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SL-28x Technical Description

USB readers

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SL-283-2 Track II Magnetic Card Reader

SL-283-3 Tracks I & II Magnetic Card Reader

SL-284 iButton Reader (ROM only)

SL-287 RF Card Reader (EM 41xx cards)

1 General Description

The SL-28x series are all USB readers that are based on FDTI USB chips and use FDTI Windows drivers.

CardWare supplies the Comm28x Windows application that communicates with the FDTI USB driver and puts the received data into the selected window's keyboard buffer, thereby simulating a keyboard wedge reader.
This makes changes in the end-user's application unnecessary.

The Comm28x program provides extensive data formatting options including prefixing and postfixing the data with ENTER, various characters, timestamps etc. Several SL-28x readers can be attached to a PC and each can send a unique ID in the formatting data.

1. **Virtual serial port**

The FDTI driver creates a virtual serial port which can also be used to receive data generated by the readers. This is an alternative way of using the readers without the Comm28x program (and all the formatting it provides).
Just installing the Comm28x program will install the FDTI drivers and the new virtual COM port will appear in the Device Manager.

The format of the data received via the virtual COM port is the same as the original format sent via the USB channel and is described below for each type of reader.

If you use the virtual serial port, you may need to send the BEEP command (described below) one or more times after having received the data. The readers beep only once before sending the data and this may not be enough for your application.

2 Low level protocol

Notation used:

<CH> single byte, usually ASCII control character
(HL) byte sent as two ASCII hexadecimal characters, i.e. (A5) = 41h, 35h

1 Common internal commands

Currently, only one internal command exists,

BEEP: <SOH><'*'><'1'>

The USB host sends this message to the SL-28x unit in order to generate a short beep.

2 SL-284 iButton reader

After reading an iButton, the following bytes are sent to the USB host

<SOH>(FC)(B6)(B5)(B4)(B3)(B2)(B1)(CRC)<ETX>(CRC8)<EOT>

Where

FC is the iButton Family Code e.g. 01 for DS1990A
B1 is the leftmost ROM byte (two digits)
...
B6 is the rightmost ROM byte (two digits)
CRC is the iButton CRC as engraved on the
CRC8 is the 8-bit CRC of all the data between <SOH> and <ETX>

3 SL-283-2 track II magnetic card reader

After reading a magnetic card, the following bytes are sent to the USB host:

<SOH> <';'> <B1><B2>...<Bn><ETX>(CRC8)<EOT>

Where

<';'> is the track II start sentinel
B1 to Bn are the track II 5-bit ASCII characters
CRC8 is the 8-bit CRC of all the data between <SOH> and <ETX>

4 SL-283-3 track I and II magnetic card reader

After reading a magnetic card, the following bytes are sent to the USB host:

<SOH> <'%'> <A1><A2>...<Am><ETX>(CRC8)<EOT>
<SOH> <';'> <B1><B2>...<Bn><ETX>(CRC8)<EOT>

Where

<'%'> is the track I start sentinel
<';'> is the track II start sentinel

A1 to Am are the track I 7-bit ASCII characters
B1 to Bn are the track II 5-bit ASCII characters
CRC8 is the 8-bit CRC of all the data between <SOH> and <ETX>

5 SL-287 RF reader

The SL-287 RF reader supports EM 41xx compatible 125kHz, AM, 64cyc/bit read-only cards and tags.

After reading an RF card, the following bytes are sent to the USB host

<SOH>(44h)(B6)(B5)(B4)(B3)(B2)(B1)(CRC)<ETX>(CRC8)<EOT>

Where

44h is the reader generated Family Code for compatibility with the iButton format
B1 is the leftmost ROM byte (two digits)
...
B6 is the rightmost ROM byte (two digits)
CRC is the iButton CRC as engraved on the
CRC8 is the 8-bit CRC of all the data between <SOH> and <ETX>

3 Configuration data in EEPROM

This data is used only by the Comm28x program and has no relevance when using the reader via the virtual COM port.

The data is stored in the 16-bytes of user space allowed by the FTDI API. This data can be accessed only through the USB chip and is not used by the microcontroller.

Byte No.	Name	Description
0	Config	Configuration byte, depends on reader type
1	ID	ID of reader
2	Event Code	Event code
3	UB1	User Byte #1
4	UB2	User Byte #2
5	UB3	User Byte #3
6	UB4	User Byte #4
7	UB5	User Byte #5
8	UB6	User Byte #6
9	PF1:PF2	Prefix #1 (high nibble) , Prefix #2 (low nibble)
10	PF3:PF4	Prefix #3 (high nibble) , Prefix #4 (low nibble)
11	PFE	Prefix Enable
12	SF1:SF2	Suffix #1 (high nibble) , Suffix #2 (low nibble)
13	SF3:SF4	Suffix #3 (high nibble) , Suffix #4 (low nibble)
14	SFE	Suffix Enable
15	N.U.	Not Used

ID - reader ID

This is a byte value that can be associated with the reader and is useful when there are several readers connected to a single PC or if the reader data is logged over a network from several PCs. It is used to identify the originating reader of the record.

EC – Event Code

This is a byte value that can be associated with the reader and is useful when there are several readers connected to a single PC or if the reader data is logged over a network from several PCs. It is used to identify the originating reader of the record. If the data is used for applications such as time & attendance, the Event Code is used to distinguish between e.g. arrivals and departures which means that two readers must be used with differing EC bytes.

Example

A gym with two entrances uses two PCs with two readers each to track the members' attendance. Both readers at the first entrance PC have an ID of 01 and both at the second entrance have an ID of 02.
At each entrance, one of the readers is used for recording arriving members (IN), the other for departing members (OUT). Both the IN readers have an EC of 00 and both the OUT readers have an EC of 01.
This way, the report generation program can tell when each member arrived and left and wt which entrance.

UB1..UB6 User bytes

These bytes are used to put specific ASCII characters in the prefix or suffix of the data sent to the keyboard buffer.

PFn , SFn (n=1,2,3,4)

Each data block send by the SL-28x can have up to four prefixes (PF1,..PF4) and up to four suffixes (SF1,..,SF4). These can have the following values:

0	UB1
1	UB2
2	UB3
3	UB4
4	UB5
5	UB6
6	’ ’ (Space)
7	’,’ (comma)
8	ID (sent as two ASCII characters)
9	EC (sent as two ASCII characters)
10	Timestamp: YYYY.MM.DD hh:mm:ss
11	ENTER
12	N.U.
13	N.U.
14	N.U.
15	Nothing is sent

1 Definition of reader-specific configuration data bytes

SL-284 iButton reader
SL-287 RF tag reader
(These reader types supply iButton-format data i.e. fixed 8-byte data length)

Byte 0 : Config

B7	B6	B5	B4	B3	B2	B1	B0
N.U.	BEEP2	BEEP1	BEEP0	LEN1	LEN0	KB	DB

BEEP2,BEEP1,BEEP0 these 3 bits determine the number of times the reader will beep after a successful read operation.

0	8 times
1	7 times
..	
7	1 time

LEN1, LEN0 these 2 bits determine the number of bytes of the iButton-type data that will be sent to the keyboard buffer

0	4 bytes
1	6 bytes
2	7 bytes
3	8 bytes

KB this bit determines if the data is to be sent to the active window's keyboard buffer

0	don't send
1	Send

DB this bit determines if the data is to be written into the KatzeReports database

0	do not write to database
1	write to database

Byte 11: PFE Prefix Enable
This byte determines which of the four prefixes is enabled i.e. will be sent.

B7	B6	B5	B4	B3	B2	B1	B0
N.U.	N.U.	N.U.	N.U.	PF4E	PF2E	PF2E	PF1E

If any of the PFE4 .. PFE1 bits is 0, the corresponding prefix is enabled, if the PFE bit is 1, the prefix is disabled

Byte 14: SFE Sufffix Enable
This byte determines which of the four suffixes is enabled i.e. will be sent.

B7	B6	B5	B4	B3	B2	B1	B0
N.U.	N.U.	N.U.	N.U.	SF4E	SF2E	SF2E	SF1E

If any of the SFE4 .. SFE1 bits is 0, the corresponding suffix is enabled, if the SFE bit is 1, the suffix is disabled

SL-283-1 Track I Magnetic Card Reader
SL-283-2 Track II Magnetic Card Reader
(These reader types supply a single, variable length data field)

Byte 0 : Config

B7	B6	B5	B4	B3	B2	B1	B0
N.U.	BEEP2	BEEP1	BEEP0	N.U.	SS	KB	DB

BEEP2,BEEP1,BEEP0 these are the same for all readers and will not be explained again .

SS this bit determines if the Start Seninel ('%' for Track 1 and ';' for Track 2) should be sent to the active window's keyboard buffer

0	Send SS
1	Don't send SS

KB, DB these two bits are the same for all readers and will not be explained here again

Byte 11: PFE Prefix Enable
This byte determines which of the four prefixes is enabled i.e. will be sent.

B7	B6	B5	B4	B3	B2	B1	B0
N.U.	N.U.	N.U.	N.U.	PF4E	PF2E	PF2E	PF1E

If any of the PFE4 .. PFE1 bits is 0, the corresponding prefix is enabled, if the PFE bit is 1, the prefix is disabled

Byte 14: SFE Sufffix Enable
This byte determines which of the four suffixes is enabled i.e. will be sent.

B7	B6	B5	B4	B3	B2	B1	B0
N.U.	N.U.	N.U.	N.U.	SF4E	SF2E	SF2E	SF1E

If any of the SFE4 .. SFE1 bits is 0, the corresponding suffix is enabled, if the SFE bit is 1, the suffix is disabled

SL-283-3 Track I & II Magnetic Card Reader
(This reader type supplies one or two, variable length data fields)

B7	B6	B5	B4	B3	B2	B1	B0
TWO	BEEP2	BEEP1	BEEP0	TK_SS2	SS	KB	DB

TWO this bit determines if one or both read tracks are to be sent to the active window's keyboard buffer.

0 send only one track (which one is sent depends on B3
1 send both tracks

BEEP2,BEEP1,BEEP0 these are the same for all readers and will not be explained again .

TK_SS2 this bit has two functions, depending on the value of B7 (TWO)
If TWO = 0 (only one track is to be sent)
TK_SS determines which of the two tracks' data is to be sent
1 Send TK1 data
2 Send TK2 data

If TWO = 1 (both tracks' data is to be sent)
TK_SS determines if the Track II Start Sentinel is to be sent
0 Send Track II SS
1 Don't send Track II SS

SS this bit has two functions, depending on the value of B7 (TWO)
If TWO = 0 (only one track's data is to be sent)
SS determines if the selected track's Start Sentinel is to be sent

0 Send SS

1 Don't send SS

If TWO = 1 (Both tracks' data is to be sent)
SS determines if the Track I Start Sentinel is to be sent

0	Send Track I SS
1	Don't send Track I SS

KB, DB these two bits are the same for all readers and will not be explained here again

Byte 11: PFE Prefix Enable
This byte determines which of the four prefixes is enabled i.e. will be sent for each of the two tracks..

B7	B6	B5	B4	B3	B2	B1	B0
PF4E2	PF3E2	PF2E2	PF1E2	PF4E1	PF2E1	PF2E1	PF1E1

If any of the PFnEm bits is 0, the corresponding prefix is enabled, if the PFnEm bit is 1, the prefix is disabled

PF4E2 .. PF1E2 are the prefix enable bits for Track II
PF4E1... PF1E1 are the prefix enable bits for Track I

Byte 14: SFE Sufffix Enable
This byte determines which of the four suffixes is enabled i.e. will be sent for each of the two tracks..

B7	B6	B5	B4	B3	B2	B1	B0
SF4E2	SF3E2	SF2E2	SF1E2	SF4E1	SF2E1	SF2E1	SF1E1

If any of the SFnEm bits is 0, the corresponding suffix is enabled, if the SFnEm bit is 1, the suffix is disabled

SF4E2 .. SF1E2 are the suffix enable bits for Track II
SF4E1... SF1E1 are the suffix enable bits for Track I