



## **Application Note**

**AN\_103**

# **CAN Plus Message Filtering**

**Document Reference No.: CP\_000034**

**Version 1.1**

**Issue Date: 2019-03-21**

This Application Note provides guidelines for configuring CAN message filtering.

Use of Connective Peripherals devices in life support and/or safety applications is entirely at the user's risk, and the user agrees to defend, indemnify and hold Connective Peripherals harmless from any and all damages, claims, suits or expense resulting from such use.

## **Table of Contents**

<b>1</b>	<b>Introduction .....</b>	<b>2</b>
1.1	Acceptance Mask.....	2
1.2	Acceptance Filter .....	2
<b>2</b>	<b>Examples.....</b>	<b>3</b>
2.1	Standard (11-bit) Single Message ID .....	3
2.2	Standard (11-bit) Range of Message IDs .....	3
2.3	Extended (29-bit) Frames .....	4
2.4	Disable Filters, Pass All Frames .....	4
2.5	CAN Channel Operation.....	4
<b>3</b>	<b>Contact Information.....</b>	<b>5</b>
	<b>Appendix A – References .....</b>	<b>6</b>
	Document References .....	6
	Acronyms and Abbreviations .....	6
	<b>Appendix B – List of Figures &amp; Tables .....</b>	<b>7</b>
	List of Figures .....	7
	List of Tables .....	7
	<b>Appendix C - Revision History .....</b>	<b>8</b>

## 1 Introduction

The Connective Peripherals 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 mXXXXXXXXX

MYYY or MYYYYYYYYY

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 Acceptance Mask and Filter. The canplus\_Close command must be issued before canplus\_Open.

### 3 Contact Information

#### Global Headquarters – Singapore

Connective Peripherals Pte Ltd  
178 Paya Lebar Road  
#07-03  
Singapore 409030

Tel: +65 67430980  
Fax: +65 68416071

E-Mail (Sales)	<a href="mailto:sales@connectiveperipherals.com">sales@connectiveperipherals.com</a>
E-Mail (Support)	<a href="mailto:support@connectiveperipherals.com">support@connectiveperipherals.com</a>
Web Site URL	<a href="http://www.connectiveperipherals.com">http://www.connectiveperipherals.com</a>
Web Shop URL	<a href="http://www.connectiveperipherals.com">http://www.connectiveperipherals.com</a>

Neither the whole nor any part of the information contained in, or the product described in this manual, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. This product and its documentation are supplied on an as-is basis and no warranty as to their suitability for any particular purpose is either made or implied. Connective Peripherals Pte Ltd will not accept any claim for damages howsoever arising as a result of use or failure of this product. Your statutory rights are not affected. This product or any variant of it is not intended for use in any medical appliance, device or system in which the failure of the product might reasonably be expected to result in personal injury. This document provides preliminary information that may be subject to change without notice. No freedom to use patents or other intellectual property rights is implied by the publication of this document. Connective Peripheral Pte Ltd., 178 Paya Lebar Road, #07-03 Singapore 409030 Registered Number: 201617872E

## Appendix A – References

### Document References

NA

### Acronyms and Abbreviations

Terms	Description
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange,
CAN	Controller Area Network
DLL	Dynamic Link Library
ECAN	Enhanced CAN module – contained in the Microchip PIC
USB	Universal Serial Bus

## **Appendix B – List of Figures & Tables**

### **List of Figures**

NA

### **List of Tables**

NA



## Appendix C - Revision History

Revision	Changes	Date
1.0	Initial release	2009-07-23
1.01	Changed reference from USB2-F-7001 to USB2-F-7x01	2019-03-21
1.1	Re-branding to reflect the migration of the product from EasySync to Connective Peripherals name – logo change, copyright changed, contact information Changed, all internal hyperlinks changed.	2019-03-21