Introduction

Several models of Copley servo drives support a proprietary communications interface which can be used to allow groups of drives to coordinate with each other.

This interface, known as Inter-Drive-Communication or IDC, is described herein.

Supported Models

The IDC interface is supported on drives in the PCF (Plus Common Firmware) family.
These include the AEV, APV, NPP, and NEP at the time of this writing. Future drives in the PCF family will also include support for IDC.

Hardware Interface

Up to 8 drives can be connected using the IDC bus. They are wired together in a ring formation where the differential output of one drive is wired to the differential input of the next drive in the ring.

The output of the last drive will be wired back to the input of the first drive. One drive on the IDC ring will be configured as the master node and assigned a node ID of 0. On power-up, this master node will configure the other nodes on the ring to have unique node IDs. The drive located directly downstream from the master will be assigned node ID 1, the next will be 2, etc.
"0" are outputs from nodes to the ring and "1" are inputs from the ring to nodes.
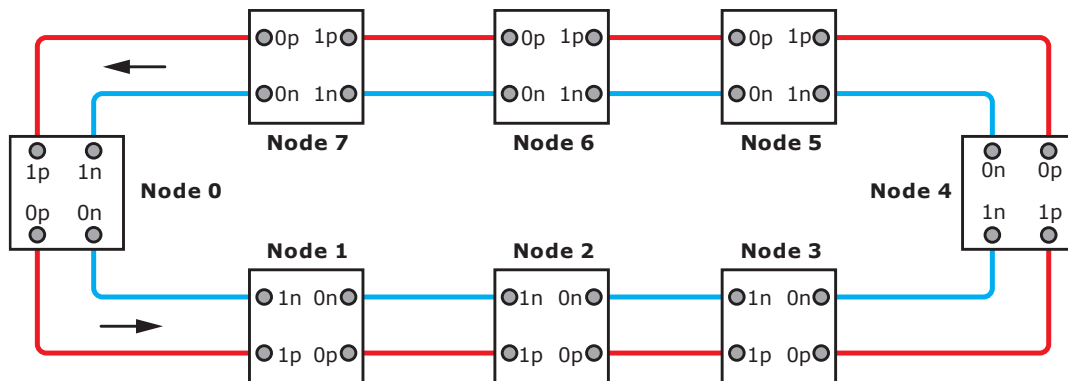
Configuration

Drive parameter 0x1AE is used to configure the IDC bus.

This parameter is bit-mapped as follows:

Bits	Function
0	Set (1) for master node, clear (0) for other nodes on the ring. Only one node can be configured as a master.
1	Set to disable command forwarding over IDC. This is useful for CAN based drives when the CAN network should be used for serial command forwarding rather than the IDC network.
2-7	Reserved.
8-10	Node ID of partner axis for cross coupling gains.
11-15	Reserved.
16-19	Identifies the type of additional data to send with every IDC message.
20-31	Reserved.

Status

Drive parameter 0x1AF gives the current status of the IDC bus.

This parameter is bit-mapped as follows:

Bits	Function
0	Set when the node is synchronized to the IDC bus.
1	Set when the node's address has been successfully assigned.
2	Set when the address assignment of the network is complete and normal mode is operational.
3-7	Reserved.
8	Set if the IDC network has been reset due to errors. Write 1 to clear.
9-15	Reserved.
16-18	Assigned node ID.
19-31	Reserved.

Command Forwarding

The IDC network can be used to forward serial commands from the master node on the IDC network to any other node.

Only the master node can initiate the forwarding of commands in this manner.
Serial port commands include a node ID as part of the command header. If a master IDC node receives a serial command addressed to a node other than node 0, it will forward that command through the IDC bus to the specified node and await the response from that node.
The master will then forward that response back to the host using the serial interface.

Cross-Coupled Gains

The IDC bus can be used to allow one drive to use the position error of another drive to influence its position loop calculations. Several cross-coupled gains are supported by the drive (see parameters 0x197, 0x198, and 0x199). When cross-coupled gains are used, the node ID of the drive whose position error is used to calculate these gains should be set in bits 8-10 of the IDC configuration parameter.

Master / Slave mode

Several modes of operation can be used to allow one axis of a multi-axis drive to follow the command of another axis.

For drives supporting IDC, these slave modes can be used to track the command of another drive on the IDC network. The slave axis should be configured in one of the slave modes of operation by setting parameter 0x24 to a value of 7 (current mode slaved to another drive), 17 (velocity slave mode), 27 (position slave mode), or 37 (micro-stepping slave mode).

The node ID of the master axis to follow must be set in bits 0-2 of parameter 0x145 (mode options). Additionally, the master node on the IDC network needs to be configured to transmit its commanded position, velocity, and current values every cycle by setting bits 15-18 of the IDC configuration parameter to a value of 1. It is possible to configure multiple slave axes to all follow the command of a single master axis if desired.
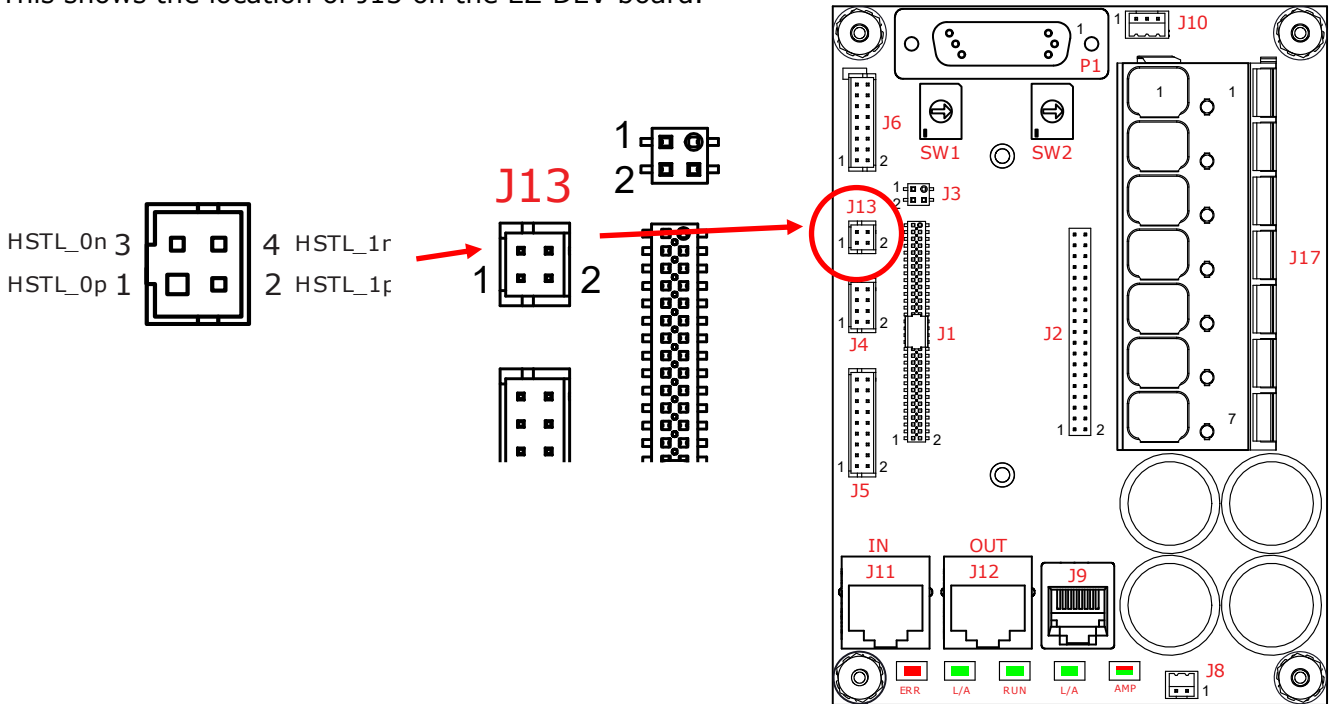
Cabling
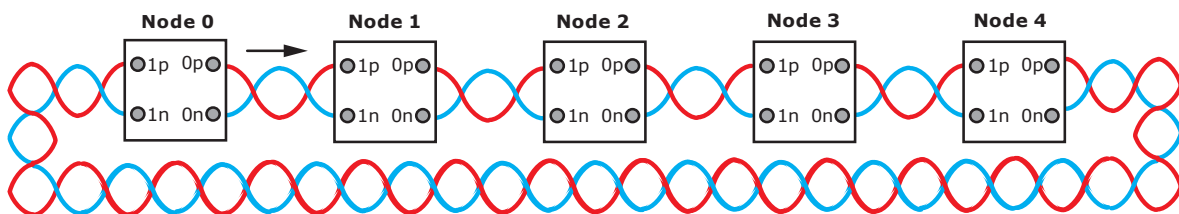
IDC with AEV/APV EZ Board
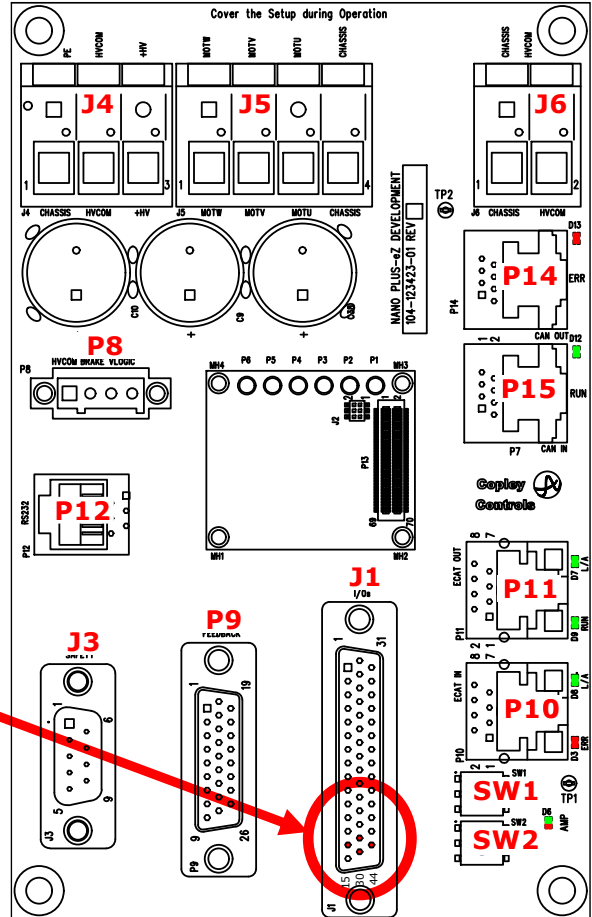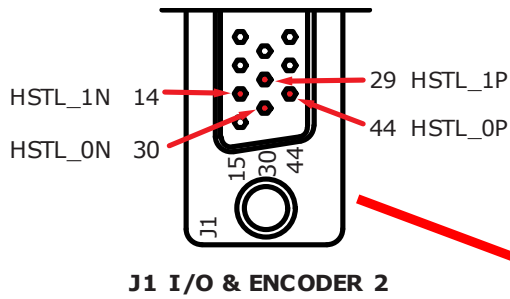This shows the location of J13 on the EZ board.

J13

HSTL_1p 2		1 HSTL_0p
HSTL_1n 4		3 HSTL_0n
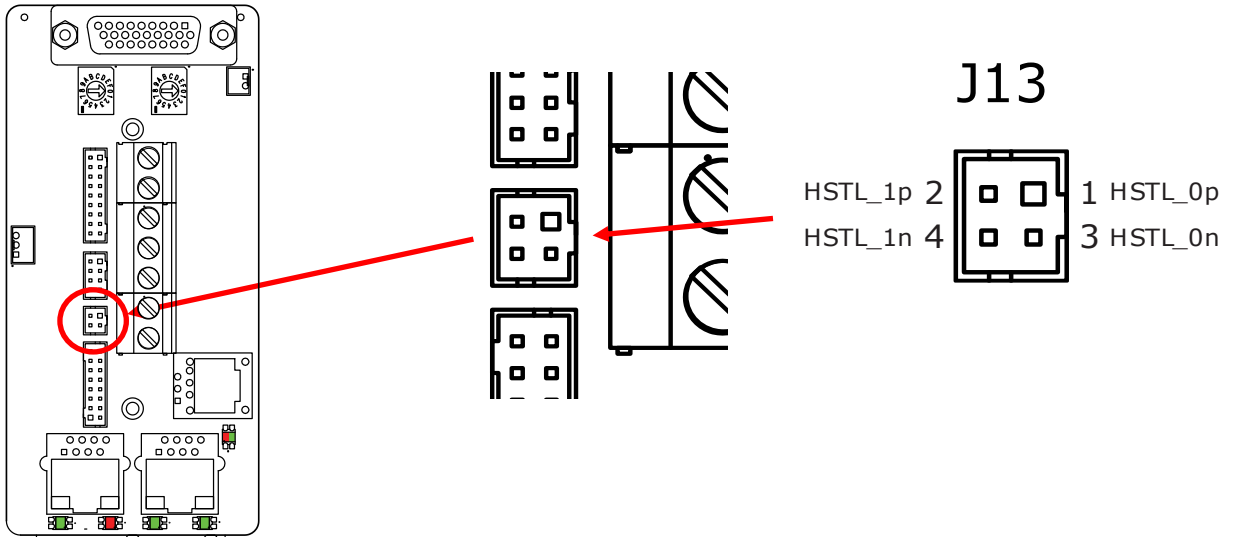
IDC with AEV/APV EZ DEV Board
This shows the location of J13 on the EZ DEV board.

HSTL_0n 3		4 HSTL_1n
HSTL_0p 1		2 HSTL_1p

J13

IDC with NEP/NPP EZ Board

This shows the location of J1 on the EZ board.

HSTL_1N 14   29 HSTL_1P
HSTL_0N 30   44 HSTL_0P

J1 I/O & ENCODER 2

Date	Version	Revision
11/23/2021	Rev 00	Initial release
2/9/2022	Rev 01	Add NEP/NPP EZ Board