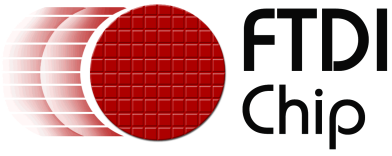

Future Technology Devices International Ltd.

AN232B-09 Using the Modem Emulation Mode in FTDI's VCP Driver

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1 Introduction

Modem Emulation Mode is a special feature of FTDI's Virtual COM Port (VCP) driver that allows binary data to be transmitted over a two (or more) wire interface with full handshaking and modem control signalling, thus allowing PPP connections to be made. Possible applications include mobile phone data cables and radio links.

Modem Emulation Mode can be setup in the driver INF file (FTDIPORT.INF) or can be enabled in the registry. Its purpose is to allow modem emulation to be done by the driver when the device attached is not a standard modem. The reason for this is that many standard applications require the DCD line to know that they are on the internet (e.g. for Dial Up Networking).

2 Modem Emulation

2.1 Method

This method can use XOn/XOff or hardware RTS/CTS handshaking. Both the XOn/XOff characters and the escape character are definable.

The standard ones will be:

XOn - 0x11
XOff - 0x13
EscChar - 0x10

Transmitter		Receiver	
Data In	**Data Transmitted**	**Data Received**	**Data Out**
XOn	EscChar + 0x01	EscChar + 0x01	XOn
XOff	EscChar + 0x02	EscChar + 0x02	XOff
EscChar	EscChar + EscChar	EscChar + EscChar	EscChar
0x01	0x01	0x01	0x01
0x02	0x02	0x02	0x02
Flow Control	XOn	XOn	None
Flow Control	XOff	XOff	None

FTDI Driver		Application Hardware	
Command In	**Data Transmitted**	**Data Received**	**Status Out**
SetDTR	EscChar + 0x03	EscChar + 0x03	DTR Active
ClrDTR	EscChar + 0x04	EscChar + 0x04	DTR Inactive
0x01	0x01	0x01	0x01
0x02	0x01	0x01	0x01
0x03	0x03	0x03	0x03
0x04	0x04	0x04	0x04
0x05	0x05	0x05	0x05
0x06	0x06	0x06	0x06
0x07	0x07	0x07	0x07
0x08	0x08	0x08	0x08
0x09	0x09	0x09	0x09
0x0A	0x0A	0x0A	0x0A
0x0B	0x0B	0x0B	0x0B
0x0C	0x0C	0x0C	0x0C
0x0D	0x0D	0x0D	0x0D
0x0E	0x0E	0x0E	0x0E
0x0F	0x0F	0x0F	0x0F

The following ones are not applicable if RTS/CTS hardware handshaking is used:

FTDI Driver		Application Hardware	
Command In	**Data Transmitted**	**Data Received**	**Status Out**
SetRTS	EscChar + 0x05	EscChar + 0x05	RTS Active
ClrRTS	EscChar + 0x06	EscChar + 0x06	RTS Inactive

Application Hardware		FTDI Driver	
Command In	**Data Transmitted**	**Data Received**	**Status Out**
SetDSR	EscChar + 0x07	EscChar + 0x07	DSR Active
ClrDSR	EscChar + 0x08	EscChar + 0x08	DSR Inactive
SetDCD	EscChar + 0x09	EscChar + 0x09	DCD Active
ClrDCD	EscChar + 0x0A	EscChar + 0x0A	DCD Inactive
SetRI	EscChar + 0x0B	EscChar + 0x0B	RI Active
ClrRI	EscChar + 0x0C	EscChar + 0x0C	RI Inactive
0x01	0x01	0x01	0x01
0x02	0x02	0x02	0x02
0x03	0x03	0x03	0x03
0x04	0x04	0x04	0x04
0x05	0x05	0x05	0x05
0x06	0x06	0x06	0x06
0x07	0x07	0x07	0x07
0x08	0x08	0x08	0x08
0x09	0x09	0x09	0x09
0x0A	0x0A	0x0A	0x0A
0x0B	0x0B	0x0B	0x0B
0x0C	0x0C	0x0C	0x0C
0x0D	0x0D	0x0D	0x0D
0x0E	0x0E	0x0E	0x0E

The following ones are not applicable if RTS/CTS hardware handshaking is used:

Application Hardware		FTDI Driver	
Command In	**Data Transmitted**	**Data Received**	**Status Out**
SetCTS	EscChar + 0x0D	EscChar + 0x0D	CTS Active
ClrCTS	EscChar + 0x0E	EscChar + 0x0E	CTS INactive

2.2 XOn-XOff Software Handshaking

If the XOn and XOff characters are substituted in this way, then raw binary may be sent without affecting the flow control. If the transmitter receives the XOff character it should stop transmission and start it on XOn being received. If the receiver wants to stop transmission it should send the XOff etc.

2.3 Enabling Modem Emulation Mode

Modem Emulation mode substitution bits can be enabled by setting the following bits in the VCP driver INF file FTDIPORT.INF :

HKR,,"EmulationMode",0x00010001,0x0000nnnn {HEX format}

Force XOn/XOff handshaking if any flow control is active - bit 0

For the following substitutions the following convention will be used :

0,0 = off
0,1 = on
1,0 = don't set
1,1 = don't set

Substitute XOn/XOff and Control Char - bit 2,1
Substitute DSR and Control Char - bit 4,3
Substitute RI and Control Char - bit 6,5
Substitute DCD and Control Char - bit 8,7
Substitute CTS and Control Char - bit 10,9
Substitute RTS and Control Char - bit 12,11
Substitute DTR and Control Char - bit 14,13

If the appropriate bit is not set, then the driver will assume the normal method for receiving/setting the line.

3 Document Revision History

Version	Release Date	Comments
1.0	March 2004	Initial release
2.0	May 2005	"Data Out" or "Status Out" column added to each table.

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