CAN in Simulation

Analog Module

Rev. 1.0

Analog Module

The Analog module is specifically designed to accommodate a maximum of eight analog inputs and eight digital inputs. Each input undergoes a 12-bit conversion process and is carefully filtered to prevent excessive noise interference. The conversion itself is ratiometric to the 5V supply provided by the board, allowing for input usage within the 0 to 5V range. Simple potentiometers can be effortlessly utilized by establishing connections to both the 5V and ground terminals.

As for the digital inputs, they employ incremental encoders capable of counting up or down 12-bit values in slow or fast increments, based on the direction and speed of rotation.

CAN ID	node ID	data type	service code	message code	data byte 0	data byte 1	data byte 2	data byte 3
718h	node	0Bh	item	num	data1	data0	0	0

Analog Module Message

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
data1	msb	x	x	x	x	x	x	x
data0	x	x	x	x	x	x	x	lsb

Analog Module Data Bytes

Here are the ***parameters*** associated with the encoder module:

Offset	The Analog module is capable of handling up to 8 potentiometers and 8 encoders, each of which is assigned a unique ID. Starting with the `offset` value, the eight potentiometers and eight encoders are given consecutive ID values, which will be included in the CAN message sent by the board. Since the ID values are 1 byte wide, up to 256 different poti's/encoders can be distinguished under a given Node-ID.

Threshold	The *`threshold`* is a time value, measured in milliseconds, that serves as a threshold for distinguishing between a fast pulse train and a slow one. The speed of the encoder turning is determined by the time between two consecutive encoder events (clicks). If the time between these events is below the threshold value, the *`fast`* flag in the CAN data byte is set, indicating that the encoder is turning quickly. Conversely, if the time between events is above the threshold, the *`fast`* flag is cleared.

Slow Step	If an encoder is turned slowly, meaning the time between consecutive events (or clicks) is above the *`threshold`* value, and the encoder is configured for analog mode, then the analog value is incremented or decremented by the *`slow step`* with each event.

Fast Step	If an encoder is turned quickly, meaning the time between consecutive events (or clicks) is below the *threshold* value, and the encoder is configured for analog mode, then the analog value is incremented or decremented by a the *fast step* with each event.

Parameter Setting

To modify the parameters of a module, the *Module Configuration Service* (MCS) is utilized. The MCS is assigned a unique CAN-ID of *7D0h* (equivalent to decimal value *2000*):

CAN ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
7D0h	node	00h	0D0	pid	pdat	0	0	0

node-ID:	node ID (node)
data type:	NODATA (00)
service code:	MCS (0D)
message code:	parameter ID (pid = 1)
message data:	Byte 4: parameter data (pdat)

The parameter ID is used to identify which specific parameter needs to be modified and Byte 4 contains the value of the parameter.

pid	*parameter*	*value (range)*
1	offset	1 ... 255
2	threshold	1 ... 255 ms
3	slow step	1 ... 10
4	fast step	1 ... 16

Parameter ID Values

Upon completion of the parameter modification request, the response message will have a message code of *0* (zero) if the operation was successful. However, if the requested parameter is out of the valid range or the parameter ID is invalid, the response message will contain a message code of *-6*.

CAN-ID Setting

The CAN-ID range for Analog board messages is *718h..71Fh* (decimal *1816..1823*).

To change the CAN-ID of the Analog board, the *CAN Identifier Setting Service* (CSS) can be used. The message code (parameter ID) should be set to 0.

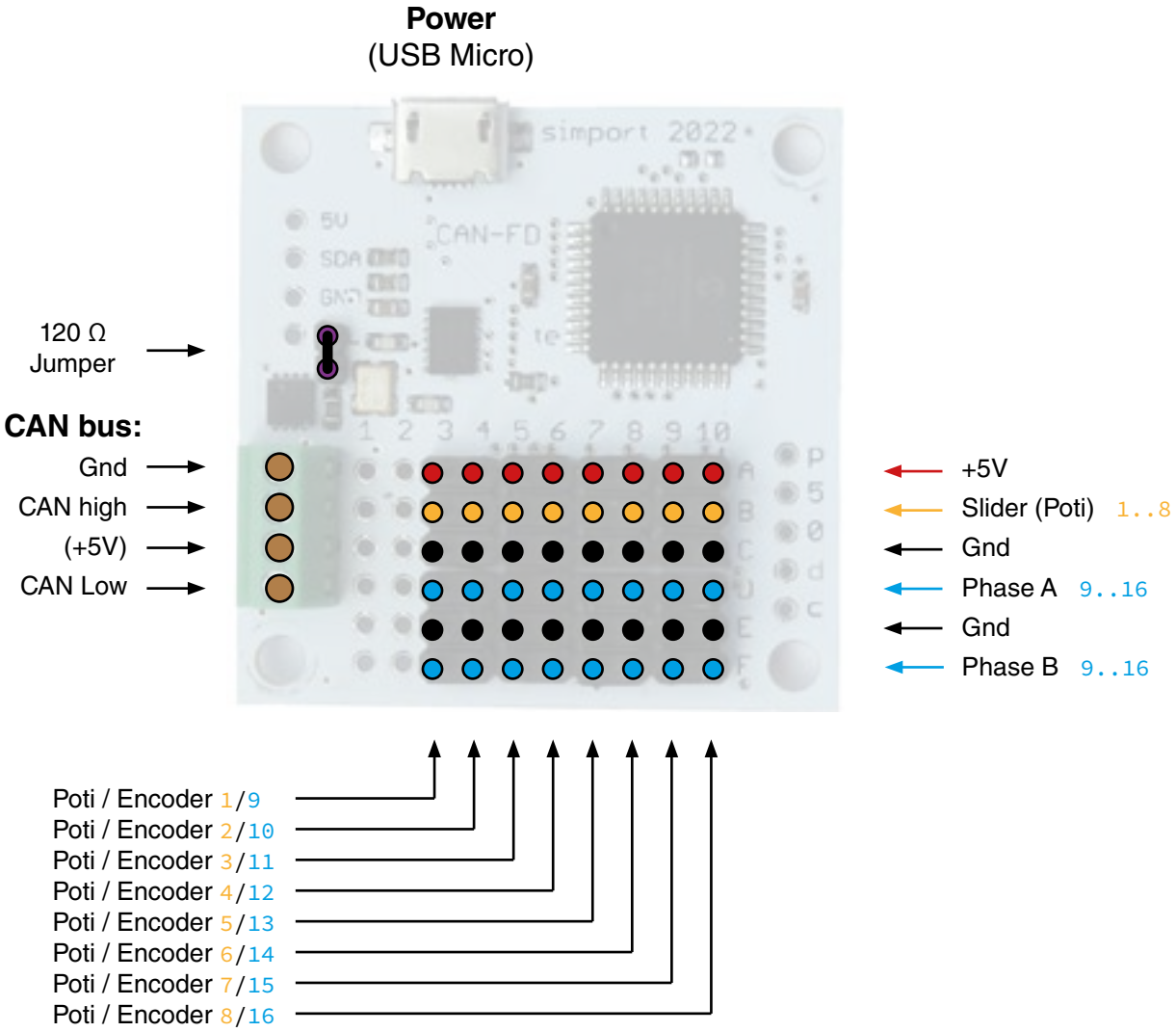
Node-ID Setting

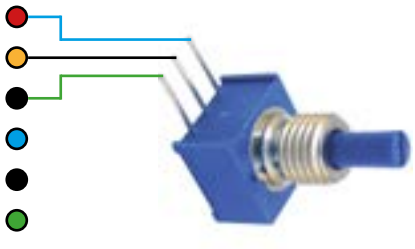
To change the Node-ID of the encoder board, the *Node ID Setting Service* (NIS) can be used. Node-ID values are in the range of 1 to 255.

Status Transmission Service

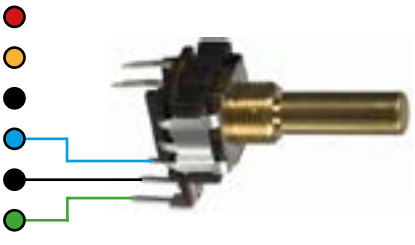
The CAN bus bus messages are designed to be triggered only when there is a change in the state of any analog axis. The *Status Transmission Service* (STS) allows for the simultaneous interrogation of all axes at once. As a result, a total of 16 messages are generated, providing an up-to-date reflection of the current states of all analog settings on the board.

Board Layout





Potentiometer



Encoder

Example Wiring

Board Dimensions