MSR210

Magnetic Stripe Card Reader

Keyboard Interface

Programmer's Manual

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AGENCY APPROVED

This Equipment, MSR210, had been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the 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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Operation of this equipment in a residential area is also likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This MSR210 also had been tested and found to comply with the agency requirements of specification for CE mark Class A and UL, cUL.

WARNING

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

WARRANTY

This product is served under one-year warranty of defects in material and functionality to the original purchasers. Within the warranty period, if the product found to be defective will be repaired or replaced. This warranty applies to the products only under the normal use of the original purchasers, and in no circumstances covers incidental or consequential damages through consumers' misuse or modification of the product.

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PREFACE

This manual provides detailed information relating to the overall operational, electrical, mechanical, environmental and functional aspects of the MSR210. This document should be read and understood prior to initial operation of the product.

For ease of installation and programming use, we have addressed everything from its attractive features to its various configurations.

If further questions do arise, please call for technical support, our FAE will assist you in any way we can.

Table of Contents

Section 1   General Description

This section presents general information about the basic characters of the MSR210.

➢ Features

The MSR210 provides the following features:

1	LED and Buzzer indicators indicate the status of reader.
2	Single, dual, or triple track versions allow to reading ISO, AAMVA and DMV cards.
3	Setting directly by keyboard.
4	Friendly setting.
5	PC could be powered on with connecting MSR210 without keyboard connecting.
6	Programmable data output.
7	Firmware downloadable.

➢ Application

This Magnetic Stripe Reader, MSR210 is designed to read high or low coercive magnetic cards. It can simultaneously decode/verify up to 3 tracks of data. This product communicates with a host computer using keyboard interface. The reader can read magnetic data form, any available track encoded per ISO 7810, 7811, AAMVA, DMV. The host can request the read data from the reader with setting sequences. For details of sequences, refer to Section 4.

➢ Function

Self Test

Whenever the reader experiences a reset cycle, a self-test on the resources is performed.

Table 1-1. Self Test

Indication		Cause
LED	Buzzer	
Green	1 Beep	Test Success
Red		EEPROM Failed
Orange		Internal ROM Failed
Green	2 Beep	Default configuration working

Default Interface Configuration Working

1. Power off the reader.

2. Switch S1_1 on and power on the reader.

3. The reader will beep twice and the green LED will turn on.

4. The reader will work under default setting condition as below: a. transmitting speed is 80 char/sec, and b. keyboard country is U.S. As soon as turn off the switch S1_1 and power reset, the reader will work as user's previous settings.

Transmitting Data Block of Tracks

Each track could be divided into 1~3 blocks for transmission and each block can be set as different card types and character numbers. If the set data is different from the data after swiping, the reader will transmit completed data without limitation. The sequences for setting blocks are shown in Section 4.

➢ **Part Number Description**

The brief configuration of MSR210 part number are shown as below:

MSR210-12 Dual track 1&2

MSR210 -23 Dual track 2&3

MSR210 -33 Triple track 1&2&3

Note: Optional configuration is available.

Section 2   Configurations

This section shows the dimensions and setup for the MSR210.

➢ Dimensions of MSR210

Figure 2-1 Dimensions of MSR210
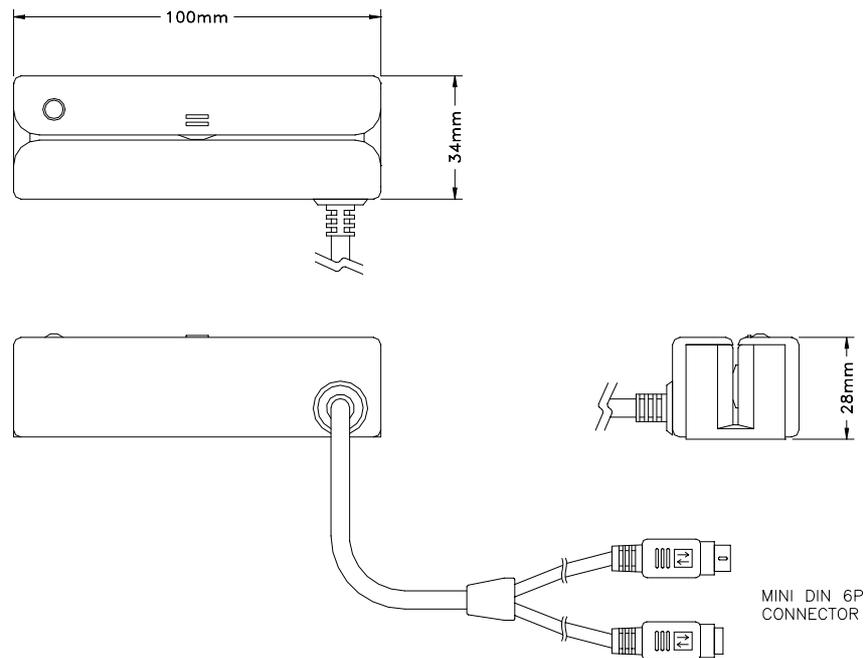
➢ Installation

1. The reader is installed between the computer and the keyboard with Y signal cable.

2. The Y signal cable is plugged into the keyboard using the **socket (female)** on one end of the cable and plugged into keyboard port using the **plug (male)** on the other end of the cable.

3. Power on your PC system if it was off originally.

Figure 2-2 Installing MSR210
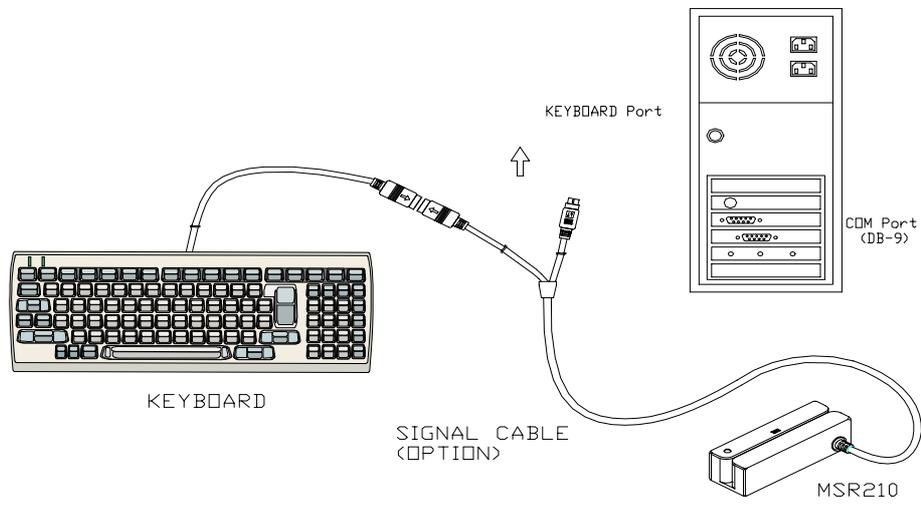
Section 3   Technical Specifications

➢ Card Specifications

Card Type

ISO 7810, 7811

DMV

AAMVA

Read high or low coercive magnetic stripes (300 -4000oe)

Thickness

0.76 mm ±0.08 mm

Card Format

Track 1 & 3:   210 bpi

Track 2:   75/210 bpi

Card Operation Speed

Table 3-1. Card Operation Speed

Test Card	Speed (IPS)
ISO standard card	5~55
* Jitter	5~50
** Low Amplitude	5~50

*Note: *Jitter card: Reliable reading of magnetic stripes encoded with bit cell length variations within ±15% as defined in ISO 7811.*

*** Low amplitude: Reliable reading of magnetic stripes encoded at 60% or more of the encoding amplitude as defined in ISO 7811.*

➢ Mechanical Specifications

Body Material

ABS 94V-0

Cover and Cable Color

IBM 43-4208 pearl white

Dimension

Length: 100mm

Width: 34mm

Height: 28mm

Weight

200g

Interface Cable Length

2 meters

Magnetic Head Life

500K swipes Min. 1M optional

➢ Electrical Specifications

Power Required

DC+5V ±5% (from PC)

Power Consumption

120mA Max. in normal operation

Communication

Keyboard simulator interface

Ripple

50mVp-p Max.

Dielectric Strength

250VDC for 1 minute

Insulation Resistance

10M Ohms min. at 250VDC

➢ Environmental Specifications

Temperature

Operating: -10-55℃

Storage: -30-70℃

Humidity

Operating: 10-85% (non condensing)

Storage: 10-90% (non condensing)

➢ **Pin Assignment**

Table 3-2. Pin Assignment

PCB-JP2	SIGNAL	PLUG	SOCKET
1			
2	VCC	5	5
3	P-DATA	2	
4	K-DATA		2
5	P-CLOCK	1	
6	K-CLOCK		1
7	SHIELD		
8	GND	4	4

Figure 3-1. Pin Assignment
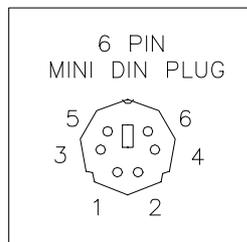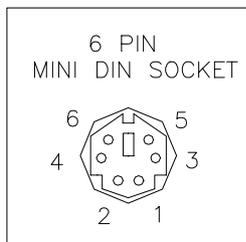
➢ **Data Output Format**

Figure 3-2. Data Output Format

Preamble	Card Data			Postamble
	Tk1 prefix	Tk1 data	Tk1 suffix	
	Tk2 prefix	Tk2 data	Tk2 suffix	
	Tk3 prefix	Tk3 data	Tk3 suffix	

Section 4   Operation Sequence

➢ Enter Configuration Mode

Procedure

1. Power off PC, connect the reader with PC and then power on.

2. Execute text editor program such as Microsoft Word, Notepad, PE2, Edit…etc.

3. Press [Ctrl]+[Alt]+[F10] to enter **Configuration Mode**.

4. Operating step-by-step following instructions as shown on the screen.

5. While in **Configuration Mode**, the green LED is always blinking. After exiting this **Configuration Mode**, the reader will be reset automatically.

6. The main menu of **Configuration Mode** is as below:

```
**** CONFIGURATION MODE ****
1:SET INTERFACE
2:SET MAGNETIC STRING
3:SET STRING EDITING
4:SET BUZZER
5:RESET TO DEFAULT
6:SHOW STATUS
7:SET KEYBOARD CONFIGURATION
0:EXIT SETUP MODE
```

Note: The bold and italics in the fallowing block are inputted manually via keyboard.

➢ 0:Exit Setup Mode

Once user choose "**0**" to exit **Configuration Mode**, the reader will be reset and execute the modified settings.

➢ 1:Set Interface

In the main menu, user could choose "**1**" to enter **Set Interface** sub-menu.

```
1:SET KEYBOARD COUNTRY
2:SET TRANSMIT SPEED
3:FIRMWARE VERSION AND DATE
0:BACK
```

Choose "1:SET KEYBOARD COUNTRY"

This is used to inform the reader about the keyboard type that should be used when transmitting card data. The default setting is "U.S.". It will shown as below:

```
1:U.S.
2:GERMAN
```

```
3:FRENCH

4:UK ENGLISH

5:SPANISH

6:ITALY

7:DUTCH

8:PORTUGUESE

9:SWEDISH

A:DANISH

0:BACK

READER STATUS = U.S.
```

READER STATUS displays the country of keyboard interface in use. The user could choose **1~A** to change the keyboard interface. Choose "**0**" to return to last menu.

Choose "2:SET TRANSMIT SPEED"

This is used to set the speed of card data sent to the host. The default setting is 80 characters/sec. IT will be shown as below:

```
**** SET TRANSMIT SPEED ****

1:25 CHARACTER/SEC

2:40 CHARACTER/SEC

3:60 CHARACTER/SEC

4:80 CHARACTER/SEC

5:120 CHARACTER/SEC

0:BACK

READER STSTUS = 80 CHAR/SEC
```

Choose "3:FIRMWARE VERSION AND DATE"

Display the firmware version, release date, and the programmer of the reader. The message is shown as below as an example:

```
2100124B 05-JUL-2002 NICK
```

Where 2100124B represents the version of firmware and NICK is the programmer.

➢ 2:Set Magnetic String

In the main menu, user could choose "**2**" to enter **Set Magnetic String** sub-menu.

```
1:SET ENABLE TRACKS

2:SET REQUIRE TRACKS

3:CARRIAGE RETURN

4:TRANSMIT SS/ES

5:CAPS LOCK

6:TRACK OUTPUT ORDER
```

```
7:CHANGE CARRIAGE RETURN CODE
8:OUTPUT CR IF READ NOTHING
0:BACK
```

Choose "1:SET ENABLE TRACKS"

This function is used to enable and disable specific tracks of data sent from the reader. The default setting is "TRACK 1, 2, 3". For example, for a triple track reader it may be necessary in some applications to use only Track 2 data. In this case, this setting can make Track 2 enabled and disable Track 1&3.

```
**** ENABLE TRACKS ****
1:TRACK 1
2:TRACK 2
3:TRACK 1,2
4:TRACK 3
5:TRACK 1,3
6:TRACK 2,3
7:TRACK 1,2,3
0:BACK
READER STSTUS = TRACK 1,2,3
```

Choose "2:SET REQUIRE TRACKS"

This function is used to set **Require Track** as criteria of effective reading. The default setting is "ANY TRACK". The criteria means if the **Require Track** has been read after swiping card. For example, if user set Track 2 as a criterion and gets Track 2 data exactly from the reading data, then it is a good reading and the reader sends all enabled track data to the host. If not, the reader doesn't transmit any data. The default setting is "any track will be considered a good read". This feature is useful if your software requires specific tracks of the card data.

```
**** SET REQUIRE TRACKS ****
1:TRACK 1
2:TRACK 2
3:TRACK 1,2
4:TRACK 3
5:TRACK 1,3
6:TRACK 2,3
7:TRACK 1,2,3
8:ANY TRACK
0:BACK
READER STATUS = ANY TRACK
```

Choose "3:CARRIAGE RETURN"

This is used to set the output data with or without **Carriage Return** for each track. The default setting is

"AFTER EACH TRACK".

```
**** CARRIAGE RETURN ****
1:DON'T SEND CARRLAGE RETURN
2:AFTER ALL TRACKS
3:AFTER EACH TRACK
4:AFTER ALL DATA
0:BACK
READER STATUS = AFTER EACH TRACK
```

NOTE: "After all data" means to send CR out following card data plus something like preamble/postamble, and

"after all track" means to do it right after sending out card data.

Choose "4:SET SS/ES SEND OR NOT"

This function is used to determine whether the SS and ES of each track will be sent with the card data. The

default setting is "ENABLE". (**SS**: start sentinel; **ES**: end sentinel)

```
**** SS/ES SEND ****
1:SEND
2:NO SEND
0:BACK
READER STATUS = ENABLE
```

Choose "5:CAPS LOCK"

This function is used to set the send data as capital letters. The default setting is "ENABLE". No matter what the

Caps Lock on the keyboard is ON or OFF, the reader is always sending out the capital letters while the setting is

"ENABLE". Once this setting is "DISABLE", the letters of the sent data are consistent with the Caps Lock status.

The default setting is "ENABLE".

```
1:ENABLE
2:DISABLE
0:BACK
READER STATUS = ENABLE
```

Choose "6:TRACK OUTPUT ORDER"

The Track Output Order is used to control the order of each track output. The default setting is "1, 2, 3". You

have to input the track in order; i.e.: FIRST, SECOND, and then THIRD.

```
1:TRACK 1
2:TRACK 2
3:TRACK 3
0:BACK
```

```
READER STATUS = 1,2,3

FIRST: 1

SECOND: 2

THIRD: 3
```

Choose "7:CHANGE CARRIAGE RETURN CODE"

The Change Carriage Return Code is used to change the code of carriage return. The default setting is [ENTER].

```
1:CHANGE

2:RESET

0:BACK

READER STATUS = [ENTER]

1

$
```

After setting, you may re-confirm it by entering "Change Carriage Return Code" section. You shall see:

```
1:CHANGE

2:RESET

0:BACK

READER STATUS = [SHIFT] 4
```

Choose "8: OUTPUT CR IF READ NOTHING"

The default setting is "DISABLE".

```
NO DATA, OUTPUT CARRIAGE RETURN

1:ENABLE

2:DISABLE

0:BACK

READER STATUS = DISABLE
```

➢ 3:Set String Editing

In the main menu, select "3" to enter Set String Editing sub-menu.

```
1:SET PREFIX

2:SET SUFFIX

3:SET MAGNETIC STRIPE PREAMBLE

4:SET MAGNETIC STRIPE POSTAMBLE

5:BLOCK OUTPUT ORDER

6:SEND CONTROL

7:FIELD OUTPUT ORDER

8:EXP DATE FORMAT

9:EXP DATE SEPARATOR

0:BACK
```

Choose "1:SET PREFIX"

The track 1, 2, 3 *prefix* are 6-character strings that are transmitted prior to the track data. It will be shown as

below:

```
1:TRACK 1

2:TRACK 2

3:TRACK 3

0:BACK

1

**** SET TRACK 1 PREFIX ****

1:ENABLE

2:DISABLE

0:BACK

READER STATUS = DISABLE

1

ENTER PREFIX (6 CHARS MAX) THEN PRESS `

WHEN FINISHED

IMPORTANT! [CAPS] KEY IS NOT ALLOWED
```

After selecting tracks, user set the *prefix* for the specific track. If track needs *prefix*, choose **1** then user can

key-in **1~6** characters to be as the *prefix*; if not, choose **2**. The default setting is "DISABLE".

Choose "2:SET SUFFIX"

The track 1, 2, 3 *suffix* are 6-character strings that are transmitted after to the track data. It will be shown as

below:

```
1:TRACK 1

2:TRACK 2

3:TRACK 3

0:BACK

1

**** SET TRACK 1 SUFFIX ****

1:ENABLE

2:DISABLE

0:BACK

READER STATUS = DISABLE

1

ENTER SUFFIX (6 CHARS MAX) THEN PRESS `

WHEN FINISHED

IMPORTANT! [CAPS] KEY IS NOT ALLOWED
```

After selecting tracks, user set the *suffix* of the specific track. If track needs *suffix*, choose **1** then user can key-in **1~6** characters to be as the *suffix*; if not, choose **2**. The default setting is "DISABLE".

Choose "3:SET MAGNETIC STRIPE PREAMBLE"

The *preamble* is a 6-character string that is transmitted before all card data. This string allows you to ensure that the cursor is positioned at the desired location at the time of a card swipe.

```
**** SET PREAMBLE ****
1:ENABLE
2:DISABLE
0:BACK
READER STATUS = DISABLE
1
ENTER PREAMBLE (6 CHARS MAX) THEN
PRESS ` WHEN FINISHED
IMPORTANT! [CAPS] KEY IS NOT ALLOWED
```

If choose **1**, then user can key-in **1~6** characters to be as the *preamble*; if not, choose **2**. The default setting is "DISABLE".

Choose "4:SET MAGNETIC STRIPE POSTAMBLE"

The *postamble* is a 6-character string that is transmitted after all card data. This string allows you to ensure that the cursor is positioned at the desired location at the time of a card swipe.

```
**** SET POSTAMBLE ****
1:ENABLE
2:DISABLE
0:BACK
READER STATUS = DISABLE
1
ENTER POSTAMBLE (6 CHARS MAX) THEN
PRESS ` WHEN FINISHED
IMPORTANT! [CAPS] KEY IS NOT ALLOWED
```

If choose **1**, then you can key-in **1~6** characters to be as the *postamble*; if not, choose **2**. The default setting is "DISABLE".

Note: For 1~4 item in the Set String Editing mode, if user key-in up to 6 characters, this mode will be finished automatically, if less than 6 characters, user can press the key ` escaping this mode.

The key ` is the character for U.S. keyboard configuration. For the same function, please press the exact position on the keyboard as below.
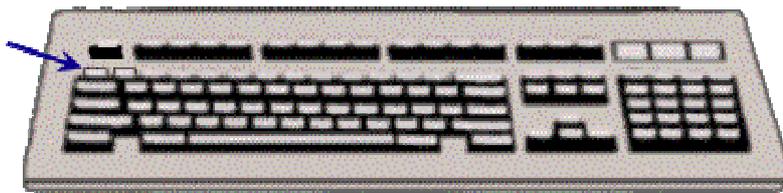
Choose "5:BLOCK OUTPUT ORDER"

The Block Output Order is used to control the order and appearance of each block output. Each track has three blocks (A, B, C) which could be set conforming to ISO, DMV or AAMVA, and the characters of each block could be set during 1~109.

EXAMPLE: Controlling the output data format of block A on track 1 is ISO standard card, 15th character to 30th character. The procedure is as follows:

Step 1: Choosing **1** to set data format of **TRACK 1**.

```
**** SET BLOCK OUTPUT ORDER ****
1:TRACK 1
2:TRACK 2
3:TRACK 3
0:BACK
```

Step 2: Choosing **1** to set **BLOCK A**.

```
1:BLOCK A
2:BLOCK B
3:BLOCK C
0:BACK
```

Step 3: Choosing **3** to set the card type is **ISO** standard.

```
** SET TRACK1 BLOCK A **
READER STATUS = DISABLE
1:DMV
2:AAMVA
3:ISO
9:DISABLE
0:BACK
```

Step 4: To set the range of the transmitting data format.

START = 15

END = 30

Example: For track 1, if you set block A is ISO type 1-4, block B is DMV type 6-9 and block C is ISO type 11-25, then

1.while you swipe a ISO card, it'll output char 1-4 plus 11-25 of track 1 data.

2.while you swipe a DMV card. It'll output char 6-9 of track 1 data.

3.while you swipe a AAMVA card/ it'll output all char of track1 data.

Choose "6:SEND CONTROL"

This function is used to control the reader send out data until users press a specific key or any key after swiping cards. After choosing **1** and a beep sound, a user starts to set the key, which will become to control the send data. That means the reader will not send data until users press the exact key. If choose **2**, the reader will send data once pressing any key excluding extension key(s). The default setting is "DISABLE".

```
1:SET KEY
2:ANY KEY
3:DISABLE
0:BACK
READER STATUS = DISABLE
```

Choose "7:FIELD OUTPUT ORDER"

The Field Output Order is used to control the order and appearance of each field output. Each card has three fields could be set (i.e.: Name, Account, and Expire Date). You may set one, two, or three fields that depend on actual application. The default setting is "DISABLE".

```
1:ENABLE
2:DISABLE
0:BACK
READER STATUS = DISABLE
```

Step 1: Choosing **1** to enable field output order.

```
1:NAME
2:ACCOUNT
3:EXPIRE DATE
0:BACK
FIRST:3
SECOND:1
THIRD:2
```

EXAMPLE: Setting the Field Output Order as Expire Date, Name, and Account in order. The procedure is as follows:

Step 1: Choosing **1** to enable field output order.

```
1:NAME
2:ACCOUNT
3:EXPIRE DATE
0:BACK
FIRST:
```

Step 2: Key in **3** to choose Expire Date as the first output field.

```
FIRST: 3
SECOND:
```

Step 3: Key in **1** to choose Name as the second output field.

```
FIRST: 3

SECOND: 1

THRID:
```

Step 4: Key in **2** to choose Account as the third output field.

After setting done, you may re-confirm it by entering "Field Output Setting" section. You shall see:

```
1:ENABLE

2:DISABLE

0:BACK

READER STATUS = EXPIRE

DATE,NAME,ACCOUNT
```

Choose "8:EXP DATE FORMAT"

The Expire Date Format is used to set the format of expiration date of the Field Output Order. This function only is effective while Field Output Order is enable, and won't impact on general card data output. The default setting is "YYMM".

```
1:YYMM

2:MMYY

0:BACK

READER STATUS = YYMM
```

Choose "9:EXP DATE SEPARATOR"

The Expire Date Separator is used to set a specific character to separate the MM and YY that is defined in Expire Date Format. This function only is effective while Field Output Order is enable, and won't impact on general card data output. The default setting is "DISABLE".

```
1:CHANGE

2:RESET

0:BACK

READER STATUS = DISABLE
```

➢ 4:Set Buzzer

In the main menu, choose **4** to enter "**Set Buzzer**" mode. Clicking **1** to makes the Buzzer of the reader active, or click **2** makes Buzzer of the reader inactive. This function only is effective while swiping card, and won't impact on general operation. The default setting is "ENABLE".

```
**** SET BUZZER ENABLE/DISABLE ****

1:ENABLE

2:DISABLE

0:BACK

READER STATUS = ENABLE
```

➢ **5:Reset to Default**

In the main menu, choose **5** to enter "**Reset to Default**" mode. Clicking **1** to reset all defaults returns the unit to

initial factory settings.

```
1:RESET TO DEFAULT

0:BACK
```

➢ **6:Show Status**

In the main menu, click **6** to display all of the existing settings of the reader.

For example:

```
KEYBOARD COUNTRY=U.S.

TRANSMIT SPEED=80 CHAR/SEC

ENABLE TRACKS=TRACK 1,2,3

REQUIRE TRACKS=ANY TRACK

CARRIAGE RETURN=AFTER EACH TRACK

SS/ES SEND=ENABLE

CAPS LOCK=ENABLE

BUZZER=ENABLE

DATA OUTPUT=1,2,3

PRESS 0 TO BACK
```

To press any key checks other settings of the reader, and press 0 escaping "**Show Status**" mode backing to the

main menu.

```
TRACK 1 PREFIX=DISABLE

TRACK 2 PREFIX=DISABLE

TRACK 3 PREFIX=DISABLE

TRACK 1 SUFFIX=DISABLE

TRACK 2 SUFFIX=DISABLE

TRACK 3 SUFFIX=DISABLE

PREAMBLE=DISABLE

POSTAMBLE=DISABLE

PRESS 0 TO BACK
```

To press any key checks other settings of the reader, and press **0** escaping "**Show Status**" mode backing to the

main menu.

```
TRACK1 BLOCK A=DISABLE

TRACK1 BLOCK B=DISABLE

TRACK1 BLOCK C=DISABLE.

TRACK2 BLOCK A=DISABLE

TRACK2 BLOCK B=DISABLE

TRACK2 BLOCK C=DISABLE
```

TRACK3 BLOCK A=DISABLE

TRACK3 BLOCK B=DISABLE

TRACK3 BLOCK C=DISABLE

After showing all of the settings, press any key to back to the main menu.

➢ **7:Set Keyboard Configuration**

In the main menu, choose **7** to enter "**SET KEYBOARD CONFIGURATION**" sub-menu. Clicking **1** to let the

reader detect if the keyboard is connected or not automatically. If user chooses **2,** then the keyboard has to be

existed. The default setting is "STANDARD".

1:KEYBOARD STANDARD CONFIGURATION

2:KEYBOARD SPECIFIC CONFIGURATION

0:BACK

KEYBOARD = STANDARD CONFIGURATION

Section 5   Download Specification

➢ **Introduction**

This section provides the information about firmware download via sending packet commands from host to the reader.

➢ **Enter Boot Mode**

The reader can accept packet commands only in Boot Mode.

Procedure

1. Power off PC; connect the reader with PC and then power on.

2. Send **the single command C5** to the reader. As soon as the reader acknowledges this command, it will go into **boot mode** and the LED goes **orange** from green.

When the reader is in boot mode, it can accept packet commands from host to do download firmware.

For download firmware, the host shall send packet command(s) to reader sequentially. When finishes download, the host shall send the packet command to reset the reader. If any errors that except LRC error are occurred during download, the host will receive EOT and a packet command that indicates error code from the reader.

After the host received EOT and the packet command, it shall abort the process.

Note: Do not disconnect keyboard if it is connected while power on host.

➢ **Command Sets**

This section describes the packet commands and responses available for the reader. Each system packet command format includes its data element, size and comments. The comments provide an explanation of each data element. The letter 'H' written in size column is an abbreviation of 'hexadecimal'.

Except single commands, all system packet commands are preceded by a header, hex code C2h, and terminated with one byte {LRC}. {LRC} is an XOR of the 8 data bits, excluding header, of each character in the entire packet command.

System Packet Command Format: <Header><Command Type><Data Length>[Data]{LRC}

Data Element	Size	Comments
<Header>	1H	Packet Command Header, Value: C2h
<Command Type>	2H	Command code
<Data Length>	1H	Indicate the length of [Data]
[Data]	0-255H	Optional
{LRC}	1H	Error Check
Maximum: 300 characters Minimum: 5 characters		

The reader's packet commands can be divided into two categories as below:

1. Single Commands
2. System Packet Commands

Single Commands

The single commands are used to enter boot mode and active/inactive the interface between host and keyboard.

The reader will react to these commands without responding any message to host.

Command in hex value	Description
C5	Request the reader to enter boot mode
C7	Active the path between host and keyboard
C8	Inactive the path between host and keyboard

C5 --- Request the reader to enter boot mode

After power on the reader, the host sends this command to reader for entering boot mode and the LED goes orange from green.

C7 --- Active the path between host and keyboard

While the reader is in boot mode, the host sends this command to active the interface between host and keyboard after finishing firmware download.

C8 --- Inactive the path between host and keyboard

While the reader is in boot mode, the host sends this command to inactive the interface between host and keyboard before starting firmware download.

System Packet Commands

When the reader is in boot mode, the system packet commands are used to do firmware related functions between host and reader.

Command in hex value	Description
01	Programming
02	Programming restart
03	Fill in unused location with zero
04	Request checksum of system program
05	Response checksum of system program

10	Reset reader
21	Request firmware version of boot loader
22	Response firmware version of boot loader
23	Request firmware version of system program
24	Response firmware version of system program

Host to Reader Flow of System Packet Command		
Host		Reader
Send system packet command to reader	=====▶	
	◀=====	ACK if LRC okay NAK if LRC incorrect, and prompt host to re-send EOT if any errors are occurred, and will follow a packet command with error code
	◀=====	Response packet command(s) if applicable
	:	
Send Message Command to reset reader	=====▶	Reader reset Reader returns to normal mode, and LED goes green

Command 01 --- Programming

The host sends this command to download system program into reader. If the reader receives this command at first time after entering into boot mode, it will erase all data stored in system program area and start download firmware from the very first location. If the reader receives this command at second times or above, it depends on if the command 02 is preceded by or not. If yes, the reader will start download firmware from the very first location; if not, the reader will download firmware from behind the location that firmware is downloaded before. During download process, the LED goes red blinking. After download done, the LED returns to orange.

Command: **01**		
Command Format: <Header><Command Type><Data Length>[Data]{LRC}		
Data Element	Size	Comments
<Header>	1H	Packet Command Header, Value: C2h
<Command Type>	2H	Command code
<Data Length>	1H	Indicate the length of [Data]
[Data]	0-255H	Optional
{LRC}	1H	Error Check
Maximum: 300 characters	Minimum: 5 characters	

Host to Reader **Flow** of System Packet **Command 01**		
Host		Reader
Send command to reader	=====▶	
	◀=====	ACK if LRC okay
		NAK if LRC incorrect, and prompt host to re-send
		EOT if any errors are occurred, and will follow a packet command with error code
Note:		
Host will send packet command 01 continuously till the firmware download is completed.		

Command 02 --- Programming restart

As long as any errors are occurred during download firmware process, this command shall be preceded prior to download firmware again. When the reader receives this command, it will initial download parameters stored in boot loader area.

Command: 02, 03, 04, 21, 23		
Command Format: <Header><Command Type><Data Length>{LRC}		
Data Element	Size	Comments
<Header>	1H	Packet Command Header, Value: C2h
<Command Type>	2H	Command code
<Data Length>	1H	Indicate the length of [Data]
{LRC}	1H	Error Check
Maximum: 5 characters Minimum: 5 characters		

Host to Reader **Flow** of System Packet **Command 02, 03, 10**		
Host		Reader
Send command to reader	=====▶	
	◀=====	ACK if LRC okay
		NAK if LRC incorrect, and prompt host to re-send
		EOT if any errors are occurred, and will follow a packet command with error code

Command 03 --- Fill in unused location with zero

When the reader receives this command, the LED goes red and the reader starts to fill zero into unused system program area. After finished, the LED returns to orange.

Note: The command format and flow sequence can be found in command 02 section.

Command 04 --- Request checksum of system program

The host sends this command to request the checksum (2-byte) of system program.

Note: The command format can be found in command 02 section.

Host to Reader **Flow** of System Packet **Command 04, 05**		
Host		Reader
Send command to reader	=====▶	
	◀=====	ACK if LRC okay
		NAK if LRC incorrect, and prompt host to re-send
		EOT if any errors are occurred, and will follow a packet command with error code
	◀=====	Response command 05 with 2-byte checksum

Command 05 --- Response checksum of system program

The reader responses this command to host to indicate the checksum (2-byte) of system program.

Command: **05**		
Command Format: <Header><Command Type><Data Length>[Data]{LRC}		
Data Element	Size	Comments
<Header>	1H	Packet Command Header, Value: C2h
<Command Type>	2H	Command code
<Data Length>	1H	Indicate the length of [Data]
[Data]	2H	Checksum of system program
{LRC}	1H	Error Check
Maximum: 7 characters Minimum: 7 characters		

Note: The command flow sequence can be found in command 04 section.

Command 10 --- Reset reader

When the reader receives this command, it will return to normal mode from boot mode. The LED goes green.
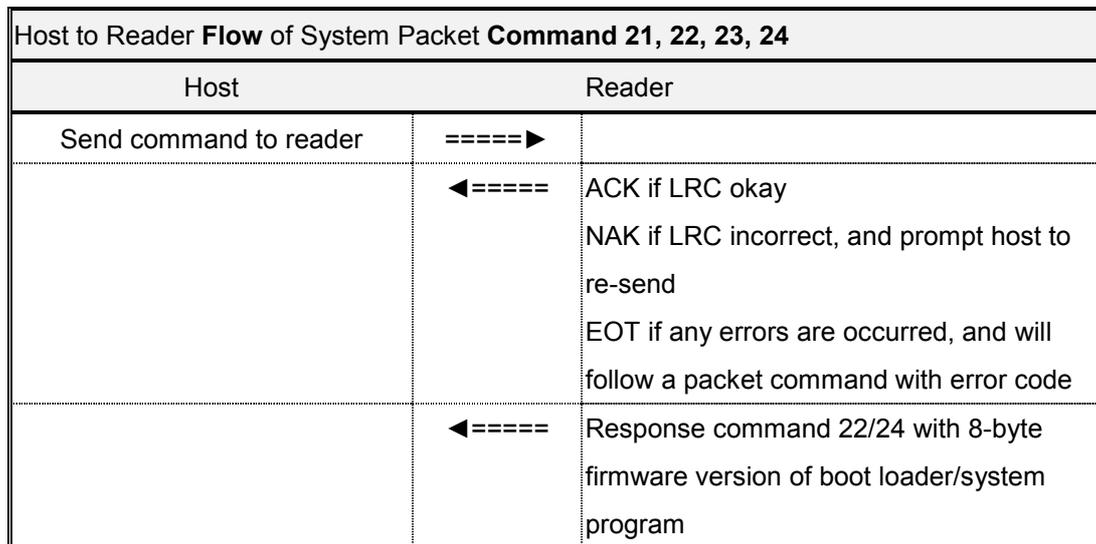
Command: **10**		
Command Format: <Header><Command Type><Data Length>[Data]{LRC}		

Data Element	Size	Comments
<Header>	1H	Packet Command Header, Value: C2h
<Command Type>	2H	Command code
<Data Length>	1H	Indicate the length of [Data]
[Data]	2H	Reset password, Value: AA55h
{LRC}	1H	Error Check
Maximum: 7 characters		Minimum: 7 characters

Note: The command flow sequence can be found in command 02 section.

Command 21 --- Request firmware version of boot loader

The host sends this command to request the firmware version (8-byte) of boot loader.

Note: The command format can be found in command 02 section.

Host to Reader **Flow** of System Packet **Command 21, 22, 23, 24**		
Host		Reader
Send command to reader	=====▶	
	◀=====	ACK if LRC okay
		NAK if LRC incorrect, and prompt host to re-send
		EOT if any errors are occurred, and will follow a packet command with error code
	◀=====	Response command 22/24 with 8-byte firmware version of boot loader/system program

Command 22 --- Response firmware version of boot loader

The reader responses this command to host to indicate the firmware version (8-byte) of boot loader.

Command: **22, 24**		
Command Format: <Header><Command Type><Data Length>[Data]{LRC}		
Data Element	Size	Comments
<Header>	1H	Packet Command Header, Value: C2h
<Command Type>	2H	Command code
<Data Length>	1H	Indicate the length of [Data]
[Data]	8H	Firmware version of boot loader/system program
{LRC}	1H	Error Check

> Maximum: 13 characters   Minimum: 13 characters

Note: The command flow sequence can be found in command 21 section.

Command 23 --- Request firmware version of system program

The host sends this command to request the firmware version (8-byte) of system program.

Note: The command format can be found in command 02 section, and flow sequence can be found
in command 21 section.

Command 24 --- Response firmware version of system program

The reader responses command 23 by responding this command to host to indicate the firmware version (8-byte) of system program.

Note: The command format can be found in command 22 section, and flow sequence can be found
in command 21 section.

Appendix A   Download Application

This section illustrates instructions in download application installation and firmware download via this application on Windows 98.

➤ System Requirements

Before you use the MSR210, make sure your computer is an IBM PC-compatible with the following minimum system requirements:

1. Intel-compatible 486DX-66 MHz CPU or higher

2. Keyboard interface.

3. Either the following operating systems: Windows 95, Windows 98, Windows 2000, or NT4.0.

➤ Application Installation and Firmware Download

User shall follow the steps below in order to install application and do firmware download:
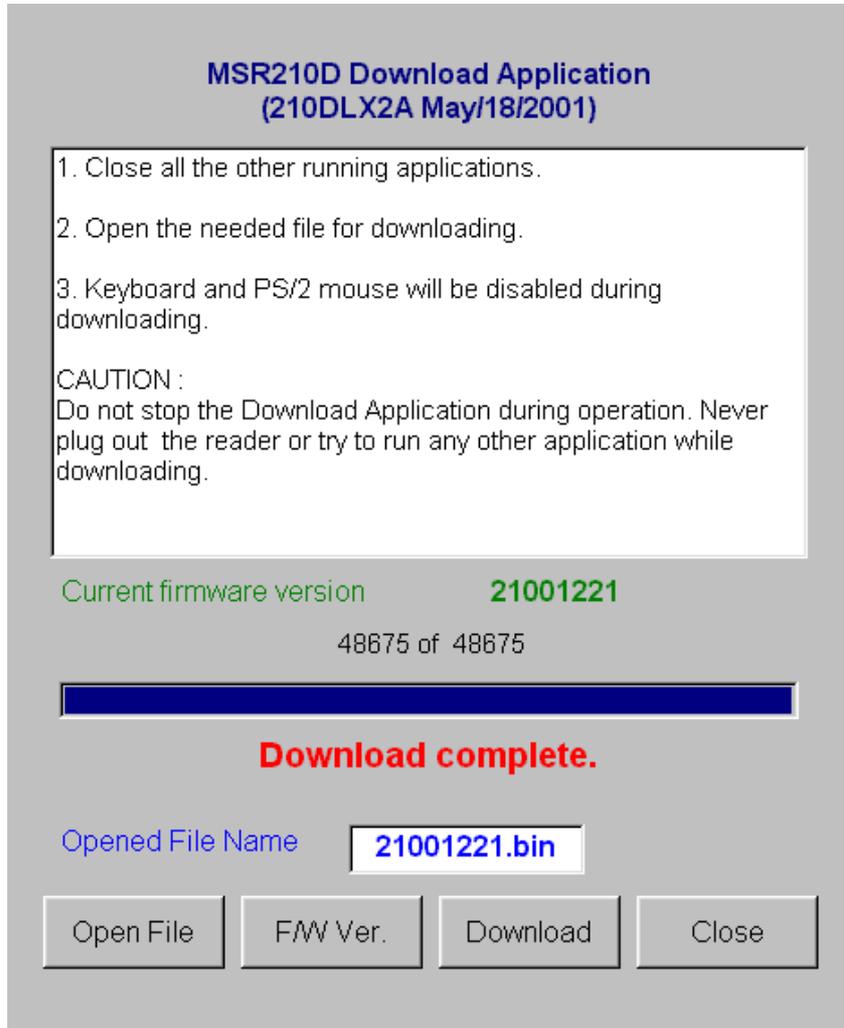
1. Connect MSR210 to keyboard port (ref. to Figure 2-2 Installing MSR210)

2. Execute application file (e.g. 210DLX2A.exe)
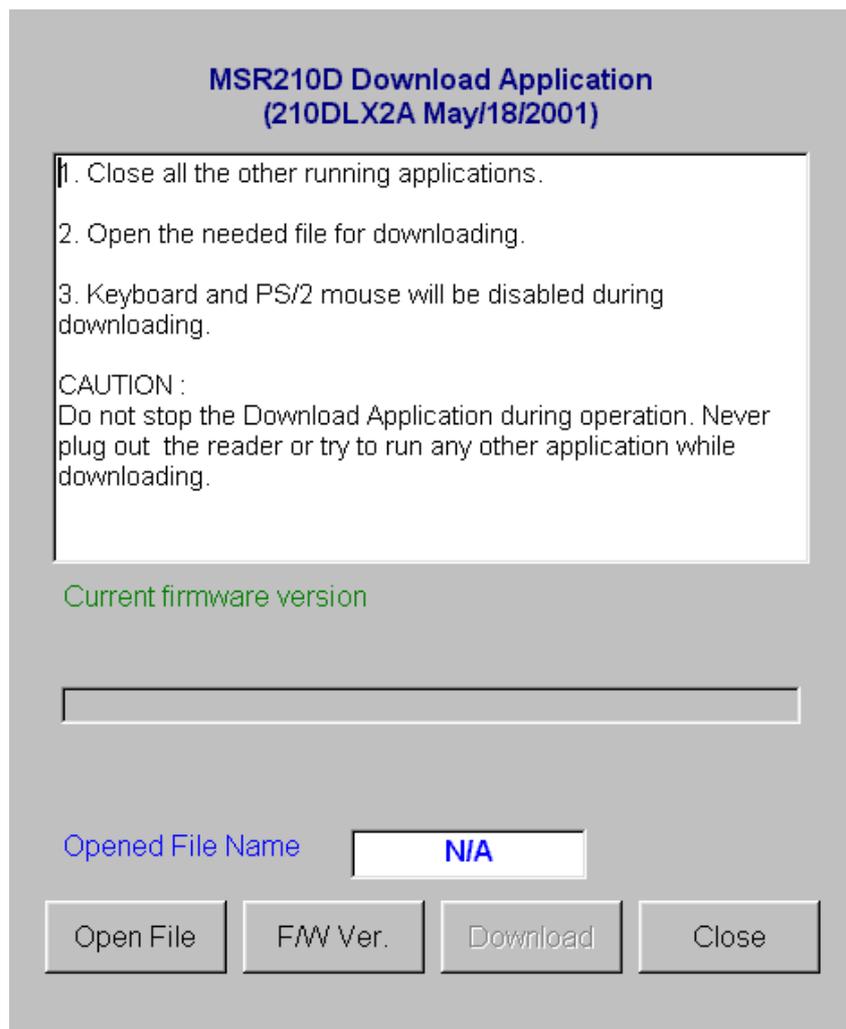
3. Select download firmware by click **Open File** button

4. Press **Download** button to do firmware download automatically.

   At this stage, the application will do actions sequentially as follows:

   a. Enter boot mode. The reader LED goes orange from green.

   b. Start firmware download. The orange LED flashes.

   c. After successful download done, the reader beeps once and LED goes green.

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1. Close all the other running applications.

2. Open the needed file for downloading.

3. Keyboard and PS/2 mouse will be disabled during downloading.

CAUTION :
Do not stop the Download Application during operation. Never plug out the reader or try to run any other application while downloading.

Current firmware version   **21001221**

48675 of 48675

Download complete.

Opened File Name   **21001221.bin**

| Open File | F/W Ver. | Download | Close |

After download done, user can close the application by click **Close** button. If user wants to download the second unit with the same f/w, just connect the unit to keyboard port and click **Download** button to continue/repeat the download process automatically.

At any time, user can query current reader F/W version by click **F/W Ver.** button. If there is any error occurred during process, the error message prompts. User may do error check per prompts.