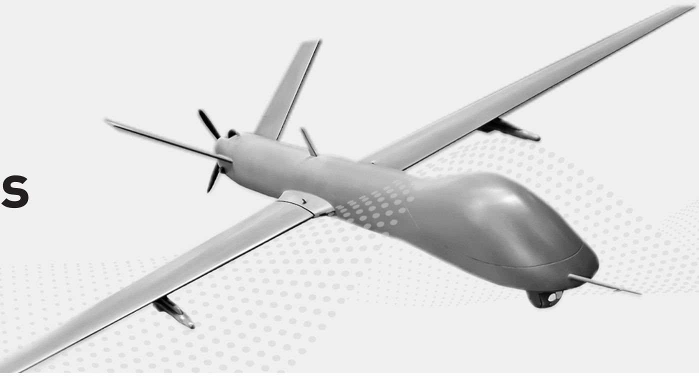
ePROPELLED™

APPLICATION NOTE



Controller Area Networks in UAVs

As UAVs become more prevalent in a wide range of industries, mission profiles and the associated payloads are becoming an increasingly diverse and complex problem that heavily relies on efficient power systems to ensure improved performance. It is critical to mission success that operators have complete information about the performance of the aircraft, including its power system.

UAV designers should utilize a standards-based approach to monitor and report on the status of onboard systems and do their best to enable diverse systems to utilize a common infrastructure. Designers should also be concerned with the UAV weight, especially of the wiring used to connect the systems.

The greatest advantage of CAN lies in the reduced amount of wiring combined with an ingenious prevention of message collision (which means that no data is lost during message transmission).

Using a Controller Area Network (CAN) for Electric Systems

A controller area network (CAN) is a serial network technology that was originally designed for the automotive industry but has become a popular bus-based system in industrial automation and in other applications. CAN is a serial communications bus defined by the International Standardization Organization (ISO). It is a message-based protocol allowing individual systems, devices, and controllers within a network to communicate. More specifically, it can be used in embedded systems of intelligent devices to provide fast communication between microcontrollers without the help of a hosting device.

A key objective in the automotive industry was to replace the complex, heavier wiring harness, and developers selected a two-wire (parallel) bus. The specification calls for high immunity to electrical interference and the ability to self-diagnose and repair data errors. The greatest advantage of CAN lies in the reduced amount of wiring combined with an ingenious prevention of message collision (which means that no data is lost during message transmission).

- Devices and controllers connected to the CAN bus can transmit data to the bus and receive data from it.
- A message transmitted by one unit is received by all the units connected to the bus.
- A data message is transmitted as a frame. In each frame, the message is labeled by an identifier that is unique throughout the network. Each unit has a filter to accept the message relevant to it.

CAN Standards

CAN is an open standard so it can be used without a license. The current version is CAN 2.0B and it can be obtained online. CAN was standardized in 1993 by the ISO as ISO 11898, later restructured into two parts; ISO 11898-1, which covers the data link layer and ISO 11898-2, which covers the CAN physical layer for high-speed CAN. ISO 11898-3 was released later and covers the physical layer for low-speed, fault-tolerant CAN.

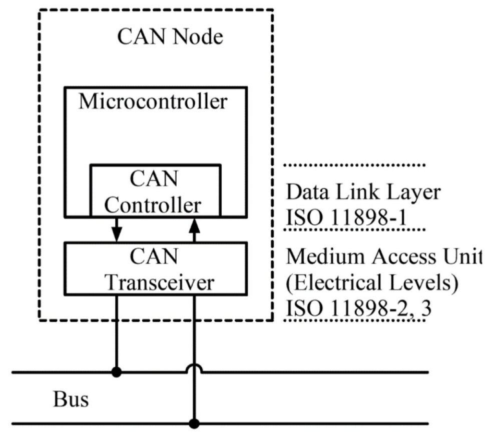


FIGURE 1: Visual diagram of CAN standard

CAN Messages

CAN status messages are generated by the power management unit (PMU), which converts the AC power from the starter generator to DC at the appropriate voltage level(s). An intelligent PMU has a CAN chip so it can connect to a CAN bus and generate a range of CAN messages covering the following:

1. Device information
2. Input and output connection status
3. Event-based alerts
4. Real-time data monitoring (RTDM) functionality
5. Electronic engine starter (EES) functionality
6. Acknowledgement of transmitted messages

ePropelled Intelligent Power Systems (iPS)

The ePropelled family of PMUs, referred to as intelligent power systems (iPS), uses an 'alert user' message to communicate to the user that an event has occurred. The message contains an alert indicator to encode the event. The user can set alerts based on user-configurable thresholds.

Real-Time Data Monitoring (RTDM) Functionality

The iPS can monitor and receive data in real time over the CAN bus and it is referred to as RTDM. The user can enable or disable this feature and change the frequency with which the data is reported. All output voltage and current measurements are taken via the iPS onboard sensors and communicated to the user over the CAN bus with the 'RTDM data' message.

The message contains measured values for the following test points:

- Counter (from power on T=0)
- 28 V output voltage
- 28 V output current
- 12 V output voltage
- 12 V output current
- 5 V output voltage
- 5 V output current

The CAN driver used by ePropelled is compatible with ISO 11898-2 and the processor is compatible with ISO 11898-1. The processor complies with ISO11898-1 (Bosch® CAN protocol specification 2.0A and B). ePropelled products support CAN 2.0A. CAN 2.0B defines extended IDs that are not used in our protocol.

For more information about ePropelled, please visit our website.