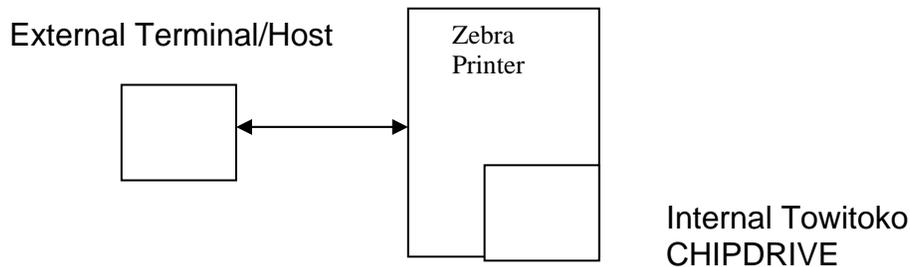**Friday, March 19, 2004**

Portable Smart Card Reader Project

S-CARD COMMAND PROTOCOL

Zebra Printer Equipped with the Towitoko CHIPDRIVE Smartcard Terminal

SYSTEM OVERVIEW

External Terminal/Host

Zebra Printer

Internal Towitoko CHIPDRIVE

OVERVIEW

The smart card library implements the T = 0 and T=1 protocols for IS07816-3 compliant cards. This allows users to send ASCII commands to the printer and the printer will in turn forward this command to the smart card with the appropriate header and checksum information then return the card's response.

COMMAND FORMAT

{ Command } { Options } { Operation }

S-CARD { Options } { Operation }

The **S-CARD** command can be used to access the Towitoko Smartcard reader embedded within the Zebra printer. The 'Operation' argument indicates how to access the reader. All options must be separated by a space unless stated otherwise. The options may appear in any order. **The entire S-CARD command must be terminated by a CRLF pair (0x0D0x0A).**

Operation

The Operation command is a required element. An error will be returned if an invalid operation is specified (see 'S-CARD Command Response' for error codes). The possible Operation commands are:

CT_ATR – Each smart card has a unique 'Answer To Reset', or ATR. This ATR contains information relevant to data transmission and the card itself. This command/response has the following form:

Comand:
! U1 S-CARD CT_ATR

Response:
<ACK><Length><ATR data>

CT_DATA – This command is used to send a command to the smart card. The response from the card is returned. A command of this type has the following form:

<CT_DATA> <Length of command> <card command in ascii form>

Example:
! U1 S-CARD CT_DATA 10 8010000008

Description:

CT_DATA: indicates the command is to go to the smart card
10:               length of command (hexadecimal format)
8010000008: Command to go to the card in ascii form. This command is converted to binary and sent to the card.

Response for successful command:

<ACK><Length><Data><SW1><SW2>

Explanation of response:

<ACK> -- Successfully send command to the card and received a response
<Response length> -- The response length (binary). This length is for data only (i.e. SW1 and SW2 are not included in response length).
<Data> -- This is the response from the card (binary).
<SW1> -- Status byte from card (binary)
<SW2> -- Status byte from card (binary)

Note: See ISO-7816-3 for an explanation of SW1 and SW2

Response for an unsuccessful command:

        <NAK><Error Code>
        See 'Error Codes' for an explanation of possible error codes.

        CT_CLOSE – This command is used power down the reader. This command will turn off the red LED. This command should be used after communicating to the card with the CT_DATA command.

Options

        Note: {Options} must precede the {Operation}

        ASCII – Data returned from the card will be converted to ASCII. Normally, data returned is in binary form. With the ASCII option, returned data will be in ASCII form.

        Example:
            ! U1 S-CARD CT_DATA 10 8010000008

            Normally, the response to this command would appear as follows:
            <0x06><0x10><0x01><0x02><0x03><0x04><0x05><0x06>…

            Where <0x06> represents <ACK>
                <0x10> indicates there are 16 bytes (0x10 = 16 decimal) of data in the response

            ! U1 S-CARD ASCII CT_DATA 10 8010000008

            The response would read:
            <0x06><10><010203040506…>

            Where, other than the 0x06 (ACK), each byte represents a nibble and each pair of ASCII bytes corresponds to a binary byte.

        DEBUG-ON

        Enables debug on the printer. This will cause some debug messages to print out during communication with the printer/card reader.

Error Codes

Errors from the S-CARD command are of the following format:
<NAK><Error code>

Where any of the following are possible error codes:
<0x02> -- Protocol not supported (card is not using T = 0 or T=1 protocol)
<0x03> -- Unable read card's ATR
<0x10> -- No card detected
<0x11> -- Invalid drive type (currently only the Towitoko CHIPDRIVE
        micro is supported)
<0x12> -- Invalid operation
<0x16> -- Invalid command length in S-CARD command

S-CARD COMMAND EXAMPLES

This section provides some examples for using the S-CARD command to communicate with the internal Smartcard reader from the 'External Terminal'.

- Read card ATR

    ```
    ! U1 S-CARD CT_ATR
    ```

    Response:
    <ACK><0x0d>< 3b e3 00 ff 91 81 71 26 44 00 54 54 54>

- Traceability command:

    ```
    ! U1 S-CARD CT_DATA 10 8010000008
    ```

    Note: When the printer actually sends this command to the printer, it converts the command to binary, adds the appropriate T=1 header and computes the overall command checksum. Then the printer sends this command to the smart card.

    Response:
    <ACK><08>< c9 1c 92 aa 66 19 a0 00><90><00>

- CT_CLOSE command

    ```
    ! U1 S-CARD CT_CLOSE
    ```