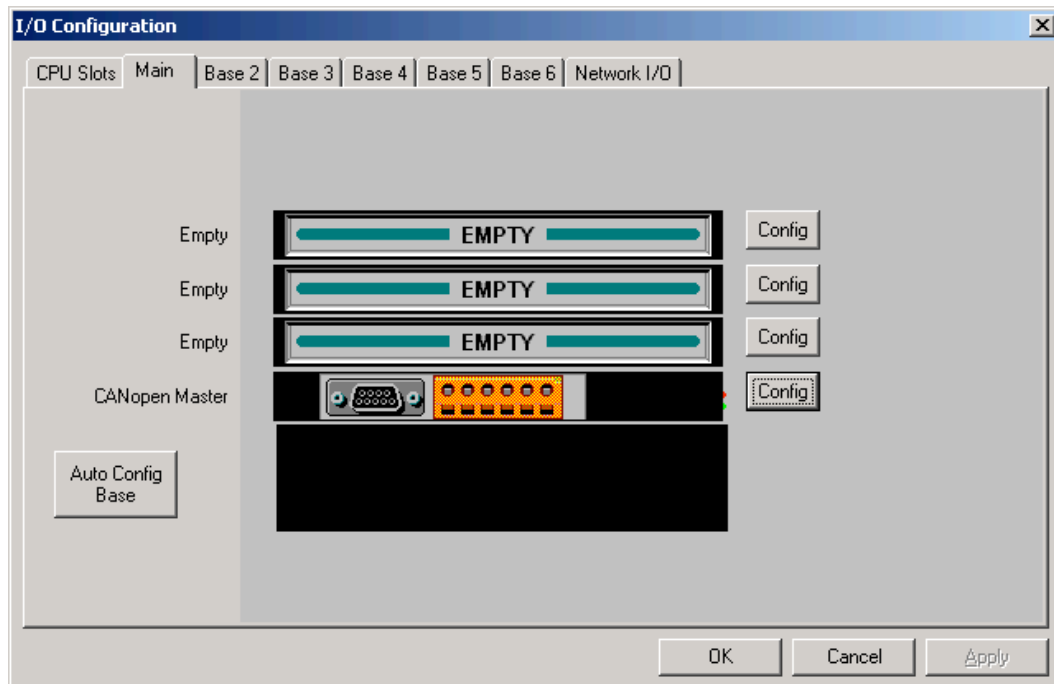
Cscape configuration continued...

2. Click on the '**Config**' button next to the CANopen Master in the I/O configuration window. Configure the COM650 as shown to the right.

Inputs:
Length: 16
Data incoming from the XLe.

Outputs:
Length: 16
Data going out to the XLe.

Status:
Nodes Online/Offline

The 'Start SYCON Config Tool>>' is not currently implemented. HSyCon should be launched manually.

Module Configuration

I/O Map | Module Setup

Start SYCON Config Tool >>>

Inputs
Starting Reg: R0101   Number Regs: 16

Outputs
Starting Reg: R0201   Number Regs: 16

Status
Network Status: R0005   64x3 1-BIT

OK   Cancel   Apply

- The 'Starting Reg:' for Inputs and Outputs are set at user discretion. This example uses R101 for the starting Input and R201 for the starting Output.
- The 'Number of Regs:' for Inputs and Outputs encompasses the whole CANOpen network. For example if there were three slave nodes all with 16 words produced and 16 words consumed the Number of registers for Input would be 48 and the number of registers for Output would be 48.
- The Network Status register shows Offline/Online nodes and is selected at user discretion. It is highly recommended to add the Status (binary format) to one of the screens in the project or utilize it in conjunction with the Cscape alarm handler. Each bit of the binary status word represents a slave node. Node ID's in the Status word start at zero. For example: if node 5 dropped offline, bit 6 would go to zero in the Status word.

3.   Once the COM650 has been configured in the I/O configuration window and suitable screens and ladder have been created, download the project to the controller.

(Technically speaking the COM650 requires no ladder to operate, but there should be at least one rung of ladder downloaded to the controller to pass all self-tests)

Section 2: HSyCon Configuration.

The HSyCon software configuration tool provides the bulk of the setup for the CANopen network. Slave EDS files are imported into the software, produced and consumed PDO's (Process Data Object) are configured for each slave and downloaded to the COM650 module through its RS-232 port. Setting network parameters and performing diagnostics are all accomplished with HSyCon, with the exception of the Status register set in Cscape.

Configure the Master.

1. Open the HSyCon software. If the option box for selecting CANopen does not pop up, click 'File' and then 'New'. Then select **CANopen**.

(New installs will display the message "No EDS files found" at this message just click 'OK')

2. Click on '**Insert**' then '**Master**'

3. The COM650-001 master should show up in the list as shown here. Click '**Add**' and then '**OK**'.
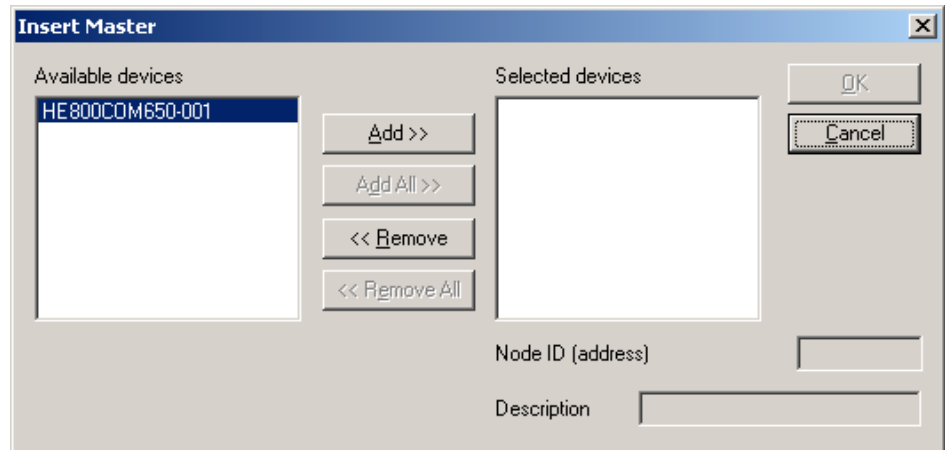
4. The COM650 defaults to 125kbits/s baud rate. If a higher baud rate is desired highlight the Master module in the main HSyCon window and click '**Settings**' then '**Bus Parameter.**' and adjust to desired baud rate. This window also includes selections for:
    -   Heartbeat from Master
    -   Master stop in case of Node Guard or Heartbeat Error
    -   Enable Global Start Node
    -   29 Bit Selection Entries

5. Import the slave device's EDS file by clicking '**File**' then '**Copy EDS'**. (The EDS file is supplied by the slave manufacturer) Browse to the location of the EDS file on the hard drive and click '**OK**'. Then click 'No' when asked to import the corresponding bitmaps.

6. Insert slave to configuration by clicking **'Insert'** then **'Node'.** In the Insert Node window click '**Add**' and then '**OK**'
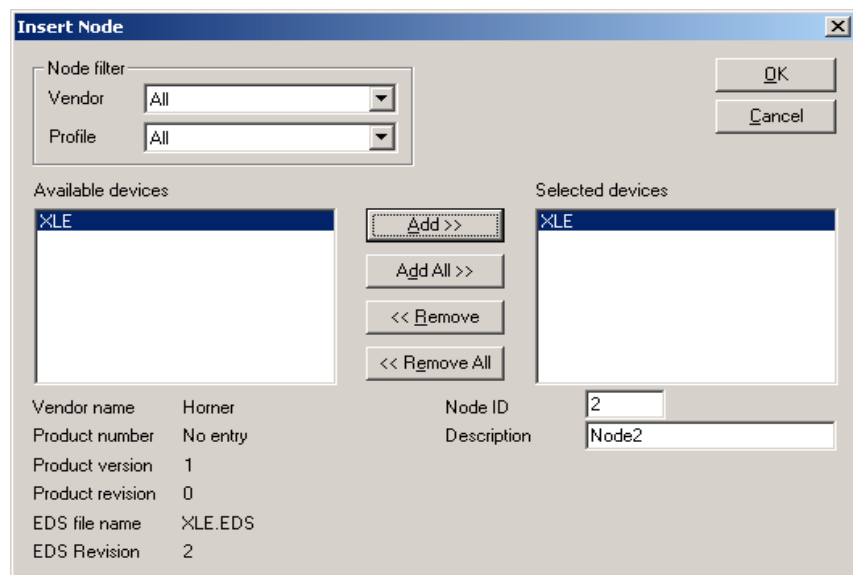
Node configuration.

Double click on the node to be configured in the HSyCon main window. At this point the PDO's are visible in the upper box called 'Predefined Process Data Objects…..', but are not yet configured. Add the first PDO by highlighting it and clicking '**Add to configured PDO's'.** Add the next PDO and so on until all desired PDO's are added as shown below.

PDO (Process Data Object)
PDO's can be used to transmit up to 8 bytes of data. Each PDO has it's own identifier, the COB-ID (Communication Object Identifier), and is transmitted by only one node, but it can be received by multiple nodes. The PDO is part of the Object Library and is defined by the slave's EDS file. HSyCon auto-indexes the PDO's. Typically all that is required in the config process is to add the PDO's pre-defined by the EDS file to the configuration as explained above. The HSyCon software also has to ability to configure SDO's (Service Data Object) which are basically device setup parameters.
       The example above shows the PDO set of an XLe. The XLe has a total of 8 PDO's, 4 transmit and 4 receive. Each PDO is 8 bytes in length. So the XLe is configured for 32 bytes in and 32 bytes out.

HSyCon configuration continued..

Connect and Download.

1. Connect the PC serial cable to the 9pinF D-sub port of the COM650, make sure the controller/COM650 is powered on.

2. Highlight the Master module in the main window and click '**Online**' and then click '**Download**'.

If the PC port is unavailable or has not been selected in the config file, the message to the right will pop up. If HSyCon will use the same COM port as Cscape, make sure Cscape is closed before launching the HSyCon software. They cannot share a port at the same time.

When downloading for the first time or if HSyCon is not able to auto-connect it will be necessary to select a COM port. The window shown below will pop up when an online function is started and the desired COM port should be selected. HSyCon supports
COM 1 through COM 4.
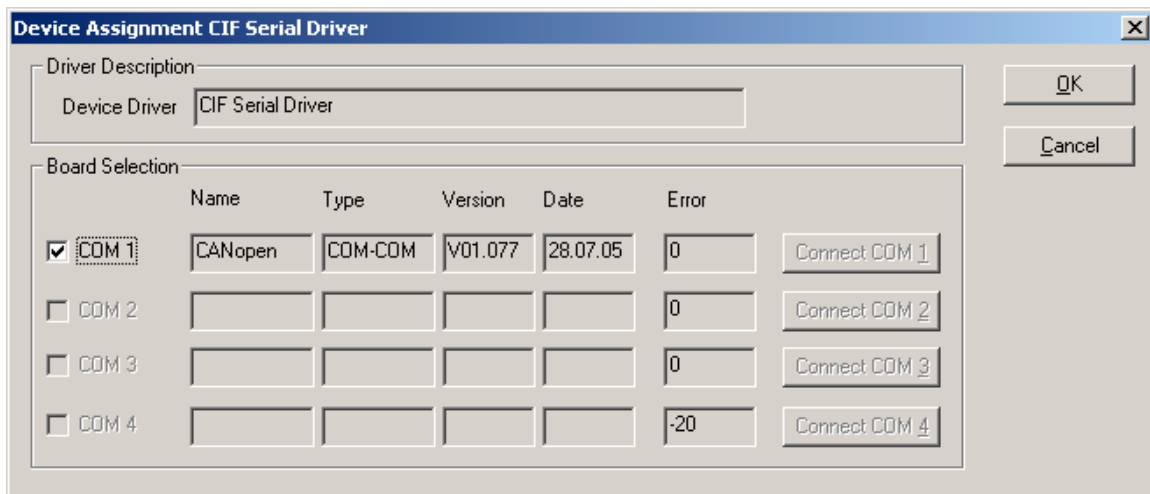
Section 3: HSyCon Diagnostics.

LED's

RDY (Orange)	OFF or Blinking ON	Module not ready Module ready
RUN (Green)	Blinking Flashing non cyclic ON	Communication stopped Hardware or system error Communication started

| Error (Red) | OFF | No errors |
	ON	Errors present. Check online diagnostics
STA (Orange)	OFF	No messages over CAN Bus
	ON/Blinking	Blinks with CAN port activity

Online Diagnostics.

This section outlines the available diagnostics for the COM650 and gives a brief overview on how they are used. The following functions are started by highlighting the Master module in the main window and clicking '**Online**'.

1. *Debug Mode.*
This mode can be used as a quick check of the overall condition of the network. The picture below shows the software in Debug Mode. The green trace indicates a functioning network, no errors. If errors are present the trace will be red.
2. *Global State Field.*
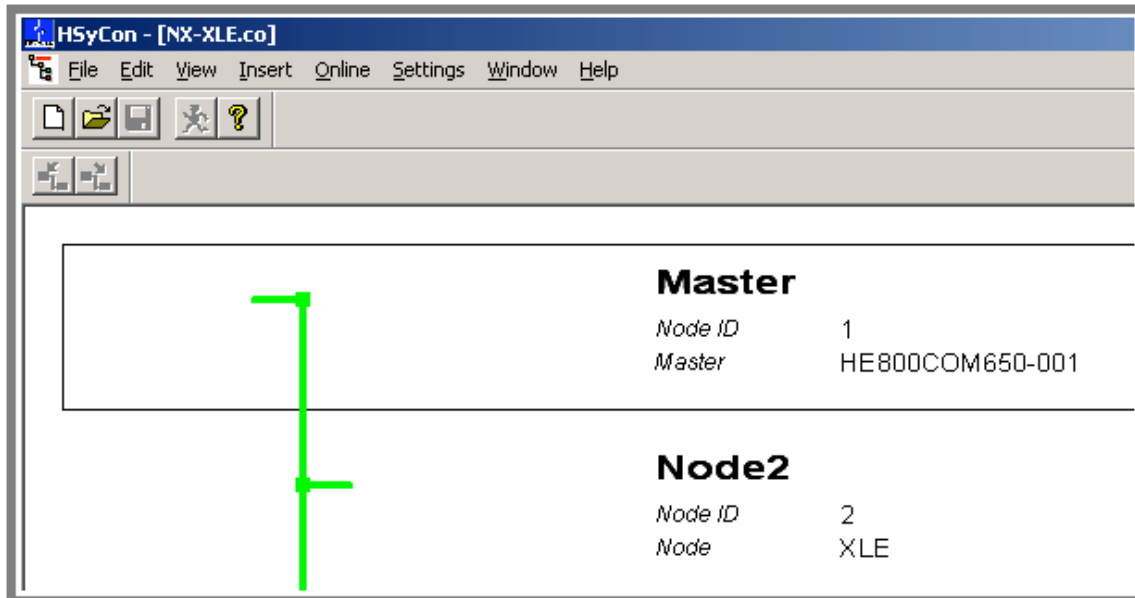
The Global State Field allows scrutiny of the Master and all of the slave nodes on the network. The connection status of each individual slave can be quickly checked from the Device Specific Status Bits window. Below is an example of the XLe connected and active at node 2 indicated by the 2 highlighted in green.

HSyCon Diagnostics continued..
*Global State Field.*
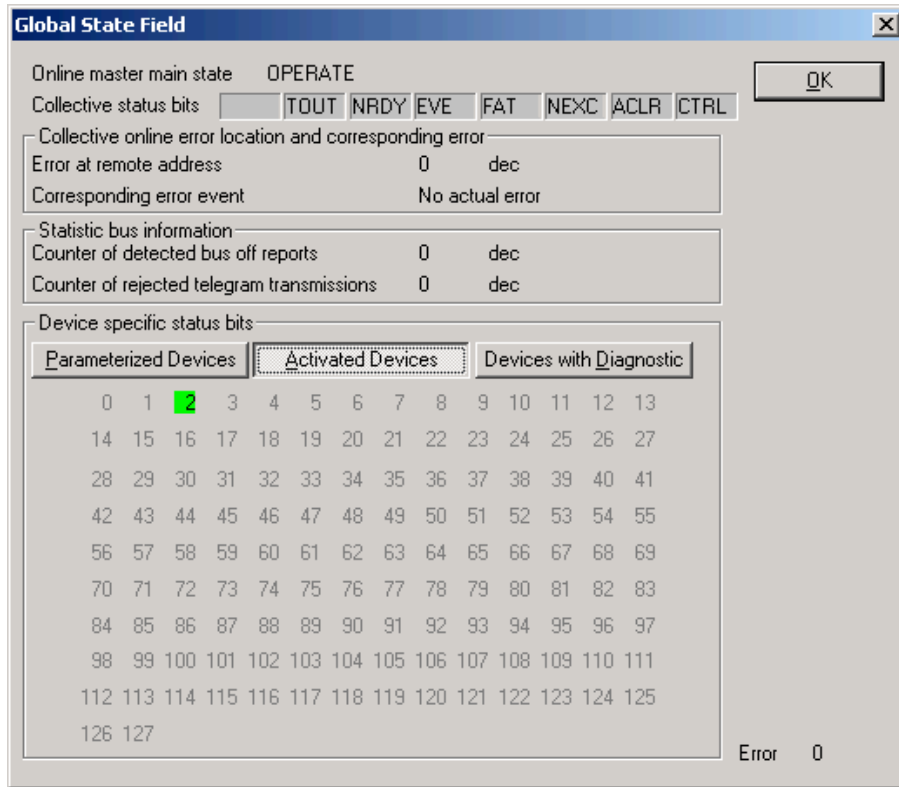
Errors that occur will result in one of the status bits (TOUT, NRDY, EVE, FAT, NEXC, ACLR, or CTRL) being highlighted. The definitions of these status bits can be found in the HSyCon help file. For more specific information on faults for individual slaves click on '**Devices with Diagnostic'.** The nodes with errors will be highlighted in red. For more information on the error double click on the specific node number in question.

3. *Live List.*
The Live List is a quick check to see which nodes are showing up on the network. The window is similar to the Global State Field, but without the extended diagnostics.

4. *Extended Device Diagnostic.*
Most network problems can be solved with the aid of the Global State Field, Debug, and Live List. However, the Extended Device Diagnostic is there to offer additional levels of node specific diagnostics if needed. Double click on the desired diagnostic to start it.
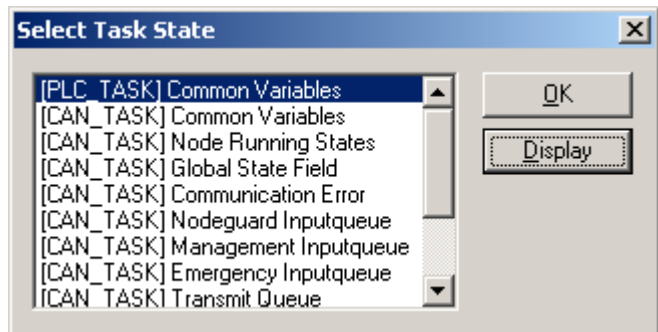
HSyCon Diagnostics continued..
Extended Device Diagnostic.

Listed below are brief descriptions of some of the more useful Extended Device Diagnostics.

- *PLC Common Variables* - The PLC Common Variable diagnostic counts the number of successful transactions between the PC COM port and the COM650.
- *CAN Common Variables* - The CAN Common Variable diagnostic counts up the number of sent messages and the number of received messages on the CAN network.
- *Node Running States* - Shows an overview for each node as to whether they are configured for inputs, outputs, or both.
- *Communication Error* - Shows slave specific error diagnostics.
- *CMS Domain Services* – This diagnostic contains a 'Hard Transmission Aborts' counter which is basically a failed transmission counter.
- *Timeout Counter* – Timeout counters for each individual network node.
- *Node Init Counter* – Initialization counters for each individual node on the network. Counts number of times node is initialized.

All codes and counters reside in the COM650 module and are reset when power to the COM650/Controller is cycled.

Example program files that closely follow this application note are available by contacting Horner APG Technical Support.

Note: The programming examples shown in this application note are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator/developer.

Horner APG wrote this document on August 9, 2007. Questions or comments can be directed to the Tech Support Department by phone at 317-916-4274 or email techsppt@heapg.com.