SensINTNet

Integrated Multi-Axis Motor Controller System

The SensINTNet Multi-Axis Motor Controller System is a complete drive network solution for multi-axis systems requiring network control with a high-level of integration. The system consists of one or more Controller Module (CM) assemblies, each controlling up to ten independent motor Drive Module (DM) nodes.

The CM nodes communicate with a Main System Host via a 10/100 Copper Ethernet link using TCP/IP protocol, and relay messages to the DM network via J1939 compliant CAN network. The DM network responds to commands such as “open”, and “close”, as well as to status commands that are received from the CM nodes. Processing resources on both CM and DM nodes allows the network to operate independently and simultaneously.

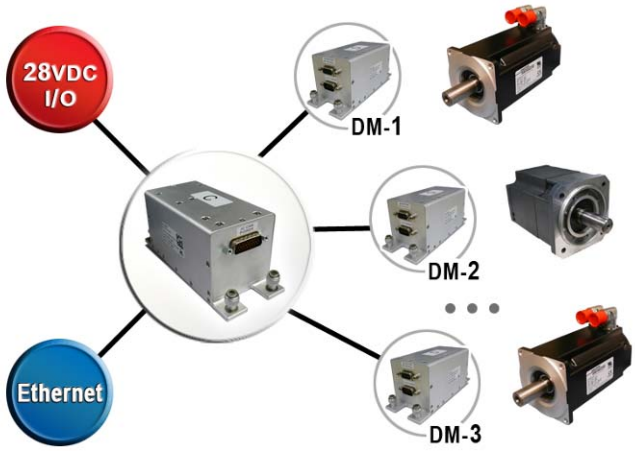

Figure 1 - Network Setup

BENEFITS:

- Fully Integrated Networked Solution
- Autonomous and Flexible Operation
- Proven Rugged Technology
- Scalable and Programmable Platform
- Rapid Prototyping and Integration
- Easy Conversion to Fit Motor Requirements

CONTROLLER MODULE (CM) FEATURES

- Ethernet with a complete TCP/IP stack
- CAN bus with SAE J1939 compatibility
- Fully integrated network-controlled motor controller bridge
- Autonomous operation - open, close, start, stop, fault detect, etc
- High-level functionality – open/close, engage, coordinate, etc
- Powered from 28V

DRIVE MODULE (DM) FEATURES

- 100V, 5A Rating
- 28V Input Inrush Current Control
- Small Size
- Shielded Enclosure
- Six Step Commutation, BLDC Compatible
- 2 or 4 Quadrant PWM Control
- Constant Velocity
- Current/Torque Limited
- Simple Communication Interface
- Shielded I/O Connectors
- Inputs From Limit Sensors

APPLICATIONS:

- Leveling / Gyro Systems
- Sequencing Pumps, Blowers and Fans
- Hatch Control

MARKETS

- Industrial Control and Manufacturing
- Unmanned Aerial Vehicles
- Manned Ground Vehicles
- Commercial Vessels
- Missile Launchers

NETWORK CONTROL

A single Controller Module (CM) supports one or multiple motor Drive Modules (DMs).

Figure 2 - SensINTNet Product

CONTROL MODULE (CM)

The Controller Module (CM) is comprised of two microcontrollers, one for each of the communications interfaces – Ethernet TCP/IP stack, and SAE J1939 CAN protocol bus. The CM receives the Ethernet commands from the Host Computer (HC) and passes the commands and data to DM nodes via the CAN interface. The Host Controller's (HC's) commands are:

- Start Motion
- Stop Motion
- Engage
- Disengage
- Report axis status
- Communications reset
- Self test
- Report network status
- Fault reset
- DM sequencer
- Etc.

The report status commands cause the CAN processor to query the appropriate DM nodes for status. The data is packed, and then passed to the Ethernet processor for transmission. The communications reset command causes the CAN processor to send the 'reset' command to all ten DM nodes on the network while the drives are in their "power up" state. The network status command queries all network drives, through the CAN processor, for their operating state such as "idle", "engage", and "disengage". The state data or 'no response' data are packed and passed to the Ethernet processor for transmission.

DRIVE MODULE (DM)

The motor Drive Modules autonomously drive the individual axis to commanded position using torque (current) limited speed control - from an open to closed position, or from a closed to open position. During the movement, the motor shaft speed remains constant. The shaft's torque is controlled and limited, varying the speed as necessary to accommodate this limit. If necessary, four quadrant operation and/or braking may be used to halt the motor within the time requirement.

The motor drive circuit is compatible with a 6-step BLDC motor utilizing Hall feedback sensors.

CAN NETWORK ADDRESSING

Each of the Drive Modules have a unique CAN bus address that is set by the cable connector. The cable harness that connects the controller and drives has five pins of the drive connector jumped, which enables the drive's network address to be assigned based on the drive's physical location.

ENCLOSURE

The Drive Module (DM) is housed in the metal enclosure with provisions for heat sink mounting. The package contains three right-angled, PCB-mounted, 15-Pin, D-sub type connectors; one for communication and power, one for t motor and Hall sensors, and one for limits switches.

WEIGHT

Individual weight characteristics:

Assembly	Weight (oz)
Motor Driver	8 oz, each
Controller	10 oz, each

POWER

Appropriate active and passive transient voltage protection ensures that the units will survive extreme conditions of MIL-STD-704. Current surge limiting techniques are implemented in order to ensure that the startup power will not exceed the spec limits. The limiting circuitry is located in each of the DM nodes, eliminating all turn-on surges including capacitor charge up currents. In order to maintain the maximum power limit of 290 watts, CM nodes distribute the consumed power by sequencing the DM nodes.