SMCAN

SMCAN is an easy way to utilize all the advantages with a CANmaster-master type transport layer. It is built into the servo motors and can be used to synchronize motion or share data between motors. It can be used between motors without the need of any external control system. Or it can coexist together with other CAN protocols on the same bus. SMCAN uses booth CAN 29 and 11bit frames on the same bus.

SMCAN 2.0B “29bit”
The purpose of this protocol is to be a simple and efficient way of communicating with Simplex Motion motors, and for motors themselves to exchange information in an efficient way.
The 29bit frame contain all the necessary information for write and read of registers in a SMCAN network, without the need of any pre configuration.

SMCAN 2.0A “11bit”
SMCAN use 11bit frames for motor-to-motor communication but can also be used to set and get values from motors in an SMCAN network.

1 SMCAN registers

SMCAN registers

No.	Type	Name	Description	Range
5000	uns16	CANRx1ID	Lower 8bits of Arbitration Field. Set this to the TX id to listen for	0..255
5001	uns16	CANRx1Parameter1	Register to put received data in	Any writable register number
5002	uns16	CANRx1Parameter2	Register to put received data in	Any writable register number
5003	uns16	CANRx1Parameter3	Register to put received data in	Any writable register number
5004	uns16	CANRx1Parameter4	Register to put received data in	Any writable register number
5500	uns16	CANTx1ID	Lower 8bits of Arbitration Field. Set this to a desired but unique value for the CAN network	0..255
5501	uns16	CANTx1Parameter1	Register to send	Any register number
5502	uns16	CANTx1Parameter2	Register to send	Any register number
5503	uns16	CANTx1Parameter3	Register to send	Any register number
5504	uns16	CANTx1Parameter4	Register to send	Any register number
5505	uns16	CANTx1RefreshRate	How often to send the message in ms, 0=off, 1-65535ms	0..65535
6000	uns16	CAN_HB_SETTINGS	Bit 0-1: Error Mode, 0= None, 1= QuickStop, 2= Shutdown, 3= Off. Bit 2: If edge or active, i.e. set mode on edge only or force mode if active Bit 15: Enable heartbeat function	

6001	uns16	CAN_HB_STATUS	Reflects the status of the CAN ID´s 6010,6020…	
6002	uns16	CAN_HB_RRATE	Timeout, i.e. time to wait for messages.	
6010	uns16	CAN_HB1_CAN_ID	CAN id to listen for on the CAN bus	
6011	uns16	CAN_HB1_CAN_CNT	Counter in ms since last received.	

2 11bit frames “CAN 2.0A”

Used for pushing values
The Arbitration field is used as message ID.
Data is configured for each ID and sent as little endian.
Data is sent as 16bit values therefore DLC is valid if DLC is 2,4,6 or 8

		Arbitration Field 11 Bits			Data Field 0-8 bytes							
	reserved	ID	RTR	DLC	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA
Size (bits)	3	8	1bit	4bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit

Example: Set data

Node1→ set		2	0	2	pay lsb	pay msb	Na	Na	Na	Na	Na	Na

3 29Bit frame “CAN2.0B”

Used for exchanging parameters, RTR frames are used as read request.
The Arbitration field is used as unit ID and Register/parameter see below

- ID/Address: Every node has a unique id/address
- Register: Command or parameter to call/read/write
- RTR: Write=0, Read=1
- DLC: Number of bytes to write (when RTR=0) or number of bytes to read (when RTR=1).
- Data is sent and returned as little endian.

		Arbitration Field 29 Bits				Data Field 0-8 bytes							
	reserved	ID	Register	RTR	DLC	DATA	DATA	DATA	DATA	DATA	DATA	DATA	DATA
Size (bits)	5	8	16	1bit	4bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit

Example 1: Request data

Node1→Node2 request		2	200	1	4	Na	Na	Na	Na	Na	Na	Na	Na
Node2→Node1 reply		2	200	0	4	pay lsb	pay	pay	pay msb	Na	Na	Na	Na

Example 2: Set data

Node1→Node2 set		2	400	0	2	pay lsb	pay msb	Na	Na	Na	Na	Na	Na
Node2→Node1 reply		2	400	0	2	pay lsb	pay msb	Na	Na	Na	Na	Na	Na

4 Configuration/setup of SMCAN 11bit

Each motor has 8 receive and 8 transmit registers along with some other control registers,

CANTxnID, n=1-8:

This is the ID value of the message that will be sent. This is also the arbitration/address field of the CAN frame and should be a unique value. **I.e., don't set up the same value on motors in the same network**.

CANTxnParametery, n=1-8 & y=1-4:

Each TxID has the possibility of sending out 4 16bit parameters or 2 32bit or any mix of them.

Example, To synchronise the position of two motors you can send out the position and mode.

CANTx1Parameter1= 200 // position low bits "position is 32bit"
CANTx1Parameter2= 201 // position high bits "position is 32bit"
CANTx1Parameter3= 400 // mode

CANTxnRefreshRate, n=1-8:

This is the rate the message will be sent at, 0=off 1-65535ms

Example sending:
This will send position and mode at a rate of 10 frames/sec.
CANTx1ID= 1
CANTx1Parameter1= 200 // position low bits "position is 32bit"
CANTx1Parameter2= 201 // position high bits "position is 32bit"
CANTx1Parameter3= 400 // mode
CANTx1RefreshRate= 100

CANRxnID, n=1-8:

This is the ID value of the message that you should receive, note that this can be the same on other motors in the network if they all need the same info.

CANRxnParametery, n=1-8 & y=1-4:

Each RxID has the possibility of receiving 4 16bit parameters or 2 32bit or any mix of them.

Example, to synchronise the position of two motors you can send out the position and mode see TX example above,
The receiving parameters for that example would look like this.
CANRx1ID= 1 // listen for message with id1
CANRx1Parameter1= 450 // put position in parameter target input
CANRx1Parameter2= 451 // put position in parameter target input
CANRx1Parameter3= 620 // put the mode in parameter ApplData1, this way we can use events to set mode or something based on this info.

5 CAN Heartbeat

Heartbeat functionality can be used to monitor the existence of certain messages on the CAN network, it can also be used to set motors in a safe/known state if a message is not received.

CAN_HB_SETTINGS
Bit 0-1, ErrMode
The state to enter on a timeout valid modes are.
0= None, 1= QuickStop, 2= Shutdown, 3= Off.
If none mode is not changed on timeout but status is still monitored.

Bit 2: Edge
If edge or active, i.e. set mode on edge only or force mode if active

Bit 15: Enable heartbeat function
Enabled, Enable heartbeat function.

CAN_HB_STATUS
This register reflects the state of the enabled IDs to monitor. 0= good, 1= time out.
Bit0 = CAN_HB1
Bit15= CAN_HB16

CAN_HB_RRATE
Time 0-65535ms.
If a message is not received within this time the status bit in register CAN_HB_STATUS for that CAN_ID will be set.
If mode is other than none then motor will enter that mode.

CAN_HBx_CAN_ID
x= 1-16
The CAN message ID, 11bit CAN Arbitration Field value.
0= off, i.e. not checked.

CAN_HBx_CAN_CNT
Time since last received, time in ms.