EasySync Ltd.

Application Note AN_103

CAN Plus Message Filtering

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This Application Note provides guidelines for configuring CAN message filtering.

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1 Introduction

The EasySync CAN Plus adapters are compatible with standard (11-bit) and extended (29-bit) CAN message IDs. By default, any message that is received is passed to the USB or RS232 side, regardless of the ID.

Often times the application only needs to act on certain messages, so it is desirable to remove the unnecessary "chatter". The CAN Plus adapters employ a filtering mechanism to accomplish this through the Acceptance Code and Acceptance Mask. The Acceptance Code and Acceptance Mask work hand-in-hand to determine which messages are passed through the adapter.

1.1 Acceptance Mask

The Acceptance Mask determines which bits of the message ID are checked by the Acceptance Filter. A "0" in a bit location is "don't-care". A "1" in a bit location tells the CAN Plus adapter to check the incoming message against the filter.

One mask is available with the default CAN Plus firmware. This mask can be either for standard or extended messages, not both.

To configure a standard message mask, issue the following command:

mXXX

where XXX are hex values indicating which bits get checked against the filter. Valid ranges for XXX are 000 through 7FF.

To configure an extended message mask, issue the following command:

mXXXXXXXX

where XXXXXXXX are hex values indicating which bits get checked against the filter. Valid ranges for XXXXXXXX are 00000000 through 1FFFFFFF.

Setting either m000 or m00000000 is a special condition which disables the filter function and allows all frames to pass. This is also the default for the CAN Plus adapters.

1.2 Acceptance Filter

The Acceptance Filter utilizes the Acceptance Mask in conjunction with the filter setting to pass a single ID or a single range of IDs. One Acceptance Filter is available with the default CAN Plus firmware. The filter can be for either standard or extended messages, not both.

To configure a standard message filter, issue the following command:

MYYY

where YYY are hex values indicating the message ID, or one ID within the range of IDs to pass. Valid ranges for YYY are 000 through 7FF.

To configure an extended message filter, issue the following command:

MYYYYYYYY

where YYYYYYYY are hex values indicating the message ID, or one ID within a range of IDs to pass. Valid ranges for YYYYYYYY are 00000000 through 1FFFFFFF.

Since the default mask setting is zero, or "filters disabled", the acceptance filter has no meaning by default.

To enable the filters, both Acceptance Mask and Acceptance Filter must be set, with the Acceptance Mask set first.

NOTE: When working with the DLL API for the USB2-F-7x01, the values are calculated in the same manner. Follow the API Programmer Guide for variable declarations and call usage.

2 Examples

2.1 Standard (11-bit) Single Message ID

The object is to pass a single message with the standard ID of 0x3F5.

Since only one message is required, all bits of the ID must be checked. The Acceptance Mask needs to be set to all 1's:

m7FF

Set up the Filter for the single ID:

M3F5

Now once the channel is opened again, only messages with the ID of 0x3F5 will be passed through the CAN Plus adapter.

2.2 Standard (11-bit) Range of Message IDs

The object is to pass a range of messages with the standard IDs of 0x120 through 0x13F.

Next, lay out the bits to determine the mask:

	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x120	0	0	1	0	0	1	0	0	0	0	0
0x13F	0	0	1	0	0	1	1	1	1	1	1

In looking at the values, bits 10 through 5 remain the same for *all* message IDs in the range, so those bits are set to 1 for the mask. Remaining bits need to be ignored, so they are set to 0. This gives us the value: 111 1110 0000 and the following command is issued:

m7E0

To set the filter, we select one of the ID's in the range of interest, in this case 0x120. The following command is issued:

M120

Together, this gives us the following:

	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Mask	1	1	1	1	1	1	0	0	0	0	0
Filter	0	0	1	0	0	1	0	0	0	0	0
Passed	0	0	1	0	0	1	x	x	x	x	x

With these Acceptance Mask and Acceptance Filter values, messages with the ID range of 0x120 through 0x13F will pass through the adapter. All other message IDs will be ignored.

2.3 Extended (29-bit) Frames

Extended frame messages are determined in the same manner, though the size of the IDs are now 29 bits. Message IDs can be 0x00000000 through 0x1FFFFFFF.

2.4 Disable Filters, Pass All Frames

In order to disable the filters, a special case is passed to the CAN Plus firmware. Either

m000

or

m00000000

can be sent to disable the filter.

When the filter is disabled, the Acceptance Filter value is ignored. It is important to note that once the Acceptance Mask (m) is re-enabled by setting a non-zero value, a new Acceptance Filter (M) value also must be set.

2.5 CAN Channel Operation

The Acceptance Mask and Acceptance Filter can be set at any time with the ASCII commands. During the time between sending the Mask (m) and Filter (M) commands, the last value set for the Acceptance Filter is used until the new one is set. For this reason, it is suggested that the following sequence be followed:

Close the CAN channel.

C

Set the Acceptance Mask then the Acceptance Filter.

mXXX or mXXXXXXXX

MYYY or MYYYYYYYY

Clear the buffers by sending the Echo command.

E

Open the CAN channel.

O (to send and receive data)

L (for listen-only – must have at least 3 CAN nodes on the bus)

When using the high-level language API, the canplus_Open command also sets the the Acceptance Mask and Filter. The canplus_Close command must be issued before canplus_Open.

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Appendix A Definitions

Terms description

Terms	Description
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
DLL	Dynamically Linked Library
CAN	Controller Area Network, differential multi-drop serial data protocol
ECAN	Enhanced CAN module – contained in the Microchip PIC

Appendix B - Revision History

Revision History

Version 1.0	Initial release	23rd July 2009
Version 1.01	Changed reference from USB2-F-7001 to USB2-F-7x01	5th Feb 2010