



WaveLynx
technologies corporation

Ethos®

Multi-technology USB Logical Access Reader

User Manual



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www.WaveLynxTech.com

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Glossary of Terms/Acronyms

ASCII: The American Standard Code for Information Interchange codes represent text in computers, communications equipment, and other devices that use text.

BID: Badge Identifier.

BLE: Bluetooth low energy.

Contactless: Technology using wireless electromagnetic fields to transfer data.

Credential Form Factors: There are a variety of low and high frequency form factors customers can choose from to meet their particular needs (clam shells, smart phones, key fobs, etc).

CSN: Card Serial Number (sometimes called UID).

CST: Configuration Software Tool.

Data: The data on access cards are a string of binary numbers set with a fixed configuration and length.

FAC: Facility Access Code

Frequencies: Low-frequency 125 kHz band and/or the high-frequency 13.56 MHz band.

HID: USB Human Interface Device (Keyboard and/or Generic).

OEM: Original Equipment Manufacturer. The proximity card and badge reader available in self-contained electronic modules for easy system integration.

Proximity: RFID technology with communication distances of typically less than 6 inches.

UID: Unique Identifier (also called CSN).

USB: Universal Serial Bus

Understanding Your Product

What does your model number mean? WaveLynx Technologies follows a simple system of categorization to

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U Series USB Readers						
A full line of USB readers for logical access						
U1	U2	U3	U4	U5	U6	U7
125 kHz	13.56 MHz	125 kHz and 13.56 MHz	Bluetooth	Bluetooth and 125 kHz	Bluetooth and 13.56 MHz	Bluetooth, 13.56 MHz, and 125 kHz
Red, Green, Amber LED and Buzzer						

n products. Below is the basic system that WaveLynx follows.

Card Data Layout

Are you trying to make sense of what the numbers in your card data stand for? Here is a helpful tool for helping you to understand the general layout of your card data.

P	FFFFFFF	BBBBBBBBBBBBBBBB	P
Parity Bits are at the beginning and end of strings of data that are used for detecting potential errors. This is 1 bit in a 26 bit format.	Facility Code – This is used to determine which facility you are in. This code is 8 bits in a 26 bit format.	Badge ID Code – This is used to determine your specific badge identification number. This is 16 bits in a 26 bit format.	Parity Bits are at the beginning and end of strings of data that are used for detecting potential errors. This is 1 bit in a 26 bit format.

System Requirements

In order to successfully install and use your logical access reader software, your computer must meet the following requirements:

- Windows 7 or newer
- 64-bit Operating System
- 2 GB RAM
- 5 MB of available memory
- Java 7 or newer (Installer will direct you to download Java if a compatible version is not found on your system)

USB Interface

Setting up your logical access reader is fast and simple. All you need to do is take the reader out of the packaging and plug it into the USB drive on your computer. The reader will appear to the computer as a USB HID device with two endpoints, a keyboard endpoint and a generic command/response endpoint. The generic endpoint is used to facilitate communication between the reader and the included configuration software tool. The Keyboard endpoint is primarily used by your password entry screens in your everyday work environment (email, PC log in, etc...). For instance, when logging into your email account, instead of typing in the password,

you can use the information on your secure access card and let the reader “type” the password for you by just reading the card.

Configuration Software Tool (CST)

The card holds information that is strictly numeric in nature. That is, it holds a number that has information embedded in it (e.g. badge identification number, facility code, etc...). Often, it's desirable to “break out” these information fields and add descriptive or control data to conform to any given access systems conventions. Or, you may want to obfuscate the information so that the card information it is not easily readable by unauthorized viewers. This is the purpose of the CST included with your reader. A simple example is when typing in the password for email, you press the enter key on the keyboard to actually submit the password. The CST can be used to automatically append this enter key press every time you read the card. So you don't have to press the enter key manually.

Step by Step Software Installation

Step 1: After downloading the installation directory, navigate to its location within your system and extract its contents by right clicking on the zipped folder and selecting **Extract all...** This will unzip the installation directory and place the extracted folder in your current location.

Step 2: Open the installation directory to view its contents. Double click on **WaveLynxReader_Setup.exe** to begin the installation process. If a popup appears requesting permission for the application to make changes to your computer, select **Yes**. The installation will proceed from here.

If another popup appears stating that the application requires that a newer version of Java be downloaded please select **Yes** to download the correct version of Java and install it.

Step 3: Once the installer appears, select the folder where you would like the application to be installed, or leave it as the default location.

Step 4: Select **Install** from the bottom right hand corner of the installer to install the application on your system.

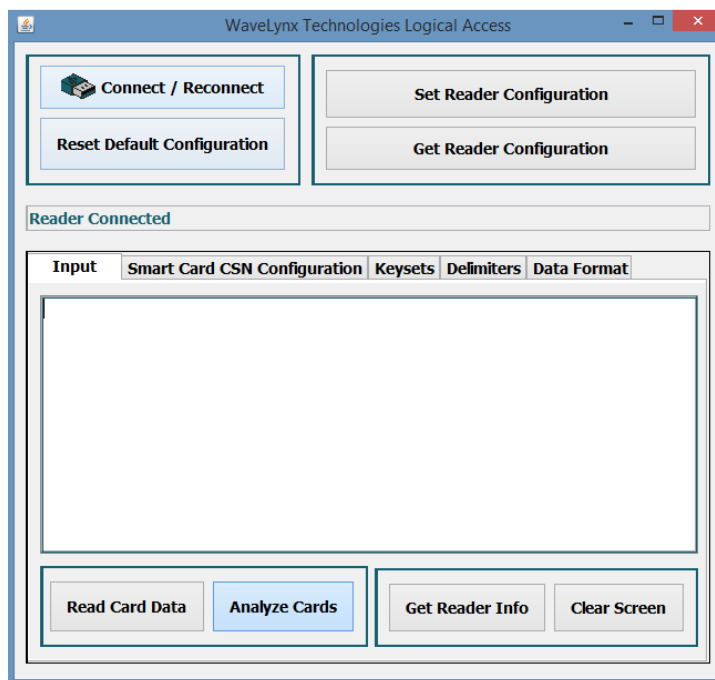
Step 5: A popup will now appear asking if you would like to create a desktop shortcut to access the logical access reader software. Select **Yes** if you would like a shortcut, or **No** otherwise.

Congratulations, you have now successfully installed your WaveLynx Logical Access Reader software.

Software Basics

Once your software is installed and running, it will look like the picture below. We will talk through how each tab and button function in the following pages. **Note:** When you change any of your settings, you need to push the “Set Reader Configuration” button at the top of the screen. If you don’t push this button your changes will not be saved.

The Buttons



Connect/Reconnect: If your reader USB cable becomes disconnected, the status bar will show a message saying No Reader Connected. If this happens, simply plug the USB cable back in and press this button. Your computer will search for and re-connect with your USB device. *Note: The reason a specific connection step is needed for this software is because the configuration setup information is communicated on another USB endpoint (not the keyboard endpoint).*

Reset Default Configuration: This button can be used to return the reader to its original factory default settings. Note: this button does not reset any custom key information entered into the reader by the user (see description for Keysets tab).

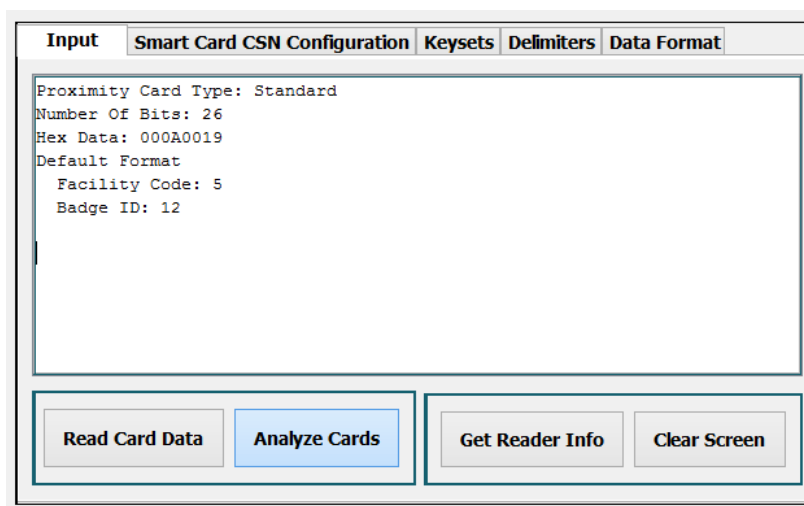
Set Reader Configuration: After changing the reader setup shown graphically by the CST, this button will load the changes you made into the reader. The changes are stored in flash memory and will be retained even if the reader loses power or is simply unplugged.

Get Reader Configuration: If knowledge of the current reader setup is desired, simply press this button and the current reader setup will be graphically depicted on the screens in all tabs.

Read Card Data: This button is pressed to make the reader perform as a Logical Access reader. This puts the reader in a mode that is most typically used in a logical access setting. This mode is included to allow you to

review the information sent to computer for logical access after you have customized the access information to your requirements.

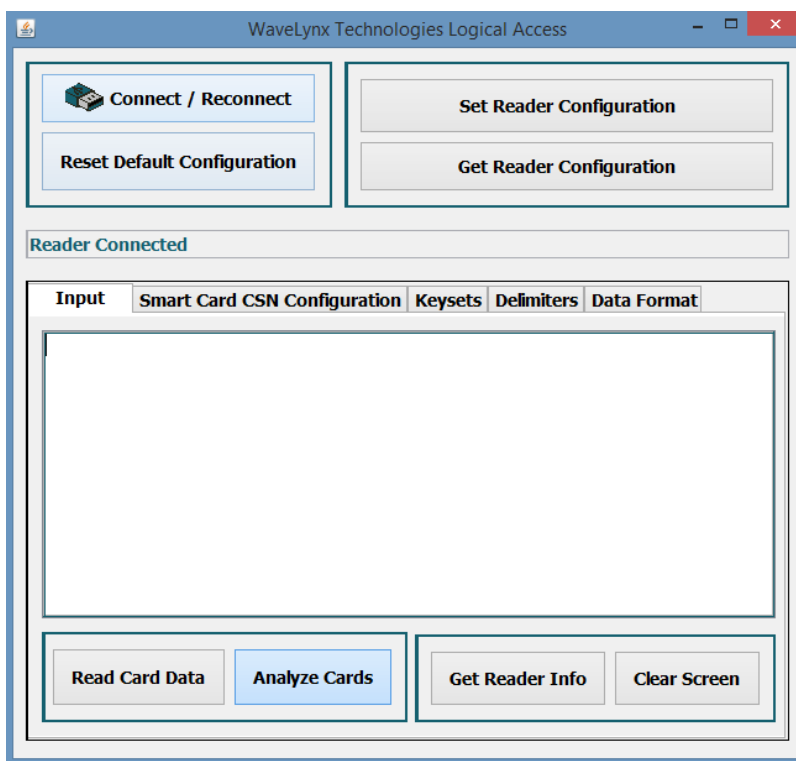
Analyze Cards: This button is pressed to make the reader act as a card analyzer. This mode is used if you want descriptive information about the card that is in addition to the logical access data. This descriptive information may include things like card manufacturer, protocol type, card serial number, etc... Note: You will need to leave the card next to the reader longer for this mode, as it takes longer to analyze all available data from the card. Below is an example.



Get Reader Info: This button is used to acquire information about your reader. The information will include the firmware version, boot loader version, hardware versions, information about the external memory, and BLE information.

Clear Screen: This button clears the display screen.

The Tabs



Input: This tab navigates you to the screen where your information is being sent. If you are on a different section, it will also bring you back to this original screen.

Smart Card CSN Configuration: This tab navigates you to the screen that lets you change your settings for reading smart card serial numbers (often called the CSN or UID). When setting your Smart Card CSN configuration be sure to click on the “Set CSN Configuration” button in the lower right-hand corner. This will save any changes that you make. To view the reader’s current CSN configuration you will push the “Get CSN Configuration” button.

Input	Smart Card CSN Configuration	Keysets	Delimiters	Data Format																		
☐ CSN Only																						
ISO14443A CL1	7	CSN Format Legend <table border="0"> <tr> <td>0: AS IS</td> <td>5: 26 bit</td> <td>10: 32 bit LSB</td> </tr> <tr> <td>1: 4001</td> <td>6: 32 bit LSB XOR</td> <td>11: 32 bit MSB</td> </tr> <tr> <td>2: 4002</td> <td>7: 32 bit MSB XOR</td> <td>12: 32 bit PLUS</td> </tr> <tr> <td>3: 5002</td> <td>8: 40 bit MSB LRC</td> <td>13: 56 bit</td> </tr> <tr> <td>4: 6400</td> <td>9: 34 bit MSB PAR</td> <td>14: 40 bit PCSC</td> </tr> <tr> <td></td> <td></td> <td>15: 75 bit PCSC</td> </tr> </table>			0: AS IS	5: 26 bit	10: 32 bit LSB	1: 4001	6: 32 bit LSB XOR	11: 32 bit MSB	2: 4002	7: 32 bit MSB XOR	12: 32 bit PLUS	3: 5002	8: 40 bit MSB LRC	13: 56 bit	4: 6400	9: 34 bit MSB PAR	14: 40 bit PCSC			15: 75 bit PCSC
0: AS IS	5: 26 bit				10: 32 bit LSB																	
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2: 4002	7: 32 bit MSB XOR				12: 32 bit PLUS																	
3: 5002	8: 40 bit MSB LRC				13: 56 bit																	
4: 6400	9: 34 bit MSB PAR	14: 40 bit PCSC																				
		15: 75 bit PCSC																				
ISO14443A CL2	7																					
ISO14443B	7																					
FELICA	4																					
ISO15693	4																					
		Set CSN Configuration Get CSN Configuration																				

Keysets: This tab navigates you to the screen that lets you enter custom keys for secure smart card access application. The reader comes with a set of default keys for use with the WaveLynx secure access application. It this allows you to have your own key sets. Please be aware, that if you create your own key sets, you are responsible for all secure key management of those custom keys. WaveLynx is not responsible for tracking or recovering a custom keyset. Key sets are 32 bytes long and are entered in hexadecimal format (0-9, A-F).

The screenshot shows the 'Keysets' tab within a configuration window. At the top, there are five tabs: 'Input', 'Smart Card CSN Configuration', 'Keysets' (selected), 'Delimiters', and 'Data Format'. Below the tabs, there is a dropdown menu labeled 'Use Default Keyset'. Below that, there is a section for 'NexPACS Keyset' with a text input field labeled 'A, B, ... F', a 'Set Keyset' button, and a 'Get Current Keyset' button. Below this is a section for 'Custom Keyset' with a 'Load Custom Keyset' button, a text input field labeled 'Custom Keyset' with a hint 'A, B, ... F', and a text input field labeled 'Keyset Data'.

Delimiters: This is the tab to use when you want to “break out” information fields and add/or descriptive or control data to conform to any given access systems conventions as describe earlier in this section. You can add a **Prefix**, which would be added before the data, a **Delimiter**, which would be added between the fields of data, or a **Suffix**, which would be added after the data. The options for a delimiter include *enter*, *tab*, and *option*, where you can add a character of your choice. You can also add 1-3 characters before or after the data by using the “Pre-Data String” or the “Post-Data String.” Each of these has the option of adding 1-3 characters of your choice. The last option on the Delimiter screen is to add a string of 1-2 characters of your choice to indicate when a card has been removed from the reader by using the **Card Removed Indicator String** option.

The screenshot shows the 'Delimiters' tab within the same configuration window. It features three columns: 'Prefix', 'Delimiter', and 'Suffix'. Each column has a dropdown menu (all set to 'None') and an 'Other' checkbox with a text input field. Below these columns are two sections: 'Pre-Data String' and 'Post-Data String'. Each section has three character input fields labeled 'Character 1:', 'Character 2:', and 'Character 3:'. At the bottom, there is a section for 'Card Removed Indicator String' with two character input fields labeled 'Character 1:' and 'Character 2:'.

Data Format: This tab allows you to obfuscate, manipulate, or filter the data information that is available in the card. The **Card Data Options** lets you choose if the data includes the full bit stream, the facility/site code, ID code, and what format that data is displayed in. The **Bit Stream Control** option lets you choose if you want to invert bits, reverse bits, reverse bytes, and what justification (left or right) you would like to use. The **Bit Stream**

Filter lets you choose if you want to process all available bits of data from the card or just a subset of all available bits. The **Parity Stripping** option lets you strip parity bits.

Input	Smart Card CSN Configuration	Keysets	Delimiters	Data Format
Card Data Options ☐ Full Bit Stream ☒ Facility/Site Code ☒ ID Code Data Format: Decimal ▼ Bit Stream Control ☐ Invert Bits ☐ Reverse Bits ☐ Reverse Bytes Justification: Right Justified ▼ Bit Stream Filter All Default Bit Stream Formats ▼ Bit Stream Map: 0 ▼ Number of Bits in Bitstream (00...FF): 00 Parity Stripping Strip Leading Bit Count: 00 ▼ Strip Trailing Bit Count: 00 ▼				

Customizing Your Access Data

Typically you will want to customize the data read from a card to use in logical access. Here we will walk through how you can do this.

Let's say you want to configure the reader to send out a specific string of data either in front of or behind the data fields to represent something, possibly your company. Let's say your company commonly uses "XYZ" in reference to itself. If you would like to add that in to your card information, you can add it to the beginning of your data by adding it in the **Delimiters** section. You click on the **Delimiters** tab, then find the **Pre-Data String** section. You would type one character into each box, as shown below. Then just make sure to click the **Set Configuration** button. This sends the setup down to the reader over USB for storage in the reader's memory. These same steps would apply if you want 1-3 characters at the end of your data, just in the **Post-Data String** section below.

Input	Smart Card CSN Configuration	Keysets	Delimiters	Data Format
Prefix None ▾ Other Delimiter None ▾ Other Suffix None ▾ Other Pre-Data String Character 1: X Character 2: Y Character 3: Z Post-Data String Character 1: Character 2: Character 3:				

Another option you may want to customize is your delimiter, so it will place a dash or some other character between your facility code and badge ID so it is easier to read quickly. You would do this by going into the **Delimiter** tab, finding the **Delimiter** drop down, selecting "other," and then typing "-" into the box directly below the drop down, as shown below. You can also perform similar actions in the **Prefix** and **Suffix** sections. See the example below.

Input	Smart Card CSN Configuration	Keysets	Delimiters	Data Format
Prefix None ▾ Other Delimiter Other ▾ Other - Suffix None ▾ Other				

When you are done configuring the reader, you should go back to the Input tab and view the data when your card is read.

Step by Step Password Example

Now assume this setup is to be used for a password entry for your email account. You would, of course, have to set up your email account to use the password sent by your reader. To do this simply follow the email account's steps for changing your password and when it is time to enter your new password, simply let the reader enter it by reading your access card. Since the reader acts as a keyboard, it will insert your information where your cursor is currently blinking.

Here is an example, and step by step instructions. Let's say the facility code on your access card is 5 and the badge ID on your card is 12 (you can discover this with the Analyze Cards button described earlier in this document). You can customize this facility/badge information to create a password. For example, if your company name is XYZ Corporation, you could build a password using your card's information and the company name (e.g. XYZ5-12). To configure your reader for this specific password you would need to make sure your **Data Format** was set to put out the facility code and badge ID in decimal format, as shown below.

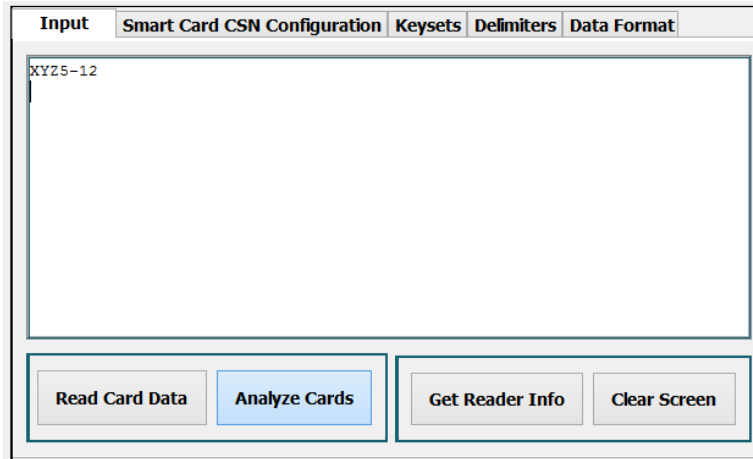
The screenshot shows the 'Data Format' tab of the 'Smart Card CSN Configuration' window. It contains four sections: 'Card Data Options', 'Bit Stream Control', 'Bit Stream Filter', and 'Parity Stripping'. In 'Card Data Options', 'Full Bit Stream' is unchecked, 'Facility/Site Code' and 'ID Code' are checked, and 'Data Format' is set to 'Decimal'. In 'Bit Stream Control', 'Invert Bits', 'Reverse Bits', and 'Reverse Bytes' are unchecked, and 'Justification' is set to 'Right Justified'. In 'Bit Stream Filter', 'All Default Bit Stream Formats' is selected, 'Bit Stream Map' is set to '0', and 'Number of Bits in Bitstream (00...FF)' is set to '00'. In 'Parity Stripping', 'Strip Leading Bit Count' and 'Strip Trailing Bit Count' are both set to '00'.

Next you would change your delimiters in the **Delimiters** tab. Change your **Delimiter** to "other" and enter "-" in the box below the drop down options. Next change your **Suffix** to "Enter/Return" so it will automatically hit enter after you swipe your card. (Note: some password entry procedures need a Tab instead of a return). Then you will add "X, Y, Z" into each of the respective boxes in the **Pre-Data String** section. All of these are shown in the picture below. And as always, after making any of these changes make sure to press **Set Reader Configuration** by pushing the button in the top right hand corner, as seen on page 6.

So at this point we have set the reader to read the data from the card, append and insert the configured characters and delimiters and output the data string (XYZ5-12) out the reader's keyboard endpoint. You could test this yourself by returning to the **Input** tab, pressing the Read Card Data button, and then presenting the card

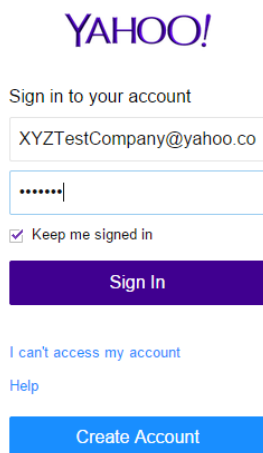
The screenshot shows the 'Delimiters' tab of the 'Smart Card CSN Configuration' window. It contains three sections: 'Prefix', 'Delimiter', and 'Suffix'. In 'Prefix', 'None' is selected. In 'Delimiter', 'Other' is selected and '-' is entered in the box below. In 'Suffix', 'Enter/Return' is selected. Below these are the 'Pre-Data String' and 'Post-Data String' sections. 'Pre-Data String' has Character 1: 'X', Character 2: 'Y', and Character 3: 'Z'. 'Post-Data String' has Character 1, 2, and 3 all empty. At the bottom is the 'Card Removed Indicator String' section with Character 1 and 2 both empty.

to the reader. All of your settings are stored in non-volatile memory in the reader. This means, even if you unplug the reader, it will “remember” the settings you have just entered. In other words, once your reader is configured, the configuration software tool is no longer needed (unless you want to make changes to your password). The reader can just be used as a log-in device without the need for any other software.



The screenshot shows a software window with five tabs: 'Input', 'Smart Card CSN Configuration', 'Keysets', 'Delimiters', and 'Data Format'. The 'Smart Card CSN Configuration' tab is active, displaying a text input field containing 'XYZ5-12'. Below the input field are four buttons: 'Read Card Data', 'Analyze Cards', 'Get Reader Info', and 'Clear Screen'.

When you are content with the data output and it matches your desired email password you can use the reader and your access card to change your password and log in using your card. For example, to log in to your email account, simply go to your email login page, type in your email address, click on the password section so the blinking cursor is in that box, read your access card, and you will be logged in to your email. Below is a picture of what your login process will look like, using our test email XYZTestCompany@yahoo.com.



The screenshot shows the Yahoo! login page. At the top is the 'YAHOO!' logo. Below it is the text 'Sign in to your account'. There are two input fields: the first contains the email address 'XYZTestCompany@yahoo.co' and the second contains masked characters '.....'. Below the password field is a checkbox labeled 'Keep me signed in' which is checked. A purple 'Sign In' button is below the checkbox. At the bottom, there is a link 'I can't access my account', a 'Help' link, and a blue 'Create Account' button.

Certification Note to Users

Note: This equipment has 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 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 will be required to correct the interference at his own expense.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.”

Changes or modifications not expressly approved by WaveLynx Technologies Corporation could void the user's authority to operate the equipment.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.