USER MANUAL

Magnetic Stripe Reader & Writer

&

Utility Application Operation Guide

80058507-001-A
July 30, 2007

FCC WARNING STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at his expense.

FCC COMPLIANCE STATEMENT

This reader complies with Part 15 of the FCC Rules. Operation of this reader is subject to the following conditions: this reader may not cause harmful interference and this reader must accept any interference received, including interference that may cause undesired operation.

CE STANDARDS

An independent laboratory performed testing for compliance to CE requirements. The unit under test was found compliant to Class A.

LIMITED WARRANTY

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MagStripe Reader Writer

Introduction

Reader/Writer is a personal computer peripheral device for reading and writing magnetic stripe card data. The Application Software is the companion software product, which provides operation of Reader/Writer through a Personal Computer. The MagStripe cards must meet the ISO 7811 standards for an ID1 card (typical credit card). Cards are manually swiped through the slot to perform a reading and/or writing operation. Data can be written and read verified with one swipe. The Reader/Writer supports magnetic stripe track formats defined either by an established industry standard or by a user (customer defined) data format. All formats use F/2F data bit encoding (writing) and either 210 or 75 bits per inch (BPI) data densities. The Reader/Writer can read and write both High coercivity and Low coercivity (Hi-Co & Lo-Co) magnetic stripes.

The enclosure is a die cast metal housing that provides weight and stability for excellent performance. There are two communication interfaces, either RS232 or USB, available through an attached six-foot cable. A separate power adaptor is required to supply the power needed for writing cards.

There are three Sections to this document:

The First Section provides Quick Start information covering Reader/Writer installation and installation of Utility Application software. The Application Software operates with both RS232 unit and USB units and provides easy to use commands for performing all read and write functions. A simple example of the Application Software operation is given in this section. The example performs the two most basic operations, writing and then reading on a Lo-Co or Hi-Co magnetic stripe card.

The Second Section provides operation details for all the Application Software functions.

The Third Section is the Technical Guide for the Reader/Writer. This section provides the product specification and related information.

The Magnetic Stripe Reader & Writer is RoHS compliant.

Quick Start

This Quick Start section covers Reader/Writer installation and the Application Software installation. An example is given to introduce the Application Software & Reader/Writer operation. The example guides an operator through the process of writing a few characters onto a magnetic stripe card and then through the process of reading the card to see the written data.

Installing Application Software

The Application Software runs on Windows 95/98, 2000, ME, & XP for Reader/Writer with an RS232 or USB communication interface.

All the software is provided on the supplied CD. Install the Application Software on a PC by running the "Setup" file located on the CD. An installation wizard will appear; follow the directions & process in the wizard. The result is a “Reader Writer Software Utility v2.4G” menu item added to the Programs menu in the Windows START menu. A file folder is added to the Program Files folder on the local hard drive. This folder contains the software application and support files for Reading and Writing cards.

Installing Reader/Writer

Reader/Writer is used in an indoor environment. Locate the Reader/Writer where it is convenient to operate and protected from dust and liquids. For right-handed persons, swiping a card is most convenient from right to left. Position the Reader/Writer so the flared card entrance is on the right. A 24VDC power adaptor is provided. The adaptor input voltage range is 100 to 240VAC and can be used in most countries. The line power plug may need to be adapted to the power outlet connector. Remove the power adaptor from the packing box. Wait to connect the power adaptor until all the other connections are made.

The communication type can be RS232 or USB-RS232. Proceed to the Communication Interface section corresponding to the interface of your Reader/Writer unit.

Communication Interface

RS232

The Reader/Writer has a communication cable with a DE-9 connector that fits most computer serial (RS232) COM port connectors. An adaptor (not supplied) can be used to adapt to a DE-25 connector if necessary. See the Specifications, Interface Section for port settings.

Connect the DE-9 connector to the PC and insure it is fully seated. Connect the power adaptor output to the power connector on the back of the DE-9 housing. Finally, connect the power adaptor to the AC line power outlet. When power is applied, the LED on the Reader/Writer is orange for a moment and then becomes green. If the LED does not light, check the connections and the availability of power from the power outlet.

USB-RS232

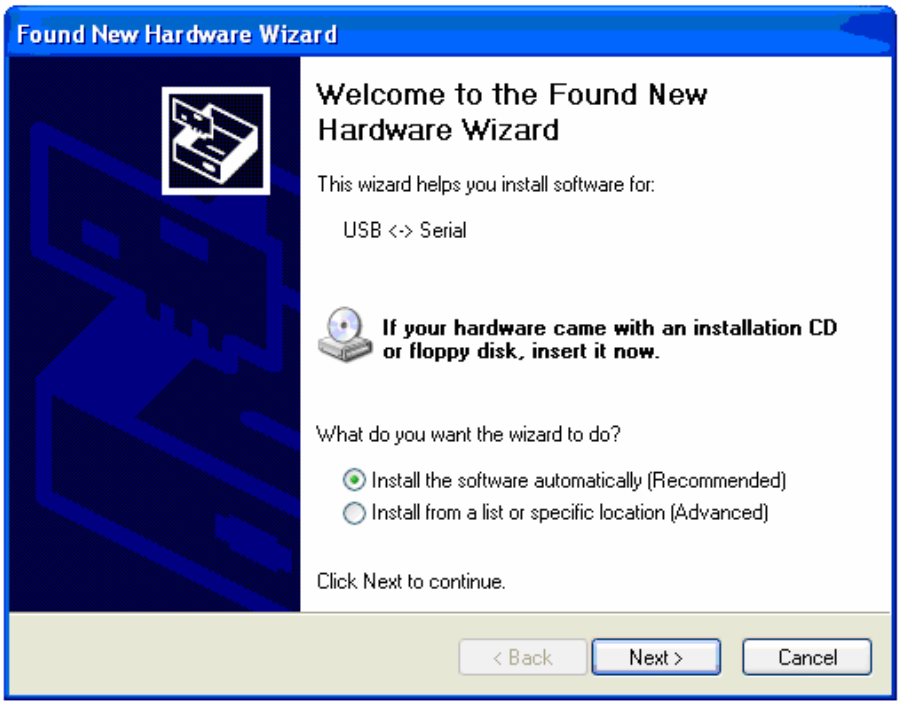
The USB interface operates though serial COM ports like an RS232 device. The USB communication uses a special USB-RS232 driver included in the supplied CD. Reader/Writer is a “Self-Powered” USB device and must be powered using the 24VDC power adaptor provided with Reader/Writer.

The USB cable has two connectors at the cable’s end. One connector is for the PC USB connection and the other is for the power adaptor connection. Connect the Reader/Writer USB connector into the PC and insure it is fully seated. Connect the power adapter output to the power adaptor connector on the USB cable. Finally, connect the power adaptor to the AC line power outlet.

When power is applied, the LED is orange for a moment and then becomes green. If the LED does not light, check the power adaptor connections.

When the USB connection is recognized by the operating system for the first time, a Found New Hardware message is given. The operating system must install USB drivers in the PC. The drivers provide the communication link between the PC and Reader/Writer.

When the New Hardware Wizard window appears, follow the wizard directions to install the USB-RS232 drivers into the PC. The drivers are available online as Signed drivers. If an internet connection is available to the PC or the Reader Writer CD is available and installed in the CD drive, then perform “Install the software automatically (Recommended)” selection. Otherwise, select the “Install from a list or specific location (advanced)” option. For the advanced option, Application Software must be installed first to have the drivers on the PC hard drive. *If the Software Application is not already installed, stop here and install as instructed above.* The Reader Writer Application Software is available on the supplied CD.

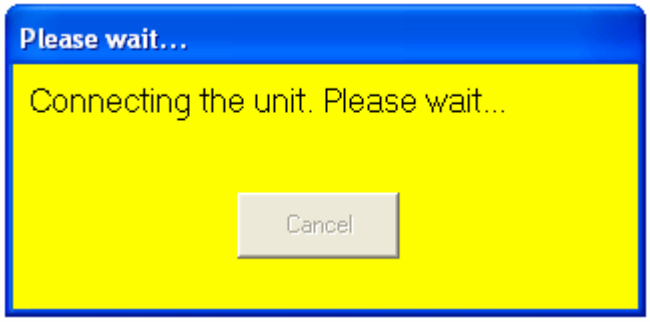


The New Found Hardware Wizard appears a second time to install a second driver. Repeat the same process again to install the second driver. When both drivers are installed, the process is complete. The USB communication interface is ready for operation when the “Found New Hardware” bubble appears with the following notice.

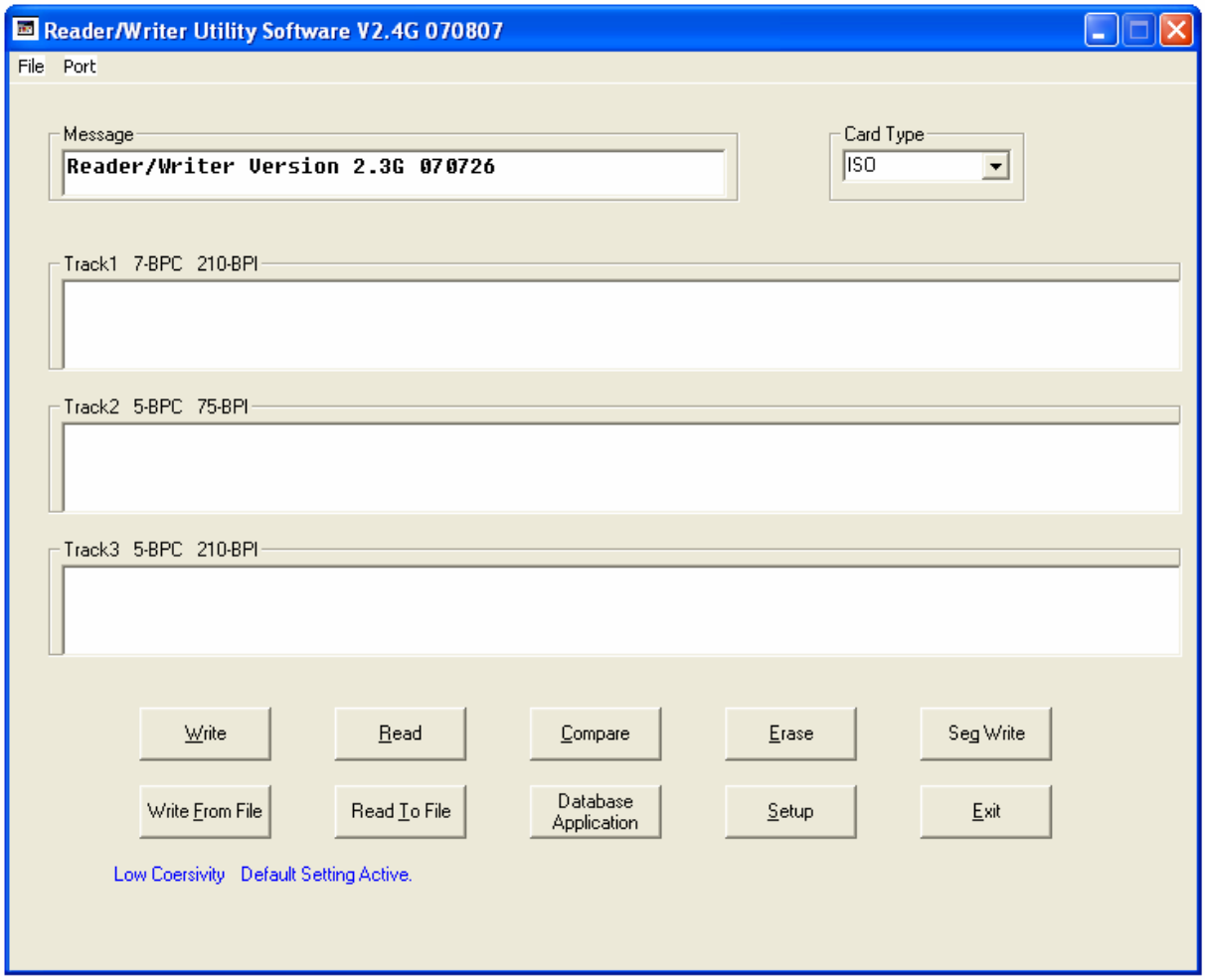
Using the Application Software

In the “Programs” tab of the Windows START button, double click the “Reader Writer Software Utility v2.4G” to RUN the application. The Password Dialog Box appears the first time the installed application is RUN. Select a password, confirm it, and click OK. Each subsequent time the Application Software is RUN, a dialog box (shown below) opens to request the password. The password is required each time the application is RUN.

The Application Software checks the communication link with the Reader/Writer both before the password window and after. During this process, the “Connecting the unit” window is displayed. The Application Software window appears when the communication link is verified. If there is an error, check the Reader/Writer LED for a Green (power on) condition and verify the communication connections.



Notice: The "Connecting the unit, Please wait…" notice may appear several times as the Application Software establishes communication with Reader/Writer. There is a delay between the "Connecting" notice closing & the application window appearing.



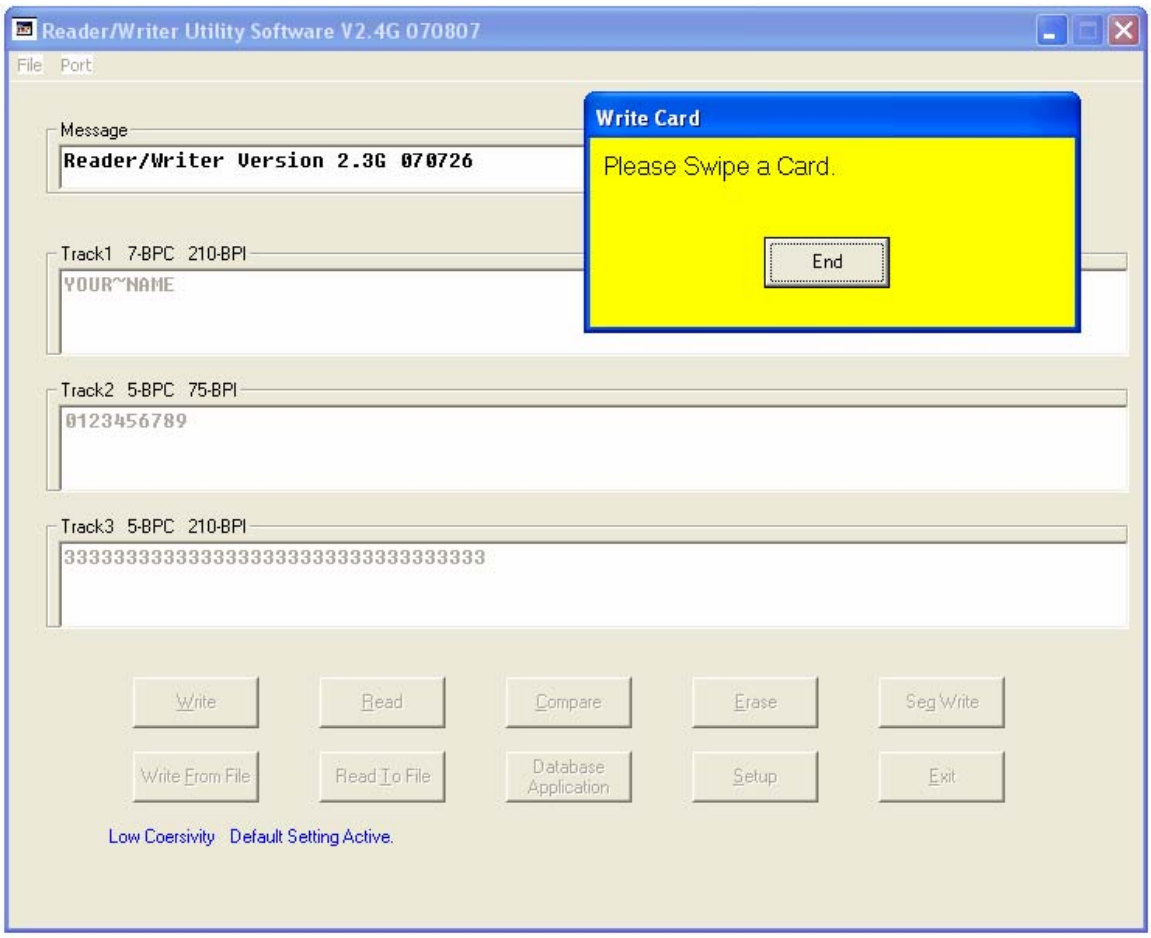
The initial Application Software Window is shown above with the firmware version shown in the Message text box. The latest version may not match the version in the screen above.

Writing on a Card (Quick Start)

The Application Software window has a separate text box for each magnetic stripe track: Track 1, Track 2, & Track 3. Above each box, a label shows the track number and the encoding format. Characters that are to be written on the magnetic stripe are entered into the text boxes. In this example, the card is written with the ISO standard format. The chart below shows the number of characters that can be written on each track of an ISO formatted card. Entering more characters than allowed for the track or entering alpha characters into a numeric characters only track causes an error.

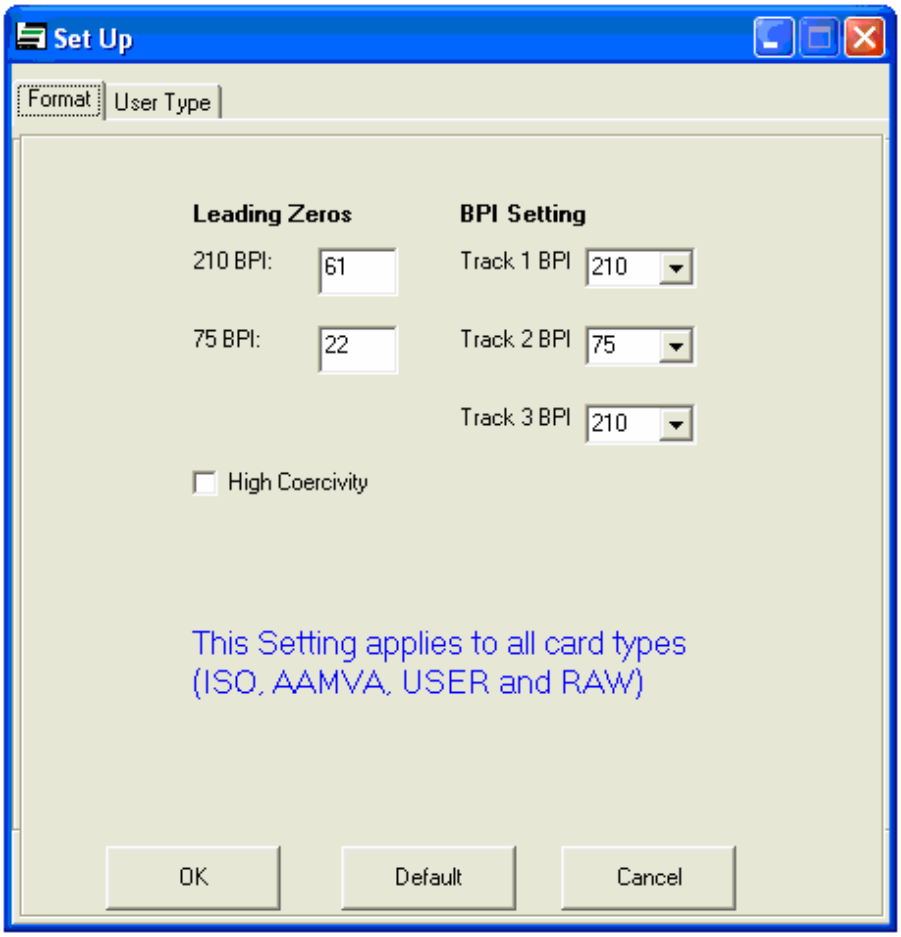
Track	Number of Characters & Type
1	76 Alphanumeric Characters
2	37 Numeric Characters
3	104 Numeric Characters

Enter some characters to be written on the card into the track text boxes. For example, enter your name in the Track 1 box, then tab down to the Track 2 box and enter the numbers 0 through 9, and finally, enter a string of number 3's in the Track 3 box. See the example window below.



The Application Software default setting is for Lo-Co magnetic stripe cards. For Hi-Co magnetic stripe cards, click the “Setup” button in the lower right corner of the Application Software window. Then click the High Coercivity check box. See the example with the Hi-Co box checked. Do not change any other selection. Click OK to return to the Application Software window.

There are two sample cards provided with the Reader/Writer. One is a Lo-Co type and the other is a Hi-Co type. Either one or the other can be used. The coercivity in the Setup window must be set to match the card type used.



Click the Write button. The “Write Card” window appears as shown on the previous page.

Caution: When the “Please Swipe a Card” window has a yellow background color and when a card is swiped through the slot, the Reader/Writer changes data on the magnetic stripe. When there is no data in a Track text box, then that specific track is not written and any data already on that track is not changed or erased.

Swipe a card at a moderate rate through the card slot. A moderate rate is equivalent to moving a card from the entrance to the exit in about 1/2 second.

When swiping a card, the magnetic stripe must be in contact with the magnetic heads. The heads are on the side with the logo labels. The card must be held so the stripe is down and facing toward the logo when swiped through the slot from right to left.

The card must be registered (held) to the reference surface at the bottom of the card slot. The card must be swiped through the slot without tipping or stopping and moved with one steady movement all the way through the slot. The operation is unidirectional; the operation is only in the forward direction starting from the card slot's tapered end. The Reader/Writer does not function with cards swiped in the reverse direction.

The Message text box at the top of the Application Software window shows "Write(1) OK!". If three cards were swiped, all three have the same written data and the Message text box shows "Write(3) OK!". End the card writing process by click the "End" button in the "Please Swipe a Card" window.

Note: The Reader/Writer has two magnetic heads; one is for writing and the other is for reading. The Reader/Writer performs a read after write operation when writing cards. When a card is swiped, the card passes over the write head first and then the read head. This read after write feature is how the Reader/Writer determines a Write OK or a Write Error condition.

Reading a Card (Quick Start)

When the Read button is clicked and a card is swiped through the card slot, the Reader/Writer reads all tracks. When reading a card, the coercivity of the magnetic stripe has no importance. The read operation is the same for all card coercivities.

To read the card just written, Click on the Read button and swipe the card. The Track text boxes fill with the data read from the card tracks. Empty card tracks have no data to be display and those text boxes are empty. Cards can be swiped and read with no limit. The Track box data is refreshed each time a card is swiped and there is no read error. To end the reading process, click the "End" button in the "Please Swipe a Card" window.

This concludes the Quick Start Section. The basic functions of loading the Application Software application, installing the Reader/Writer, card writing, and card reading have been demonstrated.

The next sections contain the full User Manual for the Application Software Utility. There is useful Magnetic Stripe information in the Appendix B.

Application Software Utility

The Reader/Writer and Application Software together provide the card reading & writing functions most often needed for magnetic stripe use. These functions & operations are available from a single Application Software window. Following is a summary of the Application Software functions:

Application Software Utility Functions

Write	Writes data to a card in the Card Type format
Read	Reads card data and displays the data in Track boxes
Compare	Compares multiple cards to a single reference card
Erase*	Erases the selected tracks of data on a card
Sequential Write	Writes both fixed and/or sequential data to a card
Write from File	Writes to each card the next record from a pre-formatted data file
Read to File	Reads a card & saves the card data as a record into a data file
Database Write	Writes cards from a database CSV file & Usage file
Card Type	Provides card format selection based on Setup menu or Standard
- ISO	Selects 7811 ISO Standard card format
- AAMVA	Selects AAMVA standard, based on ISO Standards
- USER	Selects the card format from settings in Setup USER tab
- RAW*	Reads & writes data and displays in a Hexadecimal format
Setup	Provides selections & settings of “USER” or “RAW” formats
- Leading Zero	Sets number of leading zeros before the Start Sentinel
- BPI Setting	Selects individual track data density (75 or 210 bits/inch)
- Set Coercivity†	Sets the writing coercivity to High or Low for all tracks
- Start Sentinel*	Selects the Start Sentinel character for the individual tracks
- End Sentinel*	Selects the End Sentinel character for the individual tracks
- Bits/Character	Selects the number of bits per character for individual tracks
- Parity*	Selects character parity bit logic for individual tracks
- Default	Resets the parameters & settings to the standard norms

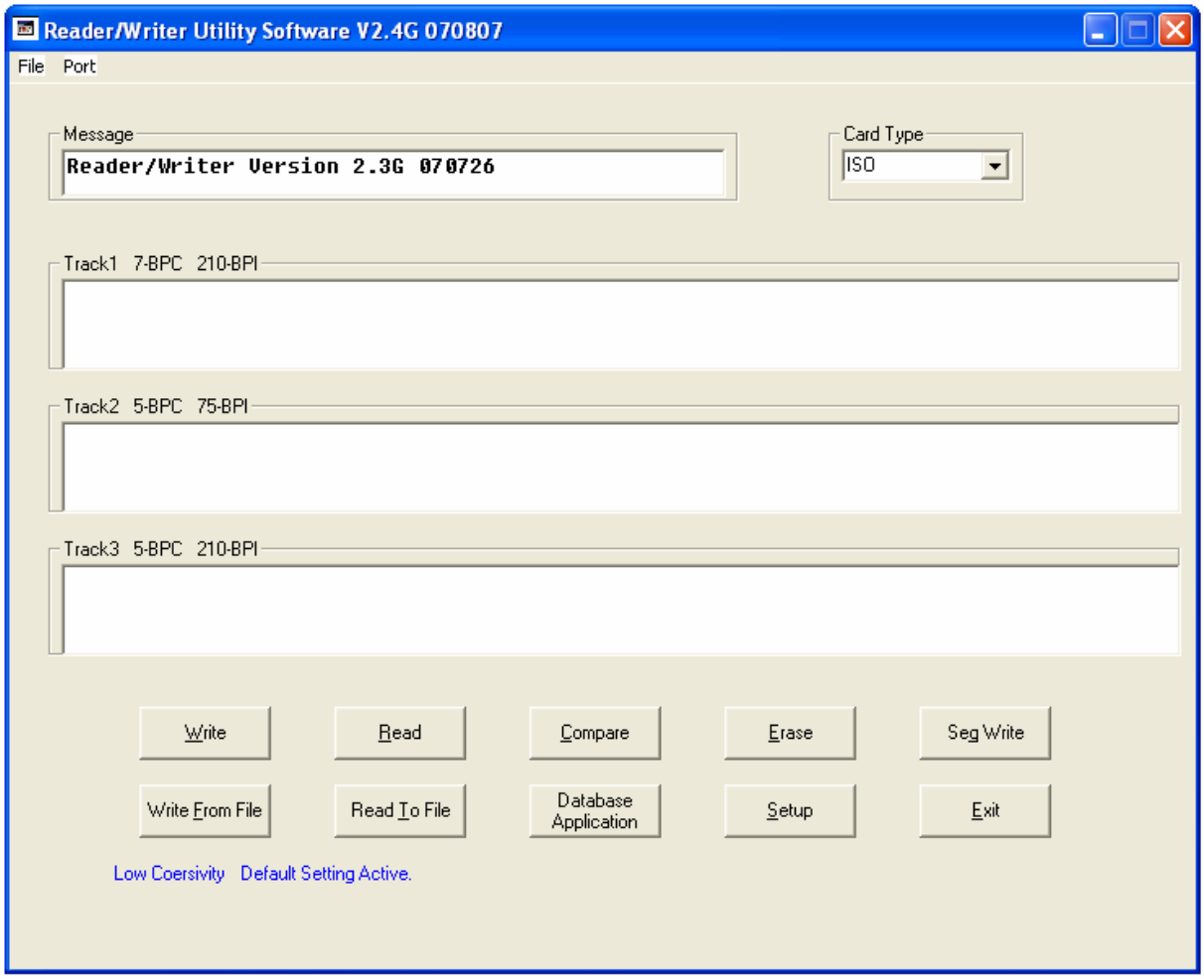
* *These functions are not supported when the “AMC protocol” is selected.*
† *Low Coercivity units cannot be set to Hi Coercivity operation*

This document assumes the user has basic knowledge of magnetic stripe track densities, data formats, character formats, and the like. Basic magnetic stripe information is given in Appendix B.

Application Software Window

The Application Software operates from this window. There are several areas (boxes) within the window. Above each box is a descriptive label. Starting from the top left, the Message box provides a “result” of the last operation. The information in the Message box shown below is the result of opening the connection to a Reader/Writer and it shows the firmware version number & date. The Card Type box on the right indicates the current selected data format for reading or writing a magnetic stripe. This is the only box with a pull-down menu. More information is provided in a following section. The next three boxes

are text boxes; there is one for each track. Either the text boxes provide a display of the data characters to be written to a stripe or the data read from a stripe, depending on the current function being performed. If there is no data in a text box, then that corresponding track is not active during the operation. There are ten function buttons along the bottom. Each of the functions is explained separately in the following sections.



Message Box

The Message Box always displays the result of the last action. Mostly, it indicates a successful read or a successful write operation after swiping a card through the slot. When the operation can be performed on more than one card, the result message provides a count of successful card operations.

Card Type

This provides a selection of reading and writing track formats. Track formats are the combination of the track density, bits per character, selection of Start & End Sentinels, and other parameters. The Card Type pull down menu has four selections: ISO, AAMVA, USER, & RAW. Each explained below. The settings for each type are available in the Setup window. See the Setup section & Appendix B for more information.

ISO - The ISO format follows the requirements given in ISO Standard 7811-6 and earlier versions. Density is in bits per inch. Bits per character include a parity bit. The number of Data Characters given does not include the Start Sentinel (SS), the End Sentinel (ES), or the Longitudinal Redundancy Character (LRC). The SS, ES, & LRC are automatically inserted into the data when writing to the card tracks.

Track	Density	Bits per Character	ISO Maximum number of Data Characters
1 IATA	210	7 bits per character	76 Alphanumeric
2 ABA	75	5 bits per character	37 Numeric
3 Thrift	210	5 bits per character	104 Numeric

AAMVA - The AAMVA format follows the same character formats as defined by the ISO Standards. The maximum number of Data Characters for Tracks 1 & 3 is different from the ISO format and Track 3 is alphanumeric, following the same format as Track 1. The number of Data Characters shown does not include SS, the ES, or the LRC characters.

Track	Density	Bits per Character	AAMVA maximum number of Data Characters
1 IATA	210	7 bits per character	79 Alphanumeric
2 ABA	75	5 bits per character	37 Numeric
3 Thrift	210	7 bits per character	79 Alphanumeric

User - The User format allows data to be written in a non-standard format. The data density and bits per character are defined in the Setup Window. The bits per character include a parity bit. See Setup section for additional information. The SS & ES characters, density, parity, and BPC are selectable in the Setup Window for the User Card type. Information written in this format may not be readable by ISO standard reading devices (MagStripe readers), as the User format chosen may not meet the ISO standards requirements.

RAW – This is not a true "Card Type". This is a data decoding & display format for the three tracks. The text boxes display data in "raw binary" using the hexadecimal number format. Data read from a card is decoded into binary starting with the first "binary one" bit (usually the first bit of a start sentinel). All the bits (in Hex) are displayed and including approximately fifteen trailing zero bits at the end of the track data. Writing to a card in this mode is not recommended except for special purposes. When writing in this mode the data density and the number of leading zeros is controlled by the selections in the Setup Window. Information written in this mode may not be readable by ISO standard reading devices (MagStripe readers), as the RAW format chosen may not meet the ISO standards requirements.

Setup

Setup is used to specify the track formatting used when reading or writing. Two fixed track parameters are the track locations and the data encoding method. Track locations are track 1 at the top side near the card edge, then track 2 and track 3 toward the middle. The data encoding method is F/2F. These cannot be changed. The track longitudinal redundancy check (LRC) character is automatically calculated by the Application Software and added to the end of track data. Listed below are format parameters that can be changed:

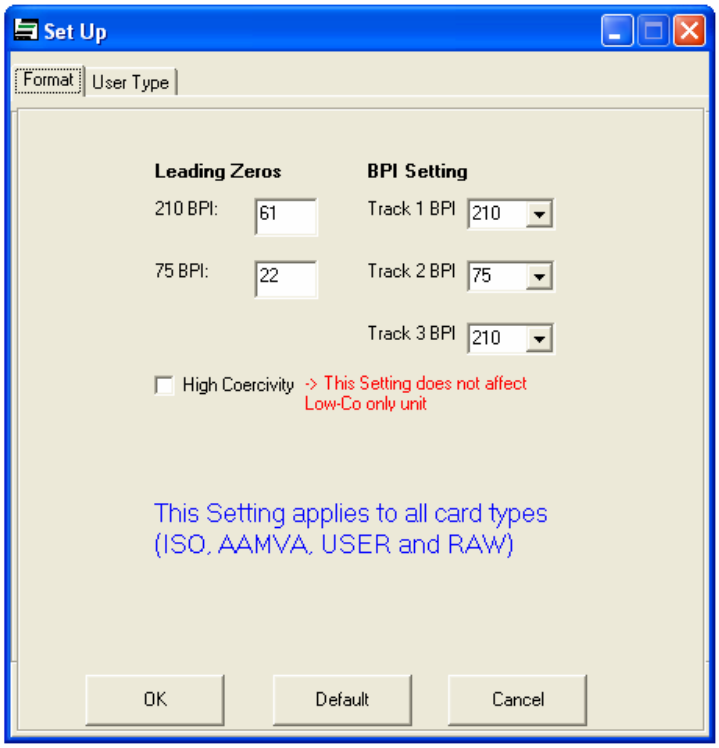
Reader/Writer format selections include:

- The Data density can be selected as either 75 or 210 bits per inch.
- The Start Sentinel (SS) location from the card edge is selected.
- The limited selection of SS characters for each track.
- The limited selection of End Sentinels (ES) characters for each track.
- The number of bits per character can be selected from 4 BPC to 7 BPC
- The character parity bit logic selection

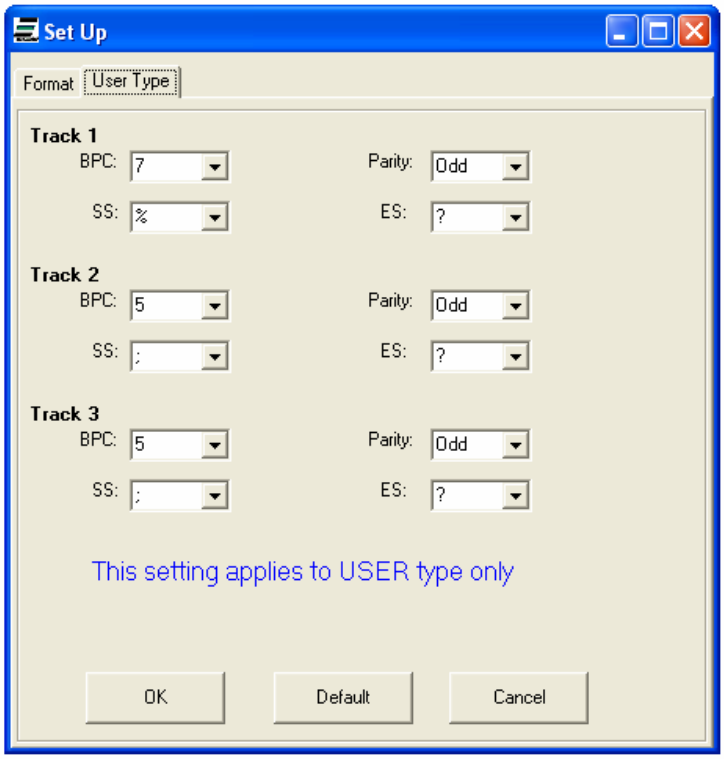
In addition to the formatting selections, selection of writing Lo-Co or Hi-Co type cards is provided. Click the Setup button for the Setup window. Two folder tabs are available.

There are "default" buttons in each tab window; these default buttons force the format settings in the window to be reset to the standardized ISO settings. See Appendix B for additional technical information.

Note: Always use the Default Setup settings unless there is a known, specific, and understood reason for not using the default settings.



Format Tab View



User Tab View

The Format tab view provides settings for card types: ISO, AAMVA, USER, & RAW.

Data Density: The data is encoded on the magnetic stripe as a string of binary bits. The physical length of each bit on the stripe is the data density specified in Bits per Inch (BPI). There are two data densities for magnetic stripe cards: 210 BPI or 75 BPI.

Leading Zeros: This is the number of zero value binary bits preceding the Start Sentinel (SS). These zeros are used for synchronizing the reading circuits and bit-decoding algorithm. These zeros are required. The number of zeros required is based on the data density and the ISO required distance of the SS from the edge of the card.

High Coercivity: This is a check box in the Format window. The Reader/Writer writes on HI-Co or Lo-Co magnetic stripes. This box selects the coercivity the Reader/Writer is to use. The default is Lo-Co. If the card coercivity is not known, use Lo-Co first and if there is a consistent write error, then switch to the Hi-Co setting. A Lo-Co Only Reader/Writer Unit cannot be set into Hi-Co operation.

The User Type tab view provides settings that apply only to the card type USER.

Start Sentinel Characters: This character marks the beginning of the track data field. This character is preceded by leading zero bits.

End Sentinel Characters: This character marks the end of the track data field. There is a Longitudinal Redundancy Check character (LRC) following the end sentinel. The LRC is used for error checking the data bits. The LRC is calculated by the Application Software and added automatically when writing to a card. There are trailing zeros following the LRC.

Bits per Character: The bits per character can be selected from 4 BPC to 7 BPC. The standards are 5 BPC for numeric characters including the parity bit or 7 BPC for alphanumeric characters including the parity bit. See Appendix B for the character tables.

Parity: The character parity bit logic can be selected. The default and standard selection for 5 and 7 bit characters is “Odd” parity. The parity bit for each character is added by the Application Software as the character is written on the card. For 4 or 6 BPC characters, parity must be “None”.

Write

This function writes data to the magnetic stripe when the card is swiped through the slot. The Application Software writes the data in the track text boxes together with standard or user defined SS, ES, and LRC each time a card is swiped through the slot. A prompt window opens to inform the user to swipe a card for writing. The Message box at the top of the Application Software window shows the result for each card swipe, either the card was written OK or an ERROR was the result. The Message box also gives the count of the cards that have been swiped and written with no errors. For sequentially changing numbers, see Sequential Write below. To finish the Write process, click on the End button to close the prompt window.

Caution: When a magnetic stripe track is written, the original data on the track, if any, is replace by the new data. An individual track can be changed without effecting data on the other tracks. However, if the Track text box is empty, the Application Software does not erase the original data, if any, in that track.

Read

This function reads data from the magnetic stripe on a card , including SS & ES, when it is swiped through the slot. The read data is shown in the track text boxes. There is a prompt window opened to inform the user to swipe a card for reading. The Message box shows the result for each card swipe, either the card was read OK or there was a reading ERROR. The count of the number of cards read is shown. There is no limit on card swipes; each card is read and the card data shown. To finish the Read process, click on the End button to close the prompt window.

Compare

This function compares card data from one card with data read from other cards. The initial data is read from a card and saved in the track text boxes. Comparisons of data read from subsequent cards are made with the initial data saved in the text boxes. A comparison is made each time a card is swiped. This function is useful for checking cards to a standard card. When the Compare button is clicked, the user is prompted to swipe the card having the initial comparison data. After the initial data is read, the prompt changes and the user is prompted to swipe cards; these cards are read and their data compared with the first, initial card data. The result of each comparison is shown in the Message box. To finish the Compare process, click on the End button to close the prompt window.

Erase

This function can be used to erase data on the card tracks. The Reader/Writer must be set for the correct operating coercivity of the card(s) to be erased. See the Setup section for information on selecting the writing coercivity. Individual tracks can be selected from the pop up track selection window. Select the track boxes to be erased; close the window. Another prompt window appears to prompt a card swipe. Only the selected tracks are erased. The non-erased tracks retain their data. The message box shows the results. After erasing, the Application Software prompts a swipe of another card for erasing. To finish the Erase process, click on the End button to close the prompt window.

Warning: If the Reader/Writer is set for Hi-Co operation and a Lo-Co card is swiped, all data on the Lo-Co stripe may be erased.

Sequential Write

This function allows creation of a special sequential number “field” in the Track text boxes. The sequential field can be one or more number characters. The sequential number field can be the only characters written in the track or the sequential number can share the track with other “fixed” data (numbers and/or alpha characters) in the track. Any fixed data in the Track text boxes can be entered before or after the sequential number field is entered. Typically, the fixed data is entered first and then the sequential number field is added to the fixed data. The same sequential number can be in one track or the same number can be in all three tracks. Only one sequential number field is allowed per track. The sequential number field(s) must allow the minimum number of sequential digit spaces as needed for the number of digits to be sequenced. As an example, the number 150 must have a sequential number field of three characters minimum or more. The number of digits in the sequential number fields can be different for each track. The sequential number field operates with numbers only.

Click the “Seq. Write” Button. Establish the sequential number field by positioning the curser at the sequential number field starting location and click. The sequential field can start at any location within the data, if any. The Application Software prompts the user to enter the sequential field digit indicators (x) by typing any printable character on the keyboard. The Application Software inserts the “x” characters, which represent each numerical digit in the sequential field. This process can be used on one track or can be repeated for each track. When the field selection is completed, close the prompt box and another prompt box is opened for selection of the starting (initial) value of the sequential number and selection of the number of cards to be written. Insert the values and click OK. The initial starting value is automatically inserted into the sequential field; the balance of the field is filled with the zero digits. The Application Software prompts the user to swipe and write the first card. After each swipe, the Application Software displays the result. If write operation is successful, the Application Software increments the sequential number and prompts for writing the next card. If there is a failure, the Application Software gives a warning and prompts for writing the same number. Other data in the track fields (if any) is not altered. When the “Number of cards to be written” value is reached, the Sequential Write process is ended. Close the Sequential Write Complete window.

Read & Writing File Operations

The Read & Write File operations provide a means to read cards, saving the read track data to a file and using the same file to write the same information to a new set of cards. The cards read are a data source for the opened file. One card or a sequence of cards can be read. Each card read creates a separate record within the file. The records are added to the file in the sequence they are read. The number of records added to the file equals the number of successfully read cards. When writing from the file, each card is written with the data from one of the records starting from the first data record and written in the same order as cards were read.

The Reading & Writing File Operation files are kept in the default file folder “To From Files”, which is a sub-folder in the Program Files folder. The To From Files can be moved and accessed from other folders. The files have a file extension that matches the “Card Type” used to create the original file. Card Type is defined in the upper right hand menu box on the software main window. The card type cannot be mixed; the card type must be consistent within a file.

Read To File

Selecting this function generates a Windows Explorer window to open an existing data file or create a new data file. If an existing file is selected, the previous data is maintained and the new card data is appended as cards are swiped. After a file selection is made, a second window opens to prompt the swipe of a card. The reading result is shown in the Message box for each swipe. If there is a read error, the card data is not saved; swipe the card again to enter the card data into the file.

Write From File

This functions Writes data from a named file to a card. The card data is in a file records created by the “Read To File” operation as described above. The Write To File function prompts the user to open an existing data file. When a file is selected, the user is prompted to swipe a card (or sequence of cards); each card is written with the next data record from the file. The Message box shows the writing result for each card. If there is a write error, the current data record is used until the record is successfully written to a card. Cards are written until the last record is used. When the last data record is written, a prompt informs the user the writing process is finished.

Database Application

The Application Software does not provide direct access to industry standard data base applications. The word “database” is used here for the convenience of describing the the Application Software function & operation, which emulates a database process. The Application Software Database Application provides a method for writing on cards using data from two files. The two files are the Database file, which is a *csv* type file and the Usage file, which is a *txt* type file. The csv file can be an extracted or exported file from a standard database application.

Both files are used together and are required for the Database Application card writing process. Both files must have the same *filename* and both files must be located in the same file folder.

The Database file shown in the example is an Excel *csv* file type. The file was created using Excel; the Excel file was saved as a .csv type. Any application program that can be used to create the rows and columns of information to be written to cards can be used to produce the Application Software Database file. The final database file must be saved as a *csv* type file for the Application Software database operations.

The Usage file in this example was created using Notepad. The Usage file has two functions: it may contain the Card Type and card Setup format rules "[SETTING]"; it must contain a data definition "[DATA]". The Card Type and card format SETTING parameters are the same Card Types as in the Application Software window and the same formatting parameters found in the Application Software Setup tabs. The SETTING rules, if used, are used for all cards written. In the example shown, no SETTING rules are specified; they are ignored by the Application Software database function because of the double forward slashes placed at the beginning of each line in the SETTING section. If no SETTING rules are specified, the Application Software database function uses the default ISO 7811 formatting norms.

The information (data) written to a card can has two sources. There is a fixed data source and a variable data source. The DATA definition in the Usage file specifies the fixed card data information and specifies the source of the variable card data information. The Usage file DATA definition has three rows. Each row specifies the data to be written on one track; the first row specifies the data for track one, the second row for track two and the third row for track three. Each card is written as specified by the DATA definition; each card written can have unique data written on the tracks because the variable data is being sourced from the database file.

The Data Usage file Fixed data is defined and directly used from the Usage file as character fields written to a card; the fields cannot contain characters not allowed for the defined track format. In other words, tracks written with five bits per character can use only Appendix B, Table 2 characters; likewise, tracks written with seven bits per character can use the character set in Appendix B, Table 1.

Variable data written to the cards is specified by two characters that define the Data Columns in the Database file. The two characters have a fixed format. The first character is a lower case "f" followed by a second "Column" letter (a through z). The variable names correspond to the column letter in an Excel *csv* file. The Data Column variable data and the Usage file fixed track data can be mixed in the Usage file DATA definition.

An example database is provided with the Application Software Utility files. That example is used here to show the format. The example does not define the SETTING rules; the rules are shown and are ignored by the Application Software Database Application (any line in the User file that starts with two forward slash characters // is ignored). When no SETTING rules are defined, ISO Standard parameters are the default. The DATA definition specifies the data to write on the three tracks. When there is no data specified for a track, the track is not written. The *csv* file has 10 rows; therefore, ten cards can be written. Each card is written with variable data from one of the ten rows, starting with row one.

The data written on the first card is shown. The number in brackets { } indicates the card track number:

{1} SLAM-DUNK~SPORTS~EVENT=DAVID=12340999
{2} 12340=999=250205
{3} (*nothing is written on track three*)

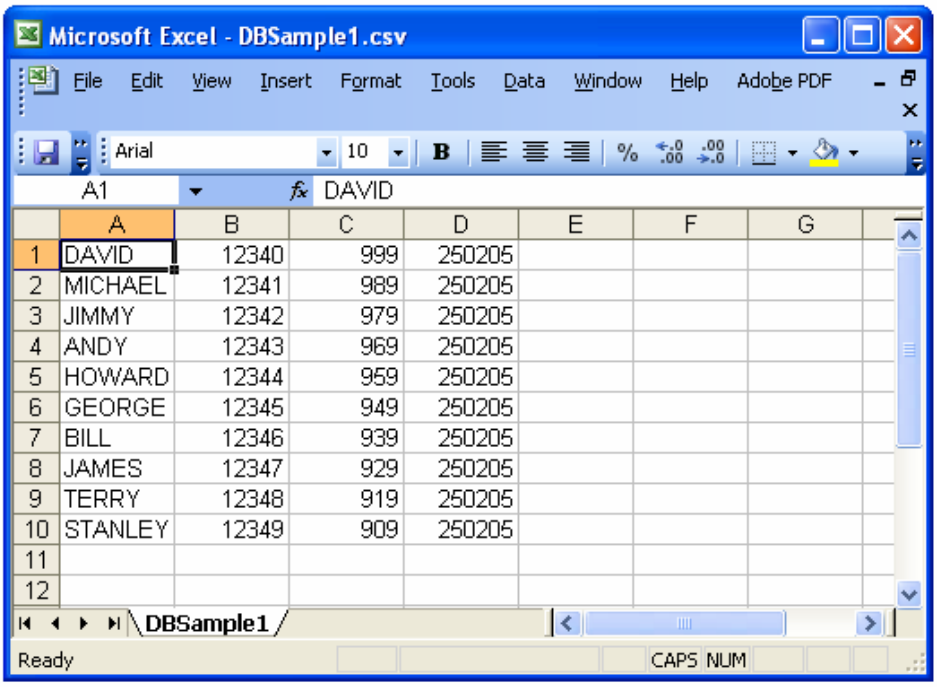
Using only track 1 as the example, the “SLAM-DUNK SPORTING EVENT=” is a fixed card data field; “DAVID” is a variable field from the database file as defined by “fa” (meaning “field a”); the next “=” is a fixed field; and “12340999” is two variable fields from the database file as defined by “fbfc”. The next card written has the same fixed field data and new variable field data based on row two in the csv file. Defined in row two is the name “MICHAEL” and the card number & validation number is “12341989”. The data in track 2 is a variable and remains the same for all cards because it is defined as the same in the database file. See the example here for the second card written:

{1} SLAM-DUNK~SPORTS~EVENT=MICHAEL=12341989
{2} 12341=989=250205
{3} (*nothing is written on track three*)

The database Usage file is shown on the following page. This file can be copied from the CD and then modified for other database applications. This file is also located on the hard drive in the Reader Writer software folder.

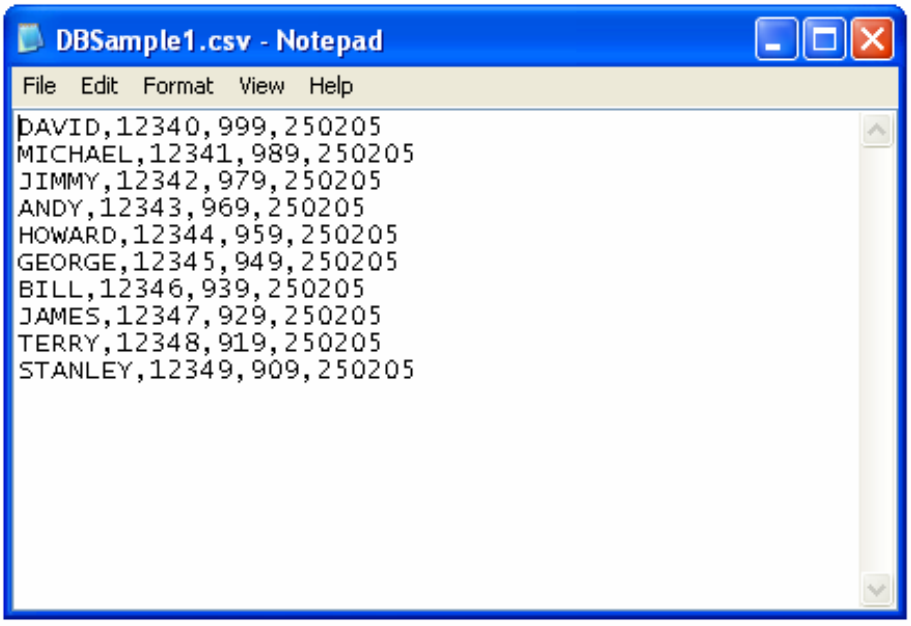
```
//////////////////////////////////////////////////////////////////
// Sample database Usage file
// The "//" at the beginning of a line specifies the line is a comment and line content
// is NOT used for database functions or operations.

[SETTING]
// This is the SETTING section.  In this example, all the lines begin with "//", so the
// content here is for your reference & NOT used by the database.  When no settings
// are specified the CARDTYPE default is, in all cases, the ISO format.  Remove the "//"
// from the lines & change values only when a non-ISO format is wanted.

// Used only one of these lines to select a non-ISO format.
//CARDTYPE=USER
//CARDTYPE=AAMVA

// In the next 3 lines the ISO default BPI is shown.  Change settings only if needed.
// The tracks can have any mix of 75 or 210 value.  Only "75" or "210" is a permitted value.
//BPI1=210
//BPI2=75
//BPI3=210

// Use the following settings ONLY when "CARDTYPE=USER" is selected.  Adjust the
// parameters to specific values for the application.  The ISO CARDTYPE format setting
// is shown as the example.  Only a specific, limited set of values are permitted.  Check
// the Application Software "Setup" window & "USER" folder for the permitted values.
//BPC1=7
//BPC2=5
//BPC3=5
//PARITY1=ODD
//PARITY2=ODD
//PARITY3=ODD
//SS1=%
//SS2=;
//SS3=;
//ES1=?
//ES2=?
//ES3=?

// The DATA section defines the fields that apply to each track.

[DATA]
Trk1:SLAM-DUNK SPORTS EVENT=fa=fbfc
Trk2:fb=fc=fd
Trk3:

//end
```

The Excel *csv* Sample file has the following variable data fields:



	A	B	C	D
1	DAVID	12340	999	250205
2	MICHAEL	12341	989	250205
3	JIMMY	12342	979	250205
4	ANDY	12343	969	250205
5	HOWARD	12344	959	250205
6	GEORGE	12345	949	250205
7	BILL	12346	939	250205
8	JAMES	12347	929	250205
9	TERRY	12348	919	250205
10	STANLEY	12349	909	250205
11				
12				

This same file can be opened from Notepad, as shown below:



The filename extension, .csv, means a comma separated values file. As seen in Notepad above (and like in the Excel example), each row is one record of variable information written on one card. Commas separate each row into columns. Each row must have the same number of columns. Most text editors can create, view, or edit a CSV file.

Reader/Writer Technical Reference

Introduction

This section of the User Guide pertains to Reader/Writer technical information.

Description

The Reader/Writer reads and writes magnetic stripe cards when the cards are swiped through a card slot. The housing encloses the read head and the write head. Both are mounted to a rail assembly. The rail assembly contains the card vertically and has a reference surface, which aligns the magnetic stripe with the heads for track locations. The heads are precision mounted to meet the ISO Standards requirements.

Adjacent to the write head is an optical encoder, which provides timing signals for writing to cards at data densities of 210 and 75 Bits per Inch (BPI). The encoder has a rubber roller that is moved by the card when the card moves past the write head.

The metal housing has an operation LED. The LED is a single lens, capable of generating three colors red, orange, and green. See the operation section for the description of operations associated with the color.

The card slot has a write head and a read head. The space between the two heads allows for writing data to the magnetic stripe and then reading the data in a single card swipe. This is an advantage for checking the integrity of the data being written.

Terms & Related documents

AAMVA	American Association or Motor Vehicle Administrators
Lo-Co card	low coercivity magnetic stripe card.
Hi-Co card	high coercivity magnetic stripe card
ASCII	American Standard Characters for Information Exchange
BPI	Bits Per Inch
BAUD	Roughly the RS232 communication in bits per second
Coercivity	The resistance of a magnetic field to change, in Oersted
CDL	California Drivers License format
Reader/Writer	Trademark name for the MagStripe Reading & Writing product
Host	The Personal Computer to which the Reader/Writer is attached
IPS	Inches Per Second
ISO	International Standards Organization
Hex	Hexadecimal, base 16 numbering system
LED	Light Emitting Diode
LRC	Longitudinal Redundancy Check a form of error check character
MSR	Magnetic Stripe Reader
PC	Personal Computer (see Host)
PCA	An assembled Circuit Board
RS232	Reference Standard for serial asynchronous communication
Slot	The card path opening for passing a card through an Reader/Writer
Swipe	The operation of moving a card through the Reader/Writer slot
USB	Universal Serial Bus—a high speed connection to the host

AAMVA	*Best Practices Guidelines for the Use of Magnetic Stripes*
ISO 7810:1995	Identification Cards - Physical characteristics
ISO/IEC 7811-2:1995	Identification Cards - Part 2: Magnetic stripe
ISO/IEC 7811-3:1995	Identification Cards - Part 3: Embossed characters, ID-1 cards
ISO/IEC 7811-4:1995	Identification Cards - Part 4: Location of read-only Tracks 1&2
ISO/IEC 7811-5:1995	Identification Cards - Part 5: Location of read-write Track 3
ISO/IEC 7811-6:1996	Identification Cards - Part 6: Magnetic stripe - High coercivity

Specifications

Environmental

This product is to be used in an indoor environment.

Operating temperature:	0ºC to 50ºC, 5 to 95% relative humidity, non-Condensing
Shipping:	-40ºC to 70ºC, 5 to 95% relative humidity, non-Condensing
Storage:	-10ºC to 60ºC, 5 to 95% relative humidity, non-Condensing

Electrical

Supply Voltage:	+24VDC ±10%
Power Consummation:	< 2 Amps, Triple track reading & writing High Coercivity
Power Adaptor:	External switched power 24V/2.5 Amp regulated, 2.1mm power jack, center Positive.
Interface & Cable	*RS232C:* 6.0' cable, DB-9 female connector with a 2.1 mm power jack in the DB-9 housing. *USB:* 6.0' cable, Serial A Plug with a 2.1 mm power jack in a pigtail extension to the cable.

Mechanical

Dimensions (H X W X L):	2.64" X 2.52" X 8.03" (6.7cm X 6.4cm X 20.4cm)
General Construction:	Die cast metal housing (Zamac) or molded plastic
Media thickness:	0.007" to 0.045 or (0.020 to 0.065" special order)
Media length:	3.38" maximum for reading after writing operation
Cable Color:	Beige or Black

Performance

Supports Formats	ISO -7811 & AAMVA
Media Densities	75 bpi, 210 bpi
Media Coercivity	250 to 4200 Oersted
Media Speed	Read 5 - 55 IPS Write 5 - 35 IPS
Write (encoding)	Meets or exceeds ISO 7811 requirement for new cards.
Reading	Low Amplitude: >30 % @210 bpi, >40% @75 bpi

Durability

MTBF:	160,000 POH for a fully configured unit
Card Swipes:	1,000,000 swipes (with proper maintenance)

Agency Approvals

FCC Class A, CE Class A

Interface

The communication parameters (port settings) are fixed for both USB & RS232 operation.

The parameters are:

Baud rate: 9600
Data bits: 8
Parity: None
Stop bit: 1

RS-232:

A 6.0' cable with DB-9 female connector with a 2.1 mm, center-positive power Jack molded into the DB-9 housing. The following is signal pin-out of the connector:

DB-9F (RS-232) connector		
PIN	Signal	Direction
1	Not Used	
2	TXD	Out
3	RXD	In
4	Not Used	
5	Signal Ground	
6	Not used	
7	CTS	In
8	RTS	Out
9	Not used	
CASE	Chassis ground	Connected to the die cast cover
POWER JACK		
Center pin	+24VDC	In
Ring	Signal Ground	

Table 1 RS-232 cable Pin-Outs

USB-RS232:

The USB interface uses PC compatible communication drivers, which emulate an RS232 COM port operation through a USB serial connection. This approach allows the application to use the more available USB connections through a virtual COM port.

A 6.0' cable with a Serial A Plug and a 2.1 mm, center-positive power Jack molded into a pigtail of the cable. The following is the signal pin-out of the connector:

USB connector		
PIN	Signal	Direction
1	USB +5V	In
2	-Data	In/out
3	+Data	In/out
4	Ground	--
CASE	Chassis ground	Connected to cover
POWER JACK		
Center pin	+24VDC	In
Ring	Signal Ground[1]	--

Table 2 USB cable

1 - The power jack ground is connected to the USB connector ground.

Maintenance

The Reader/Writer requires cleaning of the card slot on a regular interval. The interval is approximate and should be after every 50,000 card swipes. Regular cleaning insures oils and debris do not accumulate on the operating components.

Over time, operation can cause a film to collect on the heads and other surfaces. This film should be removed using “cleaning cards”. These are available from magnetic stripe cleaning card sources. Cleaning cards are about the same size as an ID1 (credit card) and have an absorbent surface on one or both sides. The absorbent surface has an alcohol solvent that should remove any film. The absorbent surface should be damp; the surface should not be saturated.

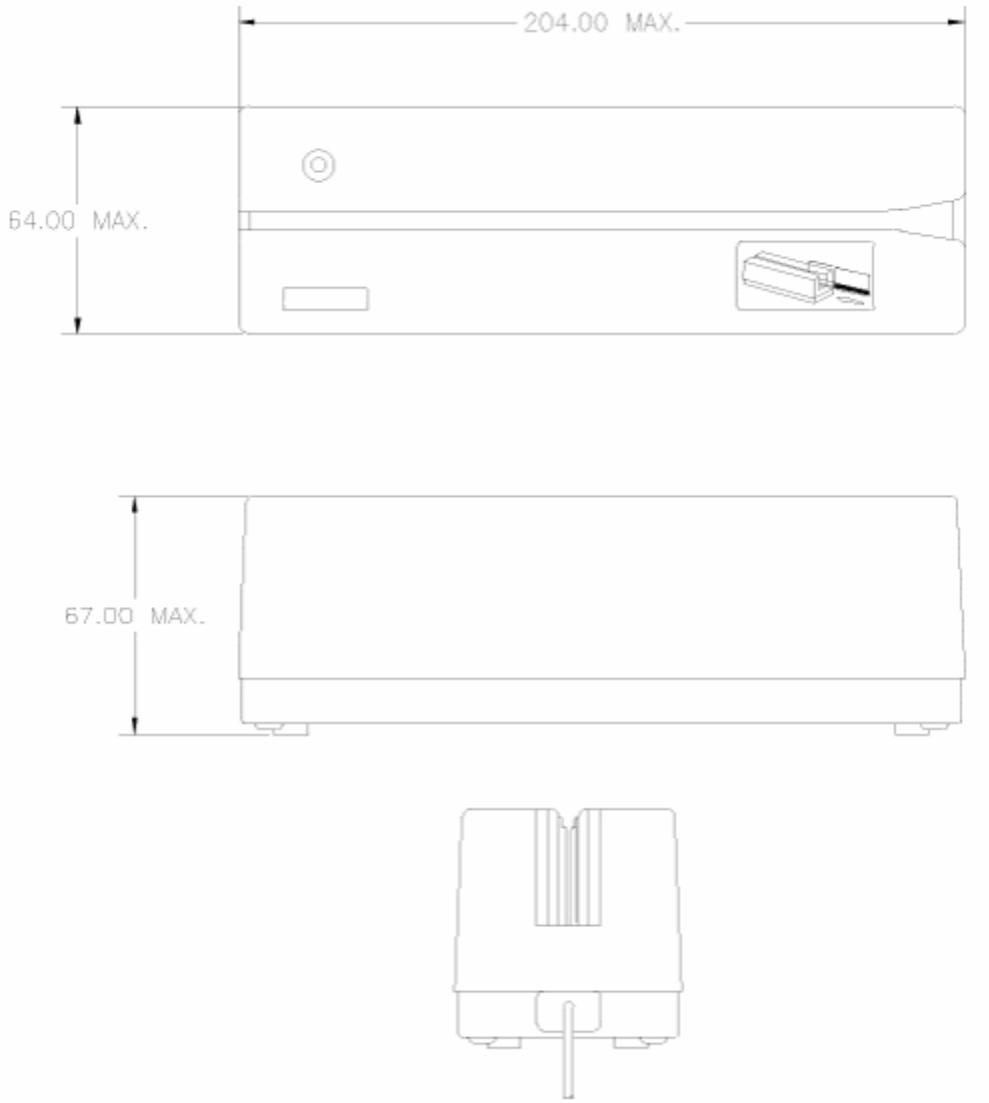
Swipe the card five to ten times with the solvent side of the card toward the read and write heads and then again five to ten times with the solvent side opposite the heads.

The cleaning cards may not remove all the debris. In the case of debris such as dust and card particles in the slot, use an aerosol can product containing clean compressed air. The clean air can be used to blow debris from the slot. Direct the stream of air at a low angle into the slot and run the nozzle along the slot. Direct the air in the direction of the card travel and then in the opposite direction. Inspect the slot by looking down its length with a good backlight to see if all debris is removed.

The metal housing can be cleaned with a mild detergent applied to a soft cloth that is rung almost dry. Detergent should not be allowed to enter the card slot.

Warning: There are no serviceable components inside the Reader/Writer. Opening the Reader/Writer voids the warranty. Tampering with the write head or tachometer assemblies may change the Reader/Writer calibration for ISO standards operation.

Appendix A Outline drawings



Appendix B: Card Formats

ISO

Table 1 – ISO Card Format							
Track	Density (bpi)	Bits/ Char *	Total Characters **	Character Set	Start Sentinel	End Sentinel	Field Separator
1	210	7	79	Alphanumeric	%	?	^
2	75	5	40	Numeric only	;	?	=
3	210	5	107	Numeric only	;	?	=

* Includes ODD parity bit
** Includes Start Sentinel, End Sentinel, and LRC characters

Track 1 allowed characters

Table 1 – Alphanumeric Character Set

				b_6	0	0	1	1
				b_5	0	1	0	1
b_4	b_3	b_2	b_1	COL / ROW	0	1	2	3
0	0	0	0	0	SP	0	@ (1)	P
0	0	0	1	1	! (1)	1	A	Q
0	0	1	0	2	“ (1)	2	B	R
0	0	1	1	3	# (2)	3	C	S
0	1	0	0	4	$	4	D	T
0	1	0	1	5	% (3)	5	E	U
0	1	1	0	6	& (1)	6	F	V
0	1	1	1	7	/ (1)	7	G	W
1	0	0	0	8	(	8	H	X
1	0	0	1	9	)	9	I	Y
1	0	1	0	10	* (1)	: (1)	J	Z
1	0	1	1	11	+ (1)	; (1)	K	[(4)
1	1	0	0	12	, (1)	< (1)	L	\ (4)
1	1	0	1	13	-	= (1)	M	] (4)
1	1	1	0	14	.	> (1)	N	^ (3)
1	1	1	1	15	/	? (3)	O	DEL (1)

(1) These characters are for hardware control purposes only.
(2) This character is reserved for optional additional graphic symbols.
(3) These characters have the following meanings: Position 0/5 % Represents “start sentinel”
1/15 ? Represents “end sentinel”
3/14 ^ Represents “field separator”
(4) These characters are reserved for additional national characters when required. They are not to be used internationally.

Track 2 and 3 allowed characters

Table 2 – Numeric Character Set

Bits						
P	b_4	b_3	b_2	b_1	Row	Character
1	0	0	0	0	0	0
0	0	0	0	1	1	1
0	0	0	1	0	2	2
1	0	0	1	1	3	3
0	0	1	0	0	4	4
1	0	1	0	1	5	5
1	0	1	1	0	6	6
0	0	1	1	1	7	7
0	1	0	0	0	8	8
1	1	0	0	1	9	9
1	1	0	1	0	10	: (1)
0	1	0	1	1	11	; (2)
1	1	1	0	0	12	< (1)
0	1	1	0	1	13	= (3)
0	1	1	1	0	14	> (1)
1	1	1	1	1	15	? (4)

(1) These characters are for hardware control purposes only.
(2) Start sentinel
(3) Field separator
(4) End sentinel

AAMVA

Table 2 – AAMVA Card Format							
Track	Density (bpi)	Bits/ Char*	Total Characters **	Character Set	Start Sentinel	End Sentinel	Field Separator
1	210	7	82	Alphanumeric	%	?	^
2	75	5	40	Numeric only	;	?	=
3	210	7	82	Alphanumeric	%	?	^

* Includes ODD parity bit
** Includes Start Sentinel, End Sentinel, and LRC characters