Future Technology Devices International Ltd.

Application Note AN_121

Accessing The EEPROM User Area Of FTDI Devices

Document Reference No.: FT_000162

Version 1.0

Issue Date: 2009-09-04

This application note gives an explanation of how users can access the user area of any EEPROM used with FTDI devices.

Future Technology Devices International Limited (FTDI)

Unit 1,2 Seaward Place, Glasgow G41 1HH, United Kingdom
Tel.: +44 (0) 141 429 2777 Fax: + 44 (0) 141 429 2758
E-Mail (Support): **support1@ftdichip.com** Web: http://www.ftdichip.com

Table of Contents

Introduction

Most of FTDI's devices have an EEPROM which records FTDI device's configuration setting. Fortunately, FTDI doesn't use all of the memory space of this EEPROM, so users can use this memory space for other purposes. FTDI call this unused memory space "user area". This application note describes how to access this user area in the EEPROM using "public functions". Users can save their own parameters in the user area and read them out by using the public functions within the FTDI D2XX API (refer to http://www.ftdichip.com/Documents/ProgramGuides/D2XX_Programmer's_Guide(FT_000071).pdf)

1 User Area Information

The user area of an FTDI device EEPROM is the area of the EEPROM that is unused by device configuration information and descriptors.

1.1 FT232R and FT245R

FT232R and FT245R have 128 bytes of internal EEPROM. There is one block of memory space available as user area:

Size – the size of the user area depends on the length of the *Manufacturer*, *ManufacturerId*, *Description* and *SerialNumber* strings programmed into the internal EEPROM. More memory space is freed up if the lengths of the information strings are shortened. The Maximum length of the *Manufacturer*, *ManufacturerId*, *Description* and *SerialNumber* strings is 48 words (1 word = 2 bytes). If all the 48 words are used, then no user area space is available. The following formula can be used to calculate the available free space.

Formula:

User Area Size (in bytes) = (48 – (*Manufacturer string* + *Description string* + *ManufacturerId string* + *SerialNumber string*)) * 2

The start address of the user area will also vary depending on the size of the above strings used. It can be calculated as follows:

Start Address = the address following the last byte of *SerialNumber* string.

1.2 FT232B, FT245B, FT2232D, FT2232H and FT4232H

FT232B, FT245B, FT2232D, FT2232H and FT4232H do not have any internal EEPROM. These need to be connected to an external EEPROM such as the 93C46, 93C56 or 93C66 to configure device's setting.

Note. The EEPROM used must be of a type with a 16-bit width.

1.2.1 Connected to an 93C46 EEPROM (128 bytes)

There is one block of memory space available as user area. The user area layout is similar to the FT232R and FT245R.

Size – this depends on the length of the *Manufacturer*, *ManufacturerId*, *Description* and *SerialNumber* strings programmed into the EEPROM. More memory space is available if the lengths of the information strings are shortened. The Maximum length of the *Manufacturer*, *ManufacturerId*, *Description* and *SerialNumber* strings is 48 words. If all the 48 words are used, then no user area space is available. The following formula can be used to calculate the available free space.

Formula :

User Area Size (in bytes) = (48 – (*Manufacturer string* + *Description string* + *ManufacturerId string* + *SerialNumber string*)) * 2

The start address of the user area will also vary depending on the size of the above strings used. It can be calculated as follows:

Start Address = the address following the last byte of *SerialNumber* string.

1.2.2 Connected to an 93C56 EEPROM (256 bytes)

There are two blocks of memory space available for user area; The first block is a fixed size block with 128 bytes, the second block is similar to the FT232R and FT245R's user area. When the user area is accessed it can be treated as one block. The size of the user area can be calculated as follows:

1. First block
   Size – 128 bytes.
   The start address of the user area within this 1st block is as follows:
   Start Address = 0x14 (for FT232B and FT245B)
   0x16 (for FT2232D)
   0x1A (for FT2232H and FT4232H)

2. Second block
   Size – this depends on the length of the *Manufacturer*, *ManufacturerId*, *Description* and *SerialNumber* strings programmed into the EEPROM. More memory space is available if the length of the information strings is shortened. The Maximum length of the *Manufacturer*, *ManufacturerId*, *Description* and *SerialNumber* strings is 48 words. If all the 48 words are used, then no user area space is available. The following formula can be used to calculate the available free space of the 2nd block:

   Formula:

   User Area Size = (48 – (*Manufacturer string + Description string + ManufacturerId string + SerialNumber string)) * 2*

   The start address of the user area within this 2nd block is as follows:
   Start Address = the address following the last byte of *SerialNumber* string.

   Note: Access to FT2232H / FT4232H device's user area was added at FTD2xx driver revision 2.04.17.

1.2.3 Connected to an 93C66 EEPROM (512 bytes)

FTDI devices treats the 93C66 the same as the 93C56. The user area size of the 93C66 is the same as the 93C56 when connected to an FTDI device. Refer to section 1.2.2.

2 Public Functions

The public functions in the D2XX API are used to access the EEPROM.

2.1 FT_EE_UASize

FT_STATUS **FT_EE_UASize** (FT_HANDLE *ftHandle*, LPDWORD *lpdwSize*)

Summary

This function gets the available size of the EEPROM user area. This API must be used to check the size before calling the functions FT_EE_UARead and FT_EE_UAWrite.

Parameters

ftHandle	Handle of the device.
lpdwSize	Pointer to a DWORD that receives the available size, in bytes, of the EEPROM user area.

Return Value

FT_OK if successful, otherwise the return value is an FT error code.

2.2 FT_EE_UARead

FT_STATUS **FT_EE_UARead** (FT_HANDLE *ftHandle*, PUCHAR *pucData*, DWORD *dwDataLen*, LPDWORD lpdwBytesRead)

Summary

This function reads the contents of the EEPROM user area. This API reads data from the first byte of the user area. It is not possible to read data from an offset of the 1st byte.

The available user area size can be determined by calling FT_EE_UASize.

Parameters

ftHandle	Handle of the device.
pucData	Pointer to a read buffer.
dwDataLen	Size of read buffer. If *dwDataLen* is less than the size of the EEPROM user area, then *dwDataLen* bytes are read into the buffer. Otherwise, the whole of the EEPROM user area is read into the buffer.
lpdwBytesRead	Pointer to a DWORD that receives the actual number of bytes read.

Return Value

FT_OK if successful, otherwise the return value is an FT error code.

2.3 FT_EE_UAWrite

FT_STATUS **FT_EE_UAWrite** (FT_HANDLE *ftHandle*, PUCHAR *pucData*, DWORD *dwDataLen*)

Summary

This function writes data into the EEPROM user area.

The available user area size can be determined by calling FT_EE_UASize.

Parameters

ftHandle	Handle of the device.
pucData	Pointer to a write buffer.
dwDataLen	Size of write buffer. It cannot be greater than the size of the EEPROM user area

Return Value

FT_OK if successful, otherwise the return value is an FT error code.

3 EEPROM User Area Access: Example Code

3.1 Read User Area

```
FT_HANDLE ftHandle;
FT_STATUS ftStatus = FT_Open(0, &ftHandle);
 if (ftStatus != FT_OK)
{
   // FT_Open FAILED!
}

DWORD EEUA_Size = 0;

ftStatus = FT_EE_UASize(ftHandle, &EEUA_Size);
if(ftStatus == FT_OK)
{
   unsigned char Buffer[EEUA_Size];
   DWORD BytesRead;

   ftStatus = FT_EE_UARead(ftHandle, Buffer, EEUA_Size, &BytesRead);
   if (ftStatus == FT_OK)
   {
     // FT_EE_UARead OK
     // User Area data stored in Buffer
     // Number of bytes read stored in BytesRead
   }
   else
   {
     // FT_EE_UARead FAILED!
   }
}

FT_Close(ftHandle);
```


3.2 Write User Area

```
FT_HANDLE ftHandle;
FT_STATUS ftStatus = FT_Open(0, &ftHandle);
 if (ftStatus != FT_OK)
{
   // FT_Open FAILED!
}

DWORD EEUA_Size = 0;

ftStatus = FT_EE_UASize(ftHandle, &EEUA_Size);
if(ftStatus == FT_OK)
{
   unsigned char Buffer[EEUA_Size];
   DWORD BytesWrite;

        for(int i=0;i< EEUA_Size;i++)
          Buffer[i] = i;

   ftStatus = FT_EE_UAWrite(ftHandle, buffer, EEUA_Size);
   if (ftStatus == FT_OK)
   {
      // FT_EE_UAWrite OK
   }
   else
   {
      // FT_EE_UAWrite FAILED!
   }
}

FT_Close(ftHandle);
```


4 Contact Information

Head Office – Glasgow, UK

Future Technology Devices International Limited
Unit 1, 2 Seaward Place
Centurion Business Park
Glasgow G41 1HH
United Kingdom
Tel: +44 (0) 141 429 2777
Fax: +44 (0) 141 429 2758

E-mail (Sales) sales1@ftdichip.com
E-mail (Support) support1@ftdichip.com
E-mail (General Enquiries) admin1@ftdichip.com

Web Site URL http://www.ftdichip.com
Web Shop URL http://www.ftdichip.com

Branch Office – Taipei, Taiwan

Future Technology Devices International Limited (Taiwan)
2F, No. 516, Sec. 1, NeiHu Road
Taipei 114
Taiwan , R.O.C.
Tel: +886 (0) 2 8791 3570
Fax: +886 (0) 2 8791 3576

E-mail (Sales) tw.sales1@ftdichip.com
E-mail (Support) tw.support1@ftdichip.com
E-mail (General Enquiries) tw.admin1@ftdichip.com
Web Site URL http://www.ftdichip.com

Branch Office – Hillsboro, Oregon, USA

Future Technology Devices International Limited (USA)
7235 NW Evergreen Parkway, Suite 600
Hillsboro, OR 97123-5803
USA
Tel: +1 (503) 547 0988
Fax: +1 (503) 547 0987

E-Mail (Sales) us.sales@ftdichip.com
E-Mail (Support) us.support@ftdichip.com
E-Mail (General Inquiries) us.admin@ftdichip.com
Web Site URL http://www.ftdichip.com

Branch Office – Shanghai, China

Future Technology Devices International Limited (China)
Room 408, 317 Xianxia Road,
Shanghai, 200051
China
Tel: +86 21 62351596
Fax: +86 21 62351595

E-mail (Sales) cn.sales@ftdichip.com
E-mail (Support) cn.support@ftdichip.com
E-mail (General Enquiries) cn.admin@ftdichip.com
Web Site URL http://www.ftdichip.com

Distributor and Sales Representatives

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

Appendix A – Revision History

Version 1.0 First Release – 04/09/09

