

## CAN class

### Starting controller

```
c = CAN(profile=CAN.CAN_BITRATE_500K_75,
        id_filters=None,
        hard_reset=False,
        brp=None,
        tseg1=10,
        tseg2=3,
        sjw=2,
        recv_errors=False,
        mode=CAN.NORMAL,
        tx_open_drain=True,
        reject_remote=True,
        rx_callback_fn=None,
        recv_overflows=False)
```

Note `id_filters` is a {integer: CANIDFilter} dictionary  
If `brp` is defined then profile is overridden  
`rx_callback_fn` is a Python function called from the ISR with the received CANFrame  
Set `tx_open_drain=True` if CANHack used

### Sending frames

```
c.send_frame(frame, fifo=False)
c.send_frames([frame], fifo=False)
c.recv_tx_events(limit=CAN.CAN_TX_EVENT_FIFO_SIZE,
                as_bytes=False)
```

Returns list of CANFrame instances sent, CANOverflow or bytes

```
c.recv_tx_events_pending()
```

### Bit rates

```
CAN_BITRATE_500K_75
CAN_BITRATE_250K_75
CAN_BITRATE_125K_75
CAN_BITRATE_1M_75
CAN_BITRATE_500K_50
CAN_BITRATE_250K_50
CAN_BITRATE_125K_50
CAN_BITRATE_1M_50
CAN_BITRATE_2M_50
CAN_BITRATE_4M_90
CAN_BITRATE_2_5M_75
CAN_BITRATE_2M_80
CAN_BITRATE_500K_875
CAN_BITRATE_250K_875
CAN_BITRATE_125K_875
CAN_BITRATE_1M_875
CAN.CAN_BITRATE_CUSTOM
```

### Modes

```
CAN_MODE_NORMAL
CAN_MODE_LISTEN_ONLY
CAN_MODE_ACK_ONLY
CAN_MODE_OFFLINE
```

### Receiving frames

```
c.recv(limit=CAN.CAN_RX_FIFO_SIZE,
       as_bytes=False)
```

Returns list of CANFrame, CANError, CANOverflow or bytes

```
c.recv_pending()
```

### Triggers

```
c.set_trigger(on_error=False,
             on_canid=None,
             as_bytes=None,
             on_tx=False,
             on_rx=True)
```

Note `as_bytes` is None or type bytes  
`on_can_id` is None or CANID  
(`as_bytes` overrides)

```
c.clear_trigger()
c.pulse_trigger()
```

### Time

```
c.get_time()
c.get_time_hz()
```

### Status

```
c.get_status()
```

Returns 4-tuple of (bus off, error passive, TEC, REC)

## CANFrame class

### Making

```
frame = CANFrame(can_id,
                 data=None,
                 remote=False,
                 tag=0,
                 dlc=None)
```

Note `can_id` is a CANID  
`data` is of type bytes  
`tag` is an integer  
DLC defaults to length of data if dlc not set

```
CANFrame.from_bytes(bytes)
```

Note returns a list of CANFrame

### Reading

```
frame.get_data()
frame.get_dlc()
frame.get_tag()
frame.get_timestamp()
```

Note returns None if not sent or received yet

```
frame.get_index()
```

Note returns index of acceptance ID filter

```
frame.is_remote()
frame.is_extended()
frame.get_arbitration_id()
frame.get_canid()
```

Note returns CANID

### Printing

```
>>> f = CANFrame(CANID(0x123), data=b'hello')
>>> print(f)
CANFrame(CANID(id=5123), dlc=5, data=686556c6c6f)
```

S = 11-bit CAN ID  
E = 29-bit CAN ID  
\* = 0 byte payload  
R = remote frame

## CANHack class

### Creating

```
ch = CANHack(bit_rate=500)
Note bit_rate can be 500, 250 or 125
```

### Frames

```
ch.set_frame(can_id=0x7ff,
            remote=False,
            extended=False,
            data=None,
            set_dlc=False,
            dlc=0,
            second=False,
            no_ack=False)
```

Note DLC set by default from data length  
data is 0.8 bytes  
second sets the Janus attack alternative value

```
ch.print_frame()
ch.send_frame(timeout=50000000,
             second=False,
             retries=0,
             repeat=1)
```

### Bus Off and Error Passive attacks

```
ch.error_attack(repeat=2,
               timeout=50000000)
```

Note Attacks the frame set with set\_frame()

### Freeze Doom Loop attack

```
ch.freeze_doom_loop_attack(repeat=2,
                          timeout=50000000)
```

Note Attacks the frame set with set\_frame()

### Double Receive attack

```
ch.double_receive_attack(repeat=2,
                       timeout=50000000)
```

Note Attacks the frame set with set\_frame()

### Diagnostics

```
ch.set_can_tx(recessive=False)
```

Returns True if RX is recessive

```
ch.send_square_wave()
```

Note Sends a square wave on TX for 160 bit times

```
ch.loopback()
```

Note Waits for falling edge then transmits on TX what is read on RX for 160 bit times

### Janus attack

```
ch.send_janus_frame(sync_time=50,
                   split_time=155,
                   timeout=50000000,
                   retries=0)
```

Note split time default is 62.5% (bit time is 249)  
sync\_time default is 20%  
timeout default is about 17 seconds

### Spoof attacks

```
ch.spoof_frame(timeout=50000000,
              overwrite=False,
              sync_time=0,
              split_time=0,
              second=False,
              retries=0,
              loopback_offset=93)
```

Note if second is True then will spoof using a Janus frame  
if overwrite is True then sends an error passive spoof  
loopback\_offset only used if overwrite is True

## CANIDFilter class

### Making

```
filter = CANID(filter_str=None)
```

Note filter\_str is 11 or 29 '1', '0' or 'X' characters

## CANError class

### Reading

```
error.get_timestamp()
error.is_crc_error()
error.is_stuff_error()
error.is_form_error()
error.is_ack_error()
error.is_bit1_error()
error.is_bit0_error()
error.is_bus_off()
```

## CANID class

### Making

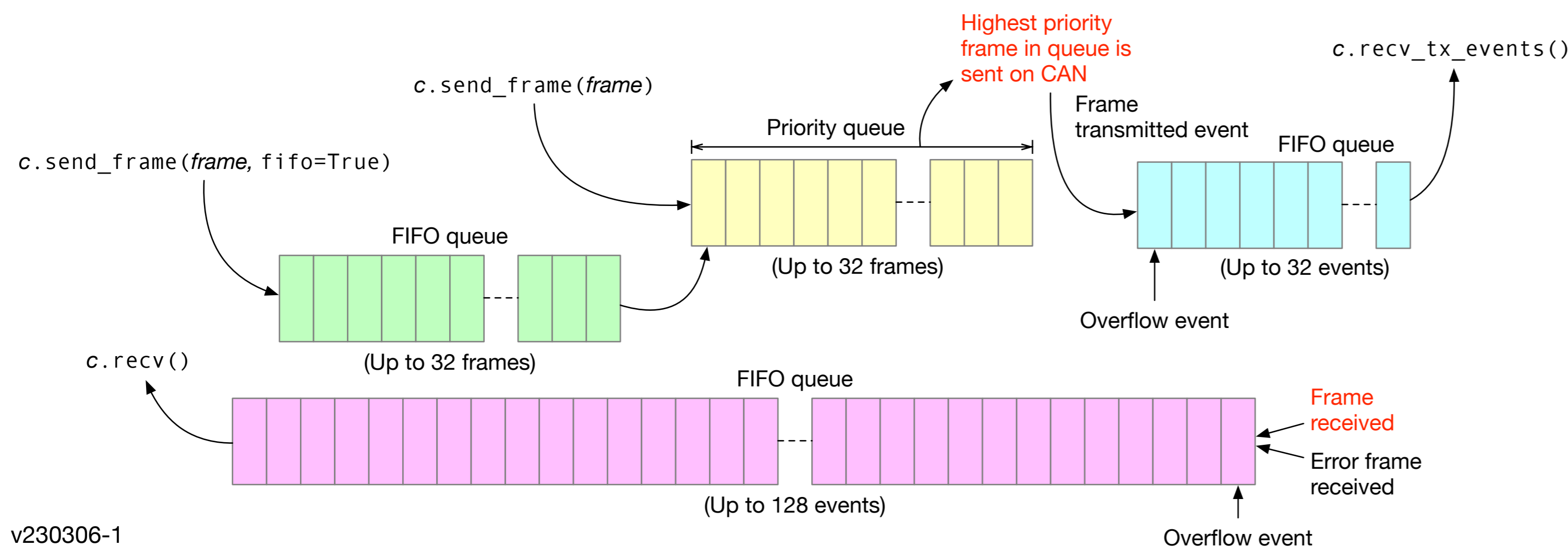
```
id = CANID(arbitration_id, extended=False)
```

### Reading

```
id.is_extended()
id.get_arbitration_id()
id.get_id_filter()
```

Returns a CANIDFilter matching the ID

## Queues



## CANOverflow class

### Reading

```
overflow.get_timestamp()
overflow.get_frame_cnt()
overflow.get_error_cnt()
```