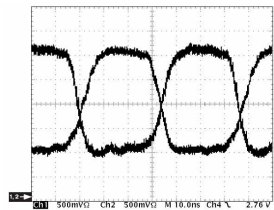


## In-Vehicle Networking

Lecture 5 Introduction to SAE J1708  
BAE 5030 - 003  
Fall 2008  
Instructor: Marvin Stone  
Biosystems and Agricultural Engineering  
Oklahoma State University

## SAE J1708 Physical Layer

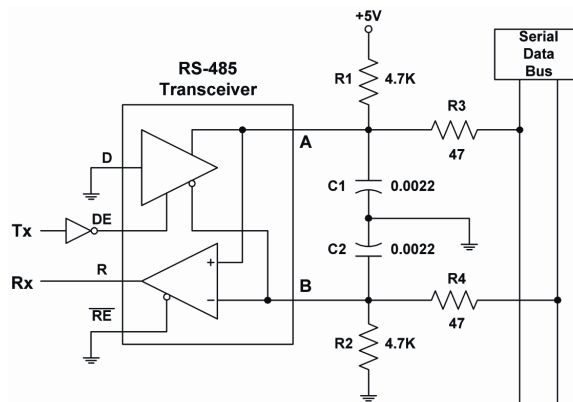
- Topology
  - Bus
  - Long drops allowed but add to length
- EIA RS485 based
  - No terminators
  - Differential voltage signaling
    - Dominant differential:  $>0.2V$
    - Common mode voltage range: -7 to +12
- 20 nodes maximum
- Twisted pair cabling - 18 gauge, one twist per inch
- 40 m Max. length (includes drops)
- Bit rate = 9600



## SAE J1708 Data Link Layer

- CSMA/CD Media access
  - Inter message space idle (12 bits high) used to allow carrier sense
  - Bus access time is a function of message priority
    - Low priority messages must wait longer allowing high priority messages more immediate access
  - Bus access must be within  $\frac{1}{2}$  bit time after the time required for verification of Idle State plus Bus Access Time
  - Collisions must be sensed and less dominant transmitter must cease transmissions – provides for random backoff for continued contention
- Message frame
  - Composition:
    - Closely spaced characters within message, space=0 to 2 bits
    - 10 bit characters, one start bit, 8 data bits, one stop bit - (9600,8,N,1)
  - Length:
    - 21 characters maximum (except engine off or vehicle not moving)
    - 3 characters minimum
  - UART based

## SAE J1708 Physical Layer Driver



## SAE J1708 Data Link Layer

- **Message structure**

- **MID**

- Message IDentification
    - 1 byte or character
    - Defines transmitting unit (device address)
    - Each must be unique within a vehicle



- **Data**

- Single or Multi-character
    - Length defined by MID

- **Checksum**

- Two's complement of the sum of the MID and the data

## SAE 1708 Example MID Assignments

- 00-07 ENGINE
- 08-09 BRAKES, TRACTOR
- 10-11 BRAKES, TRAILER (USED BY SAE J2497)
- 12-13 TIRES, TRACTOR
- 14-15 TIRES, TRAILER
- 16-17 SUSPENSION, TRACTOR
- 18-19 SUSPENSION, TRAILER
- 20-27 TRANSMISSION
- 28-29 ELECTRICAL CHARGING SYSTEM
- 30-32 ELECTRICAL
- 33-35 CARGO REFRIGERATION/HEATING
- 36-40 INSTRUMENT CLUSTER
- 41-45 DRIVER INFORMATION CENTER