



Application Note

CP_AN_002

CP-CANFD Programming Guide

Version 1.0

Issue Date: 10-06-2024

This application note describes technical information and instructions to program CP-CANFD Adapter

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.

Connective Peripherals Pte Ltd

1 Tai Seng Avenue, Tower A, #03-07 Singapore 536464
Tel.: +65 67430980

E-Mail (Support): support@connectiveperipherals.com

Web: www.connectiveperipherals.com/products

Copyright © Connective Peripherals Pte Ltd

Table of Contents

1	General.....	4
1.1	DLL Installation.....	4
1.2	Supported Products Information	5
2	Application Programming Interface.....	6
2.1	Functions.....	6
2.1.1	CAN_OPEN	6
2.1.2	CANFD_Open	7
2.1.3	CANFD_Start.....	8
2.1.4	CAN_OpenOnly	9
2.1.5	CAN_Close	9
2.1.6	CAN_Write	10
2.1.7	CAN_Read.....	11
2.1.8	CAN_Status.....	12
2.1.9	CAN_Version	13
2.1.10	CAN_Flush	13
2.1.11	CAN_SN.....	14
2.1.12	CAN_SetRcvEvent	14
2.2	Types and Structures.....	15
2.2.1	CAN_HANDLE	15
2.2.2	CAN_MODE	15
2.2.3	CAN_TIMESTAMP	15
2.2.4	CAN_ERRORS	15
2.2.5	CAN_STATUS	16
2.2.6	MSG Flags.....	16
2.2.7	CAN_MSG	16
2.2.8	FILTER	16
2.2.9	CAN_FILTERS	17
3	Example Code.....	18
4	Contact Information	20
	Appendix A – References	21

Document References	21
Acronyms and Abbreviations.....	21
Appendix B – List of Tables/Figures/Code Snippets	22
List of Tables.....	22
List of Figures	22
List of Code Snippet	22
Appendix C – Revision History	23

1 General

1.1 DLL Installation

There is no specific DLL installer. The DLL, LIB and Header files are typically copied to an application project directory. Different programming languages and compiler configurations require different locations. Consult your programming environment documentation for the correct locations to place the files contained within the distribution.

Following is a simple example project generated with Visual Studio.

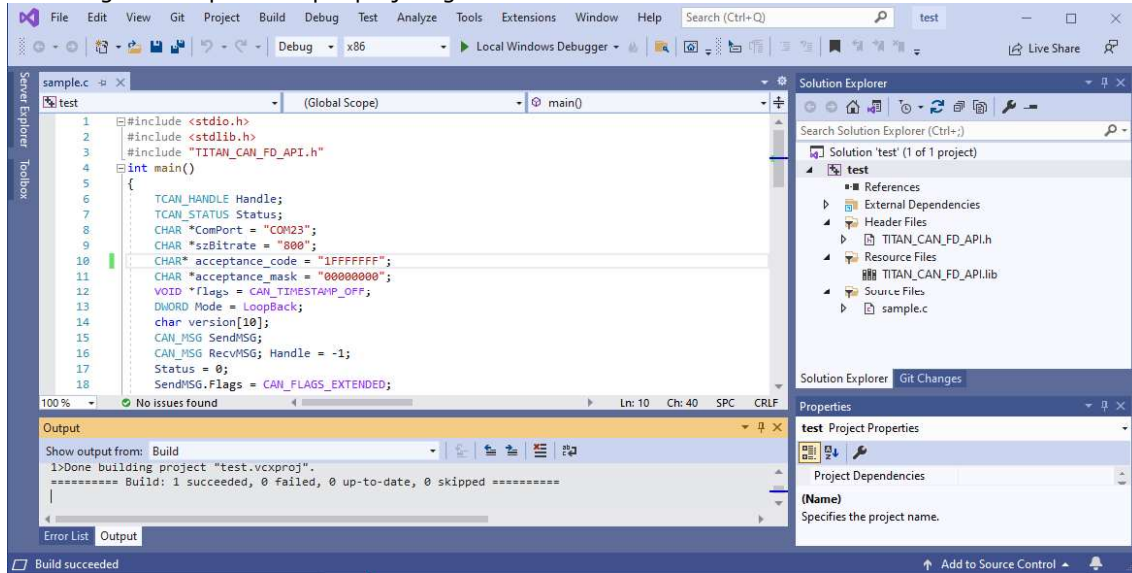


Figure 1: Sample Project

The DLL library must be installed.

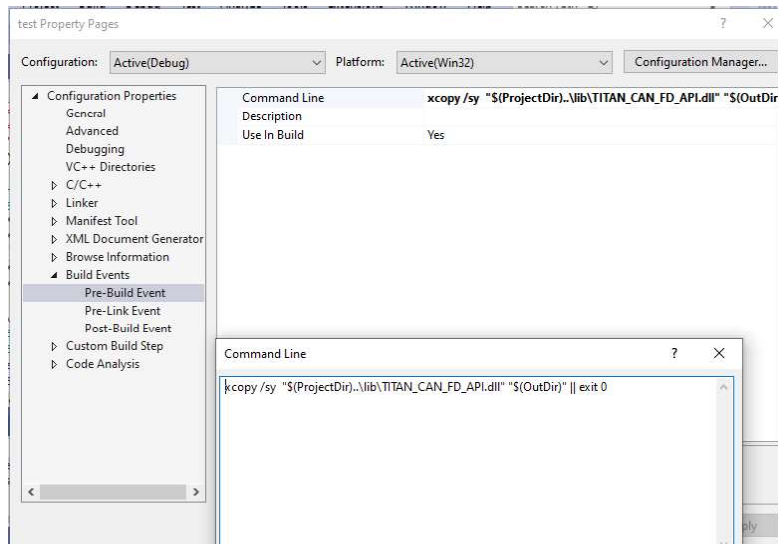


Figure 2: Project Configuration

1.2 Supported Products Information

This programming guide covers the following products only:

- CP-CANFD-1P USB to single CAN FD Adapter; Non-Isolation version
- CP-CANFD-1P-ISO USB to single CAN FD Adapter; Isolation version
- CP-CANFD-2P USB to dual CAN FD Adapter; Non-Isolation version
- CP-CANFD-2P-ISO USB to dual CAN FD Adapter; Isolation version

2 Application Programming Interface

2.1 Functions

2.1.1 CAN_OPEN

Summary

Open a channel to the CAN device.

Definition

TCAN_HANDLE CAN_Open(CHAR *ComPort, CHAR *szBitrate, CHAR *acceptance_code, CHAR *acceptance_mask, UCHAR flags , DWORD Mode);

Parameters

ComPort	CAN device Serial port name
szBitrate	10 = 10Kbps 20 = 20Kbps 50 = 50Kbps 100 = 100Kbps 125 = 125Kbps 250 = 250Kbps 500 = 500Kbps 800 = 800Kbps 1000 = 1000Kbps
acceptance_code	11-bit (0x000 to 0x7FF) or 29-bit (0x00000000 to 0x1FFFFFFF) code used in filtering specific or ranges of CAN messages. Default is to pass all frames (Acceptance Filter = 0x7FF for standard messages and 0x1FFFFFFF for extended messages).
acceptance_mask	11-bit (0x000 to 0x7FF) or 29-bit (0x00000000 to 0x1FFFFFFF) code used in filtering specific or ranges of CAN messages. A value of "0" in a bit location indicates that the bit location ID value is to be ignored when filtering messages. Default is to pass all frames (Acceptance Mask = 0x000 for standard messages and 0x00000000 for extended messages)
flags	CAN_TIMESTAMP_ON = The timestamp function will be enabled by the CAN device. CAN_TIMESTAMP_OFF = The timestamp function will be disabled.
Mode	CAN_MODE_NORMAL = the normal operation mode. CAN_MODE_LISTENONLY = the listen only mode.

CAN_MODE_LOOPBACK = the loop back mode, the CAN device will return messages you send.

Return value

CAN_HANDLE Handle to the device if successful.

<= 0 Error as noted in [2.2.4 CAN ERRORS](#)

Example

```
CHAR *ComPort = "COM11";
CHAR *szBitrate = "800";
CHAR *acceptance_code= "1FFFFFFF"; // Default is to pass all frames
CHAR * acceptance_mask= "00000000"; // Default is to pass all frames
UCHAR flags=CAN_TIMESTAMP_OFF;
DWORD Mode = Normal;
Handle=CAN_Open(ComPort,szBitrate,acceptance_code,acceptance_mask,flag,Mode);
```

Code Snippet 1 – Example for CAN_Open

2.1.2 CANFD_Open

Summary

Open a channel to the CAN FD device.

Definition

TCAN_HANDLE CANFD_Open(CHAR *ComPort, CHAR *szBitrate, CHAR *FDBitrate, CAN_Filters STDfilter, CAN_Filters EXDfilter, UCHAR flags, UCHAR Mode)

Parameters

ComPort	CAN device Serial port name
szBitrate	10 = 10Kbps 20 = 20Kbps 50 = 50Kbps 100 = 100Kbps 125 = 125Kbps 250 = 250Kbps 500 = 500Kbps 800 = 800Kbps 1000 = 1000Kbps
FDBitrate	100 = 100Kbps 125 = 125Kbps 250 = 250Kbps 500 = 500Kbps 800 = 800Kbps

	1000 = 1000Kbps 2000 = 2000Kbps 5000 = 5000Kbps 8000= 8000Kbps
STDfilter	Standard CAN_Filters structure
EXDfilter	Extended CAN_Filters structure
flags	CAN_TIMESTAMP_ON = The timestamp function will be enabled by the CAN device. CAN_TIMESTAMP_OFF = The timestamp function will be disabled.
Mode	CAN_MODE_NORMAL = the normal operation mode. CAN_MODE_LISTENONLY = the listen only mode. CAN_MODE_LOOPBACK = the loop back mode, the CAN device will return messages you send.

Return value

CAN_HANDLE	Handle to the device if successful.
<= 0	Error as noted in 2.2.4 CAN ERRORS

Example

```

CHAR *ComPort = "COM11";
CHAR *szBtrate = "800";
CHAR * FDBtrate = "5000";
CAN_Filters STDfilter=0; // Default is to pass all frames
CAN_Filters EXDfilter=0; // Default is to pass all frames
UCHAR flags=CAN_TIMESTAMP_OFF;
DWORD Mode = CAN_MODE_NORMAL;

Handle=CANFD_Open(ComPort,szBtrate,FDBtrate,FDBtrate,EXDfilter,flag,Mode);
CANFD_Start(Handle);

```

Code Snippet 2 – Example for CANFD_Open

2.1.3 CANFD_Start

Summary

Start the CAN FD channel with Handle

Definition

```
TCAN_STATUS CANFD_Start( TCAN_HANDLE Handle );
```

Parameters

Handle	the handle of the CAN channel which will be started
--------	---

Return value

=1 CAN channel is started successfully.

<0 Error as noted in [2.2.4 CAN ERRORS](#)

Example

```
Status = CANFD_Start(Handle);
```

Code Snippet 3 – Example for CANFD_Start**2.1.4 CAN_OpenOnly****Summary**

Open the CAN channel without config.

Definition

TCAN_HANDLE CAN_OpenOnly(CHAR *ComPort);

Parameters

ComPort CAN device Serial port name

Return value

TCAN_HANDLE Handle to the device if successful.

<=0 Error as noted in [2.2.4 CAN ERRORS](#)

Example

```
CHAR *ComPort = "COM11";  
Handle = CAN_OpenOnly (ComPort);
```

Code Snippet 4 – Example for CAN_OpenOnly**2.1.5 CAN_Close****Summary**

Close the CAN channel with Handle

Definition

TCAN_STATUS CAN_Close(TCAN_HANDLE Handle);

Parameters

Handle the handle of the CAN channel which will be closed

Return value

=1 CAN channel is closed successfully.
<0 Error as noted in [2.2.4 CAN_ERRORS](#)

Example

```
Status = CAN_Close(Handle);
```

Code Snippet 5 – Example for CAN_Close

2.1.6 CAN_Write

Summary

Write a message to the open channel with handle. Message is contained within the message structure.

Definition

```
TCAN_STATUS CAN_Write( TCAN_HANDLE Handle, CAN_MSG *Buf );
```

Parameters

Handle handle returned by CAN_Open
Buf transmitted message frame structure

Remarks

```
// Message flags
#define CAN_FLAGS_STANDARD (1 << 0) // Stand CAN ID
#define CAN_FLAGS_EXTENDED (1 << 1) // Extended CAN ID
#define CAN_FLAGS_REMOTE (1 << 2) // Remote frame
// CAN Frame
typedef struct
{
    UINT32 Id;
    UINT8 Size;
    UINT8 Data[8];
    UINT8 Flags;
    UINT16 Timestamp;
} CAN_MSG;
```

Code Snippet 6 – Message Frame Structure

Return value

=1 Writing transfer was successful.

<0 Error as noted in [2.2.4 CAN_ERRORS](#)

Example

```
CAN_MSG msg;
msg.Flags = CAN_FLAGS_STANDARD;

msg.Id = 0x111;
msg.Size = 5
msg.Data[0] = 0x11;
msg.Data[1] = 0x11;
msg.Data[2] = 0x11;
msg.Data[3] = 0x11;
msg.Data[4] = 0x11;
msg.Data[5] = 0x11;
msg.Data[6] = 0x11;
msg.Data[7] = 0x11;
Status=CAN_Write(Handle, &msg);
```

Code Snippet 7 – Example for CAN_Write**2.1.7 CAN_Read****Summary**

Read a message from the open channel with handle. Message is contained within the message structure.

Definition

TCAN_STATUS CAN_Read(TCAN_HANDLE Handle, CAN_MSG *Buf);

Parameters

Handle handle returned by CAN_Open

Buf received message frame structure

Remarks

```
// Message flags
#define CAN_FLAGS_STANDARD (1 << 0) // Stand CAN ID
#define CAN_FLAGS_EXTENDED (1 << 1) // Extended CAN ID
#define CAN_FLAGS_REMOTE (1 << 2) // Remote frame
// CAN Frame
typedef struct
{
    UINT32 Id;
    UINT8 Size;
    UINT8 Data[8];
    UINT8 Flags;
    UINT16 Timestamp;
} CAN_MSG;
```

Code Snippet 8 – Message Frame Structure

Return value

=1 Reading transfer was successful.

<0 Error as noted in [2.2.4 CAN_ERRORS](#)

Example

```
CAN_MSG msg;
Status=CAN_Read( Handle, &msg );
```

Code Snippet 9 – Example for CAN_Read

2.1.8 CAN_Status

Summary

Retrieve adaptor status for channel with handle.

Definition

TCAN_STATUS CAN_Status(TCAN_HANDLE Handle);

Parameters

Handle handle returned by CAN_Open

Return value

>0 Status value with bit values in [2.2.5 CAN_STATUS](#)

Example

```
Status = CAN_Status ( Handle );
```

Code Snippet 10 – Example for CAN_Status

2.1.9 CAN_Version

Summary

Retrieve device firmware version with handle.

Definition

TCAN_STATUS CAN_Version(TCAN_HANDLE Handle, CHAR *Buf);

Parameters

Handle	handle returned by CAN_Open
Buf	device firmware version

Return value

=1	Version retrieved successfully.
<0	Error as noted in 2.2.4 CAN_ERRORS

Example

```
CHAR Versioninfo[10];  
Status=CAN_Version( Handle, Versioninfo );
```

Code Snippet 11 – Example for CAN_Version

2.1.10 CAN_Flush

Summary

Clears the buffers for device with handle.

Definition

TCAN_STATUS CAN_Flush(TCAN_HANDLE Handle);

Parameters

Handle	handle returned by CAN_Open
--------	-----------------------------

Return value

=1	Buffers cleared successfully.
<0	Error as noted in 2.2.4 CAN_ERRORS

Example

```
Status = CAN_Flush( Handle );
```

Code Snippet 12 – Example for CAN_Flush**2.1.11 CAN_SN****Summary**

Get the Serial number of the device with handle.

Definition

TCAN_STATUS CAN_SN(TCAN_HANDLE Handle, CHAR *buf);

Parameters

Handle	handle returned by CAN_Open
buf	device serial number

Return value

=1	Serial number retrieved successfully.
<0	Error as noted in 2.2.4 CAN_ERRORS

Example

```
Status = CAN_SN( Handle, SerialNumber );
```

Code Snippet 13 – Example for CAN_SN**2.1.12 CAN_SetRcvEvent****Summary**

Set the event of the device with handle.

Definition

TCAN_STATUS CAN_SetRcvEvent(TCAN_HANDLE Handle, HANDLE Event);

Parameters

Handle	handle returned by CAN_Open
Event	In Windows an event handle of the type HANDLE

Return value

=1	Event set successfully.
----	-------------------------

<0

Error as noted in [2.2.4 CAN_ERRORS](#)**Example**

```
HANDLE hEvent;  
DWORD dwRetCode;  
hEvent = CreateEvent(NULL, FALSE, FALSE, NULL);  
CAN_SetRcvEvent(handle, hEvent);  
dwRetCode = WaitForSingleObject(hEvent, INFINITE);  
switch(dwRetCode)  
{  
    case WAIT_OBJECT_0 :  
        // a CAN frame arrived  
        break;  
    default:  
        // probe for error  
}  
CloseHandle(hEvent);
```

Code Snippet 14 – Example for CAN_SetRcvEvent

2.2 Types and Structures

2.2.1 CAN_HANDLE

```
typedef int TCAN_HANDLE;
```

Code Snippet 15 – CAN_HANDLE

2.2.2 CAN_MODE

```
CAN_MODE_NORMAL  
CAN_MODE_LISTENONLY  
CAN_MODE_LOOPBACK
```

Code Snippet 16 – CAN_MODE

2.2.3 CAN_TIMESTAMP

```
CAN_TIMESTAMP_OFF  
CAN_TIMESTAMP_ON
```

Code Snippet 17 – CAN_TIMESTAMP

2.2.4 CAN_ERRORS

```
CAN_ERR_OK  
CAN_ERR_ERR  
CAN_ERR_OPEN_CHANNEL  
CAN_ERR_PARAMETER  
CAN_ERR_NOT_OPEN  
CAN_ERR_READ_NO_MSG
```

Code Snippet 18 – CAN_ERRORS

2.2.5 CAN_STATUS

```
typedef int TCAN_STATUS;  
CAN_STATUS_BOFF  
CAN_STATUS_EWARN  
CAN_STATUS_EPASS  
CAN_STATUS_LEC_NO  
CAN_STATUS_LEC_STUFF_ERR  
CAN_STATUS_LEC_FORM_ERR  
CAN_STATUS_LEC_ACK_ERR  
CAN_STATUS_LEC_BIT1_ERR  
CAN_STATUS_LEC_BIT0_ERR
```

Code Snippet 19 – CAN_STATUS

2.2.6 MSG Flags

```
CAN_FLAGS_STANDARD  
CAN_FLAGS_EXTENDED  
CAN_FLAGS_REMOTE  
CAN_FLAGS_TIMESTAMP  
CAN_FLAGS_FD  
CAN_FLAGS_BRS
```

Code Snippet 20 – MSG Flags

2.2.7 CAN_MSG

```
typedef struct  
{  
    UINT32 Id;  
    UINT8 Size;  
    UINT8 Data[64];  
    UINT8 Flags;  
    UINT16 Timestamp;  
} CAN_MSG;
```

Code Snippet 21 – CAN_MSG

2.2.8 FILTER

```
typedef struct {  
    UINT32 Filter;  
    UINT32 Mask;  
} Filter;
```

Code Snippet 22 – FILTER

2.2.9 CAN_FILTERS

```
typedef struct {  
    Filter Filters[20];  
    INT NUM;  
} CAN_Filters;
```

Code Snippet 23 – CAN_FILTERS

3 Example Code

```
#include <stdio.h>
#include <stdlib.h>
#include "CAN_API.h"
int main() {
    TCAN_HANDLE Handle;
    TCAN_STATUS Status;
    CHAR *ComPort = "COM23";
    CHAR *szBitrate = "800";
    CHAR *acceptance_code = "1FFFFFFF";
    CHAR *acceptance_mask = "00000000";
    VOID *flags = CAN_TIMESTAMP_OFF;
    DWORD Mode = LoopBack;

    char version[10];
    CAN_MSG SendMSG;
    CAN_MSG RecvMSG;
    Handle = -1;
    Status = 0;

    SendMSG.Flags = CAN_FLAGS_EXTENDED;
    SendMSG.Id = 0x12345678;
    SendMSG.Size = 8;
    SendMSG.Data[0] = 0x11;
    SendMSG.Data[1] = 0x22;
    SendMSG.Data[2] = 0x33;
    SendMSG.Data[3] = 0x44;
    SendMSG.Data[4] = 0x55;
    SendMSG.Data[5] = 0x66;
    SendMSG.Data[6] = 0x77;
    SendMSG.Data[7] = 0x88;

    Handle = CAN_Open ( ComPort, szBitrate, acceptance_code, acceptance_mask,
    flags, Mode );

    printf ( "handle= %d\n", Handle );
    if ( Handle < 0 ) {
        return 0;
    }
    memset ( version, 0, sizeof ( char ) * 10 );
    Status = CAN_Flush ( Handle );
    Status = CAN_Version ( Handle, version );

    if ( Status == CAN_ERR_OK ) {
        printf ( "Version : %s\n", version );
    }

    Status = CAN_Write ( Handle, &SendMSG );
    if ( Status == CAN_ERR_OK ) {
        printf ( "Write Success\n" );
    }
}
```

```
while ( 1 ) {
    Status = CAN_Read ( Handle, &RecvMSG );
    if ( Status == CAN_ERR_OK ) {
        printf ( "Read ID=0x%X, Type=%s, DLC=%d, FrameType=%s, Data=",
            RecvMSG.Id,( RecvMSG.Flags & CAN_FLAGS_STANDARD ) ? "STD" : "EXT",
            RecvMSG.Size,( RecvMSG.Flags & CAN_FLAGS_REMOTE ) ? "REMOTE" :
"DATA" );
        for ( int i = 0; i < RecvMSG.Size; i++ ) {
            printf ( "%X,", RecvMSG.Data[i] );
        }
        break;
    }
}
Status = CAN_Close ( Handle );
printf ( "Test finish\n" );
return 0;
}
```

Code Snippet 24 – Example Code

4 Contact Information

Global Headquarters – Singapore

Connective Peripherals Pte Ltd
1 Tai Seng Avenue, Tower A,
#03-07
Singapore 536464

Tel: +65 67430980

E-Mail (Sales)
E-Mail (Support)
Web Site URL
Web Shop URL

sales@connectiveperipherals.com
support@connectiveperipherals.com
<http://www.connectiveperipherals.com>
<http://www.connectiveperipherals.com>

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 Peripherals Pte Ltd, 1 Tai Seng Avenue, Tower A, #03-07 Singapore 536464. Registered Number: 201617872E.

Appendix A – References

Document References

Acronyms and Abbreviations

Terms	Description
CAN	Controller Area Network
CANFD	Controller Area Network Flexible Data-rate
DLL	Dynamic Link Library

Appendix B – List of Tables/Figures/Code Snippets

List of Tables

NA

List of Figures

Figure 1: Sample Project.....	4
Figure 2: Project Configuration	4

List of Code Snippet

Code Snippet 1 – Example for CAN_Open	7
Code Snippet 2 – Example for CANFD_Open.....	8
Code Snippet 3 – Example for CANFD_Start	9
Code Snippet 4 – Example for CAN_OpenOnly	9
Code Snippet 5 – Example for CAN_Close	10
Code Snippet 6 – Message Frame Structure	10
Code Snippet 7 – Example for CAN_Write	11
Code Snippet 8 – Message Frame Structure	12
Code Snippet 9 – Example for CAN_Read	12
Code Snippet 10 – Example for CAN_Status	12
Code Snippet 11 – Example for CAN_Version.....	13
Code Snippet 12 – Example for CAN_Flush.....	14
Code Snippet 13 – Example for CAN_SN	14
Code Snippet 14 – Example for CAN_SetRcvEvent	15
Code Snippet 15 – CAN_HANDLE	15
Code Snippet 16 – CAN_MODE	15
Code Snippet 17 – CAN_TIMESTAMP	15
Code Snippet 18 – CAN_ERRORS	15
Code Snippet 19 – CAN_STATUS.....	16
Code Snippet 20 – MSG Flags.....	16
Code Snippet 21 – CAN_MSG	16
Code Snippet 22 – FILTER.....	16
Code Snippet 23 – CAN_FILTERS	17
Code Snippet 24 – Example Code.....	19

Appendix C – Revision History

Document Title: CP_AN_002 CP-CANFD Programming Guide
Document Reference No.: CP_000099
Clearance No.: CP#080
Product Page: <https://connectiveperipherals.com/>
Document Feedback: [Send Feedback](#)

Revision	Changes	Date
1.0	Initial Release	10-06-2024