

HF/HCAL source driver control system

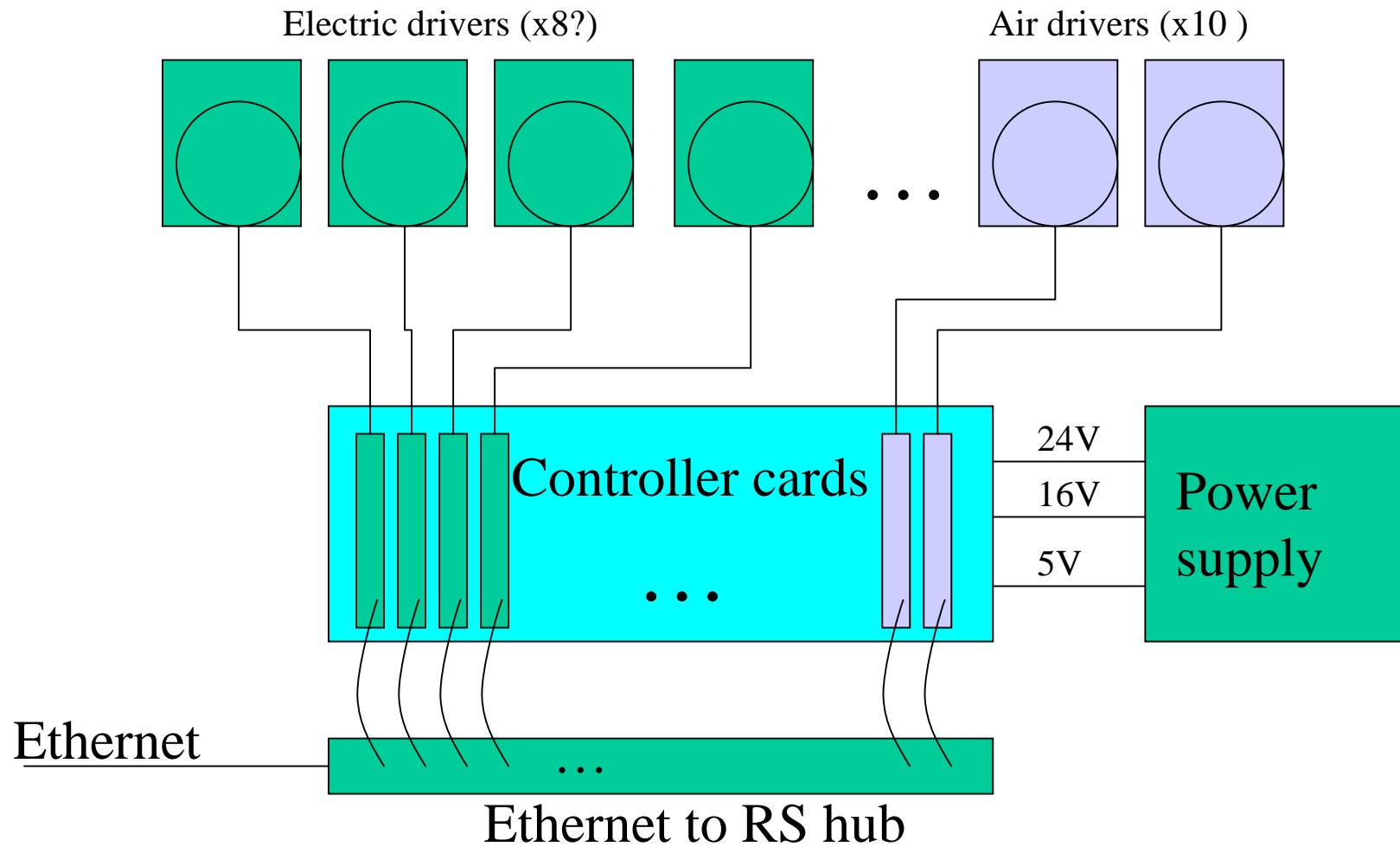
The function of the system is to control the operation, and monitor the status of the CMS source drivers, through the CMS DCS system.

Control system functions:

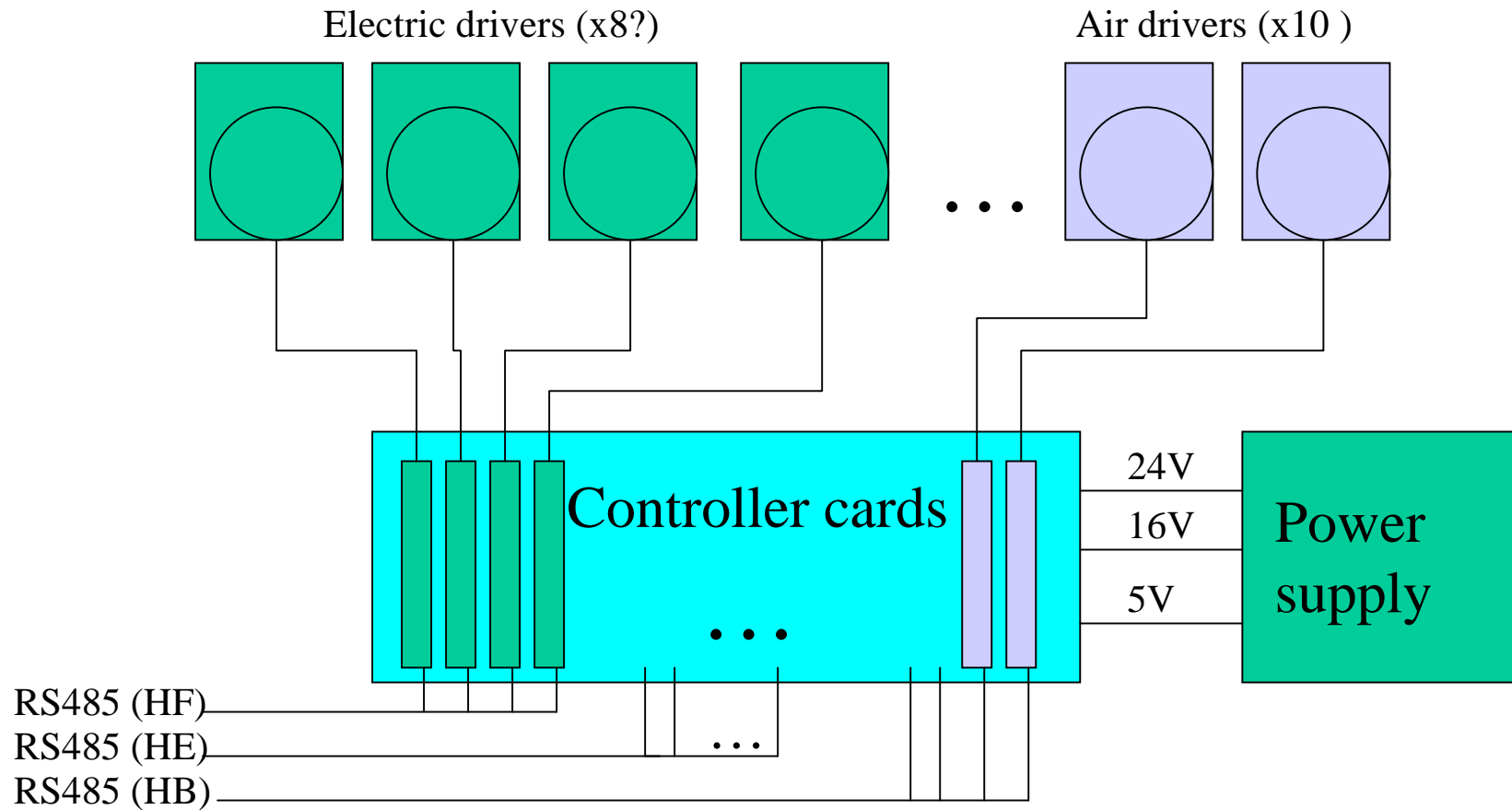
- Operation of the source drivers (motors or valves)
- Monitor and report the status of the source drivers
- Fault monitoring and handling

* Maybe interface source drivers to the detector safety system

System block diagram (Ethernet option)

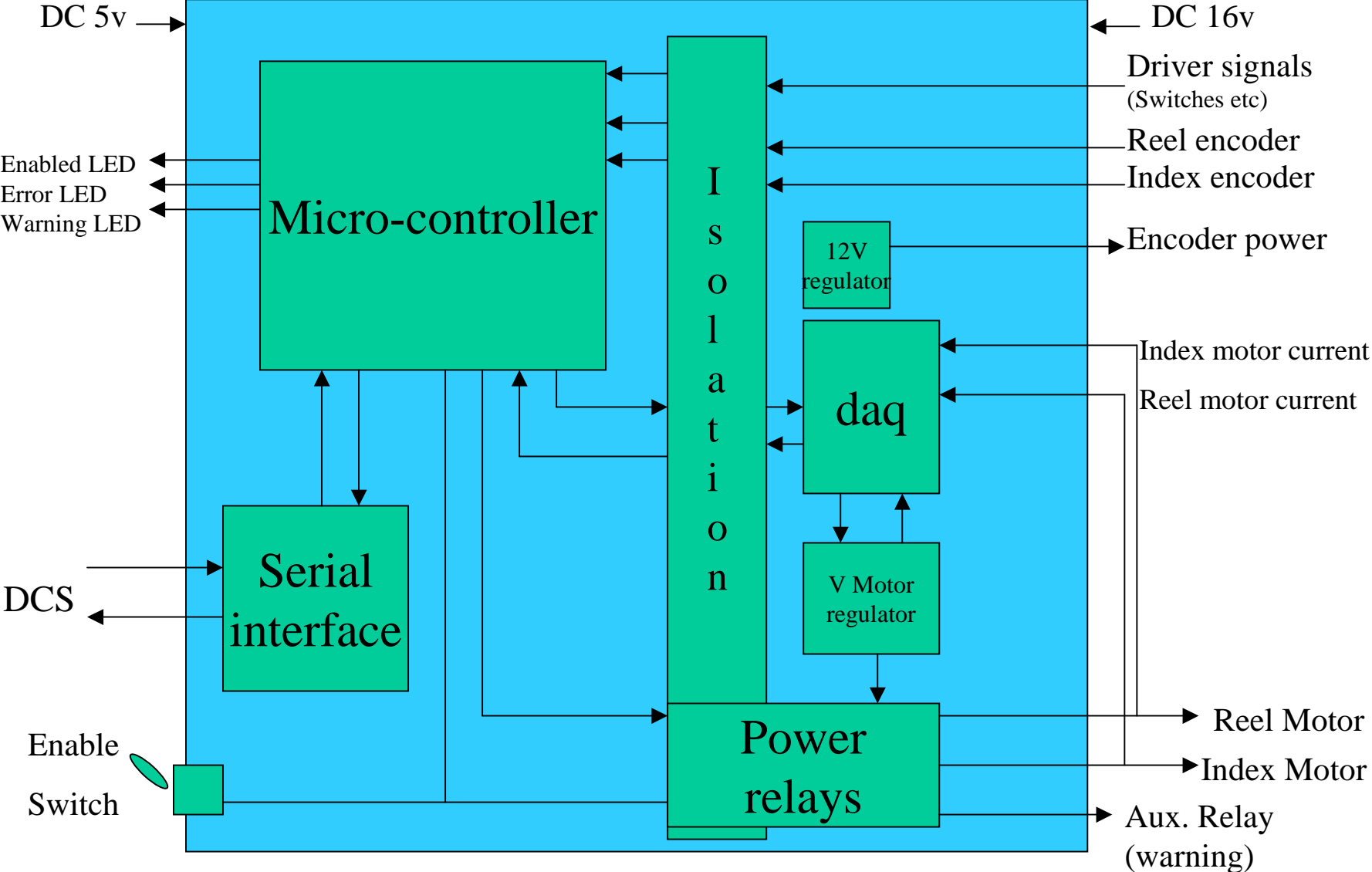


System block diagram (RS485 option)



*Too many devices on a wire will limit system bandwidth

Electric driver control card block diagram

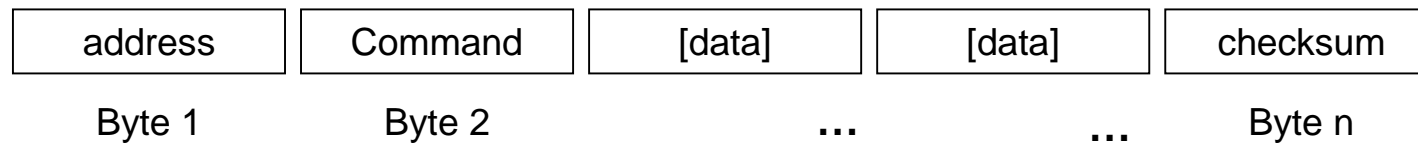


Controller functions

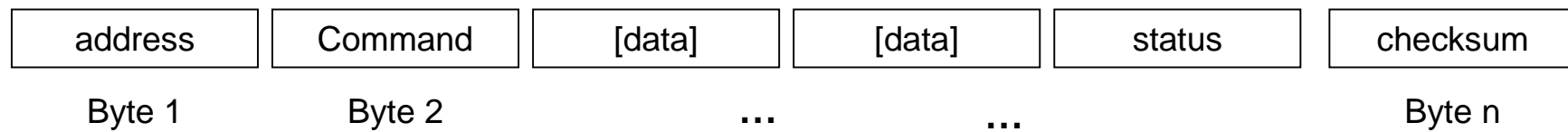
- Switch bounce filtering
- Reel encoder decoding and counting
- Index encoder decoding and counting
- Motor power control
- Serial interface control and I/O FIFO's
- Data formatting
- Driver state monitoring and fault reporting
- Watch dog timer and power fault resets

Data format proposal

From Master:

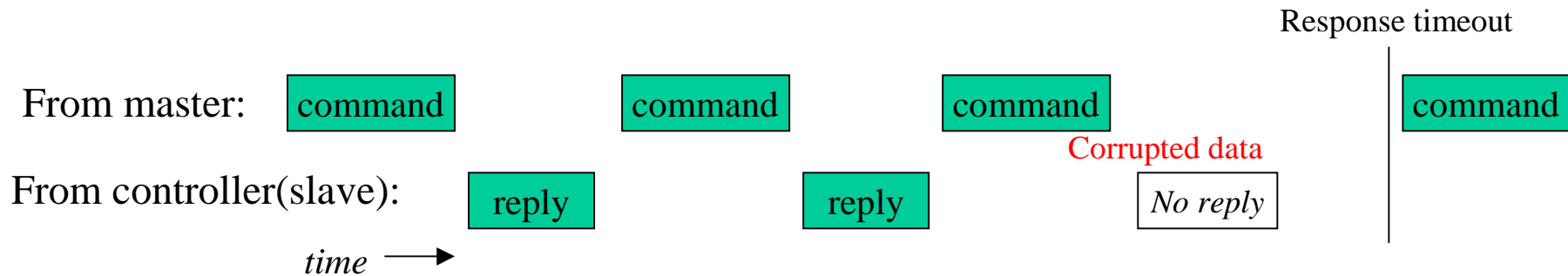


From controller (slave):



RS 232/422/485 Data is 8 bit, Even parity, with one stop bit.

Message framing



- Controller (slave) only sends data in response to a command from the master.
- Commands that fail checksum, parity, or framing checks are ignored (but counted in status registers).
- The controller must reply to the master within a specified time interval* (response timeout) or the master will assume the command failed.
- Time between consecutive bytes (inter byte delay) of a command must be less than a specified interval* or the command will be considered incomplete and discarded.
- Time between commands (inter-frame delay) greater than a specified interval* indicates the start of a command (framing synchronization).

* Interval times depend on system baud rate.

** Controller must be put in the “enabled” state by an enable command before reel or indexer movement is allowed. If there is no successful command from the master within a specified interval the controller will go into the disabled state, and source will be retracted.

DATA RATES

REEL AND ENCODER (Electric driver):

600 cycles (1200 counts) per encoder revolution.

=4800 encoder counts per reel revolution.

0.667mm of wire travel/count.

Approx. 1200 counts/sec.

Approx. 200mm of wire travel /sec. At fast speed.

DATA RATES

| Option | Frame rate | Wire travel b/t readings |
|--------------------------------------|------------|--------------------------|
| Ethernet to RS at 9600 baud | 73 hz | approx. 2.7mm |
| RS485 with 6 devices at 14.4k baud | 18.2hz | approx. 11.0mm |
| RS485 with 6 devices at 28.8k baud | 36.4hz | approx. 5.5mm |
| RS485 with 6 devices at 38.4k baud | 48.5hz | approx. 4.1mm |
| RS485 with 18 devices at 38.4k baud | 16.2hz | approx. 12.3mm |
| RS485 with 18 devices at 115.2k baud | 48.5hz | approx. 4.1mm |

Goals

Goals for test beam:

- Build prototype board (in progress).
- Establish command set.
- Have a standard software interface for operation.

Future tasks:

- Prototype air driver controller board.
- Define packaging.
- Do board layouts.
- Spec connectors and power supplies.
- Integrate control software with CMS DCS/DSS.

Wish list:

- Radiation sensor on the source garages to inform system that source is truly in garage.
- Direct reading of individual on-driver switches by the controller (more wires).
- Enhancement of indexer readout (more switches or..?) for HF indexers. (19 minutes to find home)