802 RF Terminal Users Manual

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Worth Data Inc.

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Installation

Components

The 802 Terminal is *802.11b* compatible operating between 2399.5 MHz and 2474.5 MHz using direct sequence spread spectrum; it works with Access Points that are *802.11b* or *802.11g* compatible (b is a subset of g). The components in your 802 Terminal system will vary according to the configuration of your system. Your R/F Terminal shipment should contain at least:

- **An R/F Terminal T802 or LT802** (unit includes keypad and display). If the R/F Terminal is an LT802 model, it will have an integrated laser scanner built-in to the body of the terminal. Each terminal is shipped with a shoulder strap, boot, and Manual.

- **An optional Scanner** – if you ordered the **T802** models instead of the **LT802** models with the built-in laser scanner.

- **Optional rechargeable batteries** and a 9v **power supply.**

- **802 Utilities CD ROM** – demo programs, Active X development software, test program, and firmware loader program

Keep the shipping box for the R/F Terminal in the event it is necessary to return equipment for repair later.

Installation Tips

1. Be sure all Access Points and Terminals have the same *SSID* and *WEP Key*, (if Encryption is used). Terminals are shipped with a *SSID* of *WORTH DATA*.

2. **Start with one Terminal**. Get everything working with the single terminal and then add other terminals, being certain that all terminals have unique *IP Device Address*.

3. Use the 802 Test Programs to validate that everything is working. If you have problems, refer to the **Trouble Shooting Section**.

Using the RF Terminal keypad…

ON/OFF   The R/F Terminal is turned on by pressing the green ON/OFF button located in the upper left-hand corner of the R/F Terminal keypad.

The R/F Terminal has a *Shut Down Time* feature that allows you to determine the length of time the R/F Terminal must be inactive before automatically shutting down to conserve battery power. When the R/F

Terminal shuts down, simply press the ON/OFF button to resume operation.

The keypad is custom designed for the R/F Terminal operations. It has numeric and control keys in the non-shifted state, and alpha characters in its shifted state. You can readily determine if SHIFT is on by the cursor on the display. When upper case alpha SHIFT is on, the cursor is a large black rectangle. When SHIFT is off, the cursor is a narrow underline character. For all prompts which ask for a YES or NO response, the ENTER key, is the YES reply, and the 0 (zero) key is the NO reply. As you key data, you will see each character displayed on the screen. If you make a mistake, you can delete the last character by pressing the DELETE key, or you can clear all characters displayed on the screen by pressing the CLEAR key.

You can order NiMH rechargeable batteries (L01) from Worth Data along with a 9v recharging Power Supply that recharges the batteries completely within 2 hours. When recharging options (batteries or Power Supply) are ordered with the Terminals, the Terminal's *Batteries Setup* parameter is set for recharging "1" which allows the batteries to be recharged under program control. Otherwise, the batteries shipped are non-rechargeable alkalines with no recharging options set in the Terminal. However, you may change the battery type yourself. Using NIMH or alkaline batteries, you should get 24 hours of operation (assuming 1 transaction every 8 seconds).

If you did not order the rechargeable batteries and you change to rechargeables, you must change the Terminal's **Setup** to *Batteries 1* to allow recharging. If you want to charge the batteries without having to remove them from the Terminal, you must use the **Worth Data 9v power supply**.

You can safely use alkaline batteries in a terminal set for recharging, **providing** you **don't** plug a power supply into the terminal. *Recharging Alkaline batteries may cause the batteries to explode and leak battery acid throughout the RF Terminal.* Battery acid damage is not covered by the Worth Data warranty because it not deemed to be "normal use".

If you are using alkaline batteries (either *regular* or *rechargeables*) and have selected the **Rechargeables** setting in the *Battery* setup parameter (See **Chapter 2**; *RF System Setup*), the RF Terminal will generate the following error message:

> **Alkaline Batteries**
> **Detected,**
> **Recharge-**
> **ables Are Specified**
> **Do Not Recharge**

Battery Life Indicator

The R/F Terminal detects low AA batteries and displays the following message:

> **LOW BATTERIES**
> **Finish, Sign Off**
> **Change Batteries**
> **Hit Any Key_**

At this point you have approximately 2 minutes of operational time to finish your transaction (or note where you are leaving off if in the middle of a transaction) and sign off. After 2 minutes, the R/F Terminal displays:

> **CHANGE BATTERIES**
> **UNIT SHUT DOWN_**

This message displays for 20 seconds before the R/F Terminal signs off from the host (if signed on) and then shuts itself down. If you turn it back on without changing batteries, you may experience constant beeping, intermittent scanning, and very irritating symptoms that look like equipment failure.

Once you remove the batteries, you have 5 minutes to change them before you lose the date and time in the Real-Time Clock.

The R/F Terminal also has a battery life indicator. Press the **STATUS** key to display the remaining battery life of the AA batteries (as well as the date, time and other information) as follows:

> **mm/dd/yy hh:mm**
> **alkBAT■■■■■■■■■■■■-zz%**
> **ServerIP=nnn.nnn.nnn.nnn**
> **DeviceIP=nnn.nnn.nnn.nnn**
> **Ch:=n SSID=xxxxxxxxxxxx**
> **WEP=128 Signal=nn%**

alk - *when Alkaline batteries are specified in Battery setup*
rch- *when NiMH or specified in Battery setup*
zz=*percent or battery life left in numbers i.e. 99, 50, 23*

- **Server IP** either shows the Server's fixed TCPIP address; or if Device searches out the Server, shows 0.0.0.0.

- **Device IP** either shows the Device's fixed TCPIP address or, if it is determined by a DHCP Server, shows 0.0.0.0.

- **Ch:=n** shows the channel to start using, (the channel of the most frequently used Access Point).

- **SSID=xxxxxxxxxxxx** refers to the first 12 characters of the up to 32 character network name.

- **WEP=128 or 64 or NO** shows how the Device is configured with an encryption key.

- **Signal=nn%** shows the signal strength from the best Access Point with the same SSID (if already SIGNED ON).

Press the **STATUS** key again to resume processing

To change the AA batteries:
1. Turn **OFF** the R/F Terminal.
2. Remove the battery holder door on the back of the R/F Terminal by pressing down on the grooved portion of the door and pushing outward.
3. Remove the old batteries and insert the new ones, making sure to orient the batteries with the positive (+) end facing down toward the bottom of the R/F Terminal.
4. If using rechargeable batteries, make sure that rechargeables are specified. See the previous page to quickly determine the setting using the **STATUS** *key.*
5. Replace the battery door and turn the reader on using the ON/OFF switch.
6. Sign ON and resume your application.

Recharging the batteries
1. Be sure you have specified rechargeable batteries in the RF Terminal's Setup. If you ordered NiMH rechargeable batteries with a RF Terminal, Worth Data makes the change before shipping. See *Battery* in the *RF Setup.*
2. With the RF Terminal shut off, plug the F15 9V power adapter into the RF Terminal.
3. The firmware in the terminal then checks the level of charge in the batteries to see if they need charging, displaying the following message:

> **Checking Batteries**
> **Please Wait………..**

4. If the batteries are already charged, the message will disappear. If the batteries need charging, the following message is displayed:

> **Charging Batteries**
> **Please Wait………..**

R/F Terminal Menu Functions

There are three modes of operation for the R/F Terminal:

DEVICE SIGN ON *Signs R/F Terminal on for two-way communication with host.*

SETUP MODE *Accesses Setup parameters for Terminal and Base.*

SITE SURVEY *Allows you to survey the Access Points strength*

Upon power-up, the R/F Terminal displays the following opening screen:

802 TERMINAL 1XWFUnnn
ServerIP=nnn.nnn.nnn.nnn
DeviceIP=nnn.nnn.nnn.nnn
Ch:=n SSID=xxxxxxxxxxxx
WEP=128 Rnn
HIT ANY KEY

*(The opening screen can be bypassed upon power up. See **Chapter 2**)*

- The first line on the screen, **802 TERMINAL WFUnnn,** gives the firmware revision number.

- **Server IP** either shows the Server's fixed TCPIP address; or if Device searches out the Server, shows 0.0.0.0.

- **Device IP** either shows the Device's fixed TCPIP address or if it is determined by a DHCP Server, shows 0.0.0.0.

- **Ch:=nn** shows the channel to start using, (the channel of the most frequently used Access Point, 01-11).

- **SSID=xxxxxxxxxxxx** refers to the first 12 characters of the up 32 ch character network name.

- **WEP=128 or 64 or NO** shows how the Device is configured with an encryption key.

- **Rnn=**the radio firmware version**.**

To move on to the first menu item, press any key on the R/F Terminal keypad.

The display now reads:

DEVICE SIGN ON ----->1
SETUP MODE----------->2
SITE SURVEY----------->3

- Press the **1** key to initiate to a two-way communication host computer program through an Access Point.

- Press the **2** key to change the configuration of the Terminal Device.

- Press the **3** key to survey the intended site for adequate coverage.

This screen can be skipped (see **Chapter 2**; *RF System Setup*), causing the R/F Terminal to automatically enter **DEVICE SIGN ON** at power up.

Installing the 802 Terminal Utilities Software

The R/F Terminal system ships with a CD of programs for use with the 802 Terminal communicating with a network. To install any of the programs found on the Utilities CD, simply insert the CD into your CDROM drive. The install program should start automatically. If it does not, simply run the SETUP.EXE program found on the CD. The Setup program is a standard Windows installer and will offer a Default or Custom installation option. If you choose default, everything is installed. If you choose Custom, you can choose any or all of the available programs and samples:

- Demo Programs in VB, Excel, and Delphi
- VB QL3 printer demo program
- 802 Test Program
- Windows 802 RF Terminal Firmware Loader Program
- ActiveX Programming Tool

Demo Programs in VB, Excel, and Delphi
These demos provide samples that illustrate how to use the ActiveX programming tool and how to create a host application that can manage multiple terminals.

VB QL3 Printer Demo Program
A Visual Basic demo that shows how to use a QL3 printer attached to a terminal from your host application

802 Test Program…
The 802 Test Program is provided to help you test your 802 Terminal with a two-way communication program. Refer to the 802 Test Program's help for details on operation.

Windows 800 RF Terminal Loader Utility
The R/F Terminal Loader program is a Windows application that allows you to download new R/F Terminal firmware from Worth Data into your R/F Terminal using the RF link or a failsafe serial link, (firmware can also be downloaded over the radio link. See **Appendix D**; *Firmware Upgrades* for details**.**

ActiveX Programmers Library
The Programmers Library is installed. See Chapter 5 and the installed ActiveX Manual help file for details on usage.

Chapter 2
RF System Setup

RF Terminal Setup

The RF Terminal itself can be configured using the Terminal keypad or by using the bar coded **Setup Menu**, which is in the back of your manual. Even if you configure the RF Terminal using the keypad, you may need the bar coded **Setup Menu** to use as a reference. Most users do not need to change anything in the setup. Some parameters are available only by bar code menu and others only by keypad:

Bar Code Menu Only	Keypad Only
Reset	Server IP
	Device IP
	Starting Channel
	SSID
	Subnet Mask
	WEP Encryption Key
	Control Keys Only
	Automatic Check Back
	Skip Opening Screens
	Display of Year
	Date and Time
	Aiming Dot Duration
	Display Backlighting

If you are using the bar coded Setup Menu and are unfamiliar with scanning bar codes, see **Appendix M**; *How to scan a bar code* to learn proper scanning technique before you begin scanning the bar codes on the Setup Menu.

RF Terminal Default Settings

This is the default configuration of the RF Terminal as it is shipped from the factory. If you ever need to return the RF Terminal to these default settings, use the bar coded Setup Menu and scan the following bar codes in this sequence:

- START SETUP
- RESET
- END SETUP

Default RF Terminal Configuration

Parameter	Default Setting	Parameter	Default Setting
Device IP	DHCP Server Used	**Codabar**	Disabled
Server IP	Device Searches		Start/Stop not transmitted
Subnet Mask	255.255.255.0		CLSI format disabled
Starting Channel	1	**MSI Code**	Disabled
SSID	None		check digit not transmitted
WEP Encryption	None		Plessey Code disabled
			Label Code4 and 5 disabled
Code 39	Enabled	**Code 128**	Enabled
	Accumulate Mode ON		EAN/UCC 128 disabled
	stop/start chs not xmit	**Code 11**	Disabled
	check digit disabled	**RSS-14**	Disabled
	Caps lock OFF	**Code 93**	Disabled
	Full ASCII Enabled		Full ASCII enabled
2 of 5 Code	Disabled	**Beep Tone**	medium
	I 2 of 5 Code disabled	**Date Format**	mm-dd-yy
	6 digit code length	**Baud Rate**	19200
	check digit disabled	**Parity**	none
UPC/ EAN	Enabled	**Data Bits**	8
	UPC supps disabled	**Stop Bits**	1
	UPC-A NSC & check digit transmitted	**Batteries**	Alkaline default
		Speaker	Speaker Volume 5
	UPC-A NSC & check digit transmitted		Headphone Volume 5
		Laser Options	none
	EAN-13 country code & check digit transmitted	**Shut Down Time**	5 minutes
		Voice Messages	303015
	EAN-13 country code & check digit transmitted	**Encryption**	none
	UPC-E 1st char & check digit not transmitted	**Control Keys Only**	no
		Display of year	2 digit
		Skip opening screens	no
	UPC-E 1st char & check digit not transmitted	**Aiming Dot**	No
	EAN-8 1st char & check digit not transmitted	**Automatic Check Back**	No
		Display Backlight Duration	5 seconds
	EAN-8 1st char & check digit not transmitted		

All *parameters are set back to their defaults when reset using the bar coded Setup Menu, even parameters that are changed by keypad only. Shaded items are keypad access only.*

Using the bar code RF Terminal Setup Menu

To use the bar coded Setup Menu, scan these bar codes in this order:

- **Start Setup -** *you should hear 2 beeps*

- **Setup Parameter bar code** (*i.e. "Beep Tone"*)-*you should hear 2 beeps for each scan*

- **Number bar code that corresponds to the appropriate setting** (*i.e. "3" to change the Beep Tone to "high"*) - *you should hear 2 beeps for each scan*

- **End Setup-***you should hear 3 beeps after END SETUP.*

More than one *Setup Parameter* can be changed before you scan END SETUP. For example, if you scanned **START SETUP**, then "**Beep Tone**", then **3**, then "**Speaker Operation**", then **1**, then **END SETUP,** this would change the beep tone to "*high*", and turn the speaker "*off*".

If you are using a Laser Scanner to setup the RF Terminal, the beam will often cover more than one bar code. Cover any adjacent bar codes before scanning, and then check the RF Terminal display to make sure the correct setting was entered.

Using the keypad to setup the RF Terminal

The RF Terminal can be setup via the Terminals' keypad by entering *Setup Mode* from the menu. Turn on the Terminal and press any key. You should see:

> **DEVICE SIGN ON ----->1**
> **SETUP MODE----------->2**
> **SITE SURVEY----------->3**

Press the **2 key** to change the configuration of the Terminal Device.

At this point, the terminal will ask for a password:

> **SETUP MODE**
> **PASSWORD?_**

Enter WDTRI on the keypad. The next item allows you to choose which item to configure:

> **R/F Terminal------->1**
> **Voice Operations->2**

Press **1** to enter the RF Terminal Setup.

 Now you are in the RF Terminal Setup Menu and can choose from the following options:

> **RF Setup---0   Batteries--4**
> **BarCodes--1   Speaker---5**
> **RS232-------2   Other------6**
> **Date/Time--3   Exit-------F1**

At this point, choose which group you want to configure. Most of the RF Terminal setup parameters are accessible from the either the keypad Setup Menu or the bar code Setup Menu. There are only 2 that are available only from the bar code Setup Menu while there are quite a few options that are available **only** from the keypad Setup.

The groups in the keypad Setup Menu contain the following setup parameters:

Setup Group	Parameter	Setup Group	Parameter
RF Setup	Device IP	**Date/Time**	Set Time
0	Server IP	3	Set Date
	Subnet Mask		Date Format
	Starting Channel		Display of Year
	SSID		
	WEP Encryption Key	**Battery**	Recharging or Not
	Authentication (only if WEP is set)	4	
	Skip Opening Screen	**Speaker**	Speaker Volume
Bar Codes	Code 3 of 9	5	Headphone Volume
1	UPC/EAN		Beep Tone
	Code 2 of 5/I 2 of 5		
	2 of 5 Length	**Other**	Shut Down Time
	Code 128	6	Voice Messages
	Codabar		Laser Options
	MSI/ Plessey		Aiming Dot Duration
	Code 11		Automatic Check Back
	Code 93		Control Keys Only
	RSS-14		LCD Display Mode
			LCD Backlight
RS232	Baud Rate		LCD Backlight Duration
2	Parity		
	Data Bits		
	Stop Bits		

Once you have selected a group to edit, you will see each parameter displayed in the order listed above. Use the next section of this chapter as a reference for all RF Terminal Setup Parameters, whether they are configured using the keypad or the bar coded Setup Menu. Each parameter is followed by either a key symbol:

$\boxed{1^{\text{w}}}$ and the group you will find the parameter in, *RF Setup*

or a bar code symbol: ▐║▌║▌║▌

or both, depending on how the parameter can be configured.

RF Terminal Setup Parameters

Default settings are shown in **bold** type in this manual and are marked by a * on the bar code Setup Menu.

The RF Terminal will typically require no setup changes except, Device Address (if more than one terminal) and enabling bar codes to be read other than UPC or Code 39.

Device IP Address

|||||| |||| 1 W   *RF Setup*

Get Device IP from DCHP Server   0.0.0.0
Use a Fixed Address   nnn.nnn.nnn.nnn

- Every terminal needs a unique **Device IP Address**. You can use a fixed IP address, or you can use a DHCP Server (default) to obtain an IP address. Enter in the address in the format of nnn.nnn.nnn.nnn (where each *n* is a value of 0-9); or if you wish to use a DHCP Server, enter 0.0.0.0. The terminal's default setting is to use a DHCP Server.

Server IP Address

|||||| |||| 1 W   *RF Setup*

Search for Server IP Address   0.0.0.0
Use a Fixed Address   nnn.nnn.nnn.nnn

- The terminal communicates with a Server by IP address. The Server IP address can be found by a search initiated by the terminal, or you can enter in a fixed IP address for the server. The default setting in the terminal is to search, (a setting of 0.0.0.0). If you want to use a fixed server IP address, enter the IP address nnn.nnn.nnn.nnn (where each *n* is a value of 0-9.

Subnet Mask

|||||| |||| 1 W   *RF Setup*

Default Subnet Mask   255.255.255.0
User Defined Subnet Mask   nnn.nnn.nnn.nnn

- If you wish to change the default Subnet Mask of 255.255.255.0, then enter a new mask in the format of nnn.nnn.nnn.nnn.

Starting Channel

|||||| |||| 1 W   *RF Setup*

Default Starting Channel   1
User Defined Starting Channel   1-11

- The terminal device's channel should be set to the channel of the most frequently used Access Point to minimize the initial SIGN ON. To save time, the Terminal Device will try other channels in case the *Starting Channel* does not immediately find an Access Point.

SSID

Default SSID	**None**
User Defined	XXXXXXXXXXX

- If wish to restrict terminal device to a specific network name, enter the name here (up to 32 chs). The default setting is NONE. You will need to change it in order to sign on to your network. The SSID is case-sensitive; if you want an SSID with lower case characters, use Shift F2 to go into lower case or you will have to scan the Full ASCII Menu.

WEP Encryption Key

- Here is where you enter the encryption key (WEP). If you want a 64 bit key, enter the 10 hex number (0-F) string to use. If you want a 128 bit key, enter the 26 hex (0-F) number string to use. Whatever you enter should match the Access Point's WEP key.

Authentication

Open System	**0**
Shared Key	1

- Before a wireless client device can communicate on a network, it must authenticate to the access point and the network. You must enter a WEP Encryption key to access the Authentication settings.

- **Open System** authentication, which is the default setting, is the preferred method – it allows any device to authenticate with the access point, but will only allow it to communicate if the WEP keys match.

- *Shared Key* is allowed to comply with the IEEE 802.11b standard, however, because of its security flaws; it is not the recommended type of authentication.

Control Keys Only

No	**0**
Yes	1

- Several special keys on the RF Terminal keypad can generate a response automatically, sending a separate message to the host by simply pressing the appropriate control key (without pressing the ENTER key afterward). This allows for simple and fast scrolling by the operator. The arrow keys, Begin, End, and Search are the specific keys supported. The default setting is to require the ENTER key to be pressed before data transmission.

- If you set this feature to **1** (YES), in order for the RF Terminal to transmit the following values, the corresponding *Control Key* must be the *first* key pressed in a data entry sequence. If it is not the first data entered, the arrow key is ignored.

Control Key on RF Terminal	Code transmitted to Host
Up Arrow	FS (ASCII 28)
Down Arrow	GS (ASCII 29)
Left Arrow	RS (ASCII 30)
Right Arrow	US (ASCII 31)
Begin	ETB (ASCII 23)
End	CAN (ASCII 24)
Search	VT (ASCII 11)

LCD Backlight Display Mode

1^w *Other*

No	0
Yes	**1**

The Backlit Display is standard. The default setting is for the LCD Backlight to be ON. As shipped the *Backlight Duration* is 5 seconds.

Backlight Duration

1^w *Other*

Always ON	0
Duration in # of seconds	1..2..**5**..-9

The *Backlight Duration* is of no concern unless you have set the *LCD Backlight Display* to 1 for YES. This setting determines how long the Backlight Display is on at startup or when triggered by pressing the F2 key. **Always ON** will create a drain on your batteries and you can expect shorter battery life. The default setting is 5 seconds.

Skip Opening Screens

1^w *RF Setup*

No	**0**
Go to Device SIGN ON	1

- Many users want to skip the opening screens and go directly to SIGN ON communication once their programs are fully operational. Selecting **1** will automatically take the operator to the DEVICE SIGN ON and into your application program, skipping the screen shown below:

> **DEVICE SIGN ON ------>1**
> **SETUP MODE------------>2**
> **SITE SURVEY------------>3**

If you have skipped the above screen and want to get to it, simply the press the **F1** key.

If your skip the opening screen and you want to check the settings of the Terminal without having to reset this parameter, just press the *Status Key* and the terminal will display six lines as follows:

> **mm/dd/yy hh:mm**
> **alkBAT■■■■■■■■■■■-zz%**
> **ServerIP=nnn.nnn.nnn.nnn**
> **DeviceIP=nnn.nnn.nnn.nnn**
> **Ch:=n SSID=xxxxxxxxxxx**
> **WEP=128 Signal=nn%**

alk - *when Alkaline batteries are specified in <u>Battery</u> setup*
rch- *when NiMH batteries specified in <u>Battery</u> setup*
zz=*percent or battery life left in numbers i.e. 99, 50, 23*

- **Server IP** either shows the Server's fixed TCPIP address; or if Device searches out the Server, shows 0.0.0.0.

- **Device IP** either shows the Device's fixed TCPIP address or if it is determined by a DHCP Server, shows 0.0.0.0.

- **Ch:=n** shows the channel to start using, (the channel of the most frequently used Access Point).

- **SSID=xxxxxxxxxxx** refers to the first 12 characters of the up to 32 character network name.

- **WEP=128 or 64 or NO** shows how the Device is configured with an encryption key.

- **Strength=nn%** shows the signal strength from the best Access Point with the same SSID, (if already SIGNED ON).

Press the **STATUS** key again to resume processing.

Speaker and Headphone Volume Controls   `1 ᵂ` *Speaker*

By selecting *Speaker* in the keyboard Setup Mode, you get to the options to control the *Speaker/Beeper* and *Headphone* volumes. If you are using headphones, you will want set the *Speaker* volume to 0 to conserve batteries. Volume settings possible are 0-9.

The prompt for *Speaker Volume* is:

> **SPEAKER VOLUME**
> **Enter 0-9 for Volume**
> **Control**
> **Current Value is: 5**

The prompt for *Headphone Volume* is:

> **HEADPHONE VOLUME**
> **Enter 0-9 for Volume**
> **Control**
> **Current Value is: 5**

Automatic Check Back

1 *Other*

This parameter should not be changed under normal circumstances. After the host sends a prompt, the Terminal goes to sleep waiting on the operator to key or scan input in response to the prompt. It waits until the *Automatic Shut Off* time or until the operator responds. This parameter sets the time that the Terminal stops waiting on input from the operator, discards the current prompt, and goes back to the host to see if there is a change in instructions. If no change, the host must resend the prompt again because the Terminal has discarded the original prompt. The host now has the opportunity to change a prompt. The time can be set in increments of 5 seconds, up to 495 seconds. The default value is 00. The values possible for entry are 00-99. An entered 99 gives 99x5 seconds, or 495 seconds between check backs. The Terminal sends back an *ASCII 07* for the data back to the host (ID ASCII 07 CR). This parameter's prompt is:

> **AUTOMATIC CHECK BACK**
> **Key 00-99.**
> **Current Value: 00**

Code 3 of 9 (Code 39)

1 *Bar Codes*

Enable Code 3 of 9	**0**
Disable Code 3 of 9	1
Enable Full ASCII Code 39	**2**
Disable Full ASCII Code 39	3
Enable Code 39 Accumulate Mode	**4**
Disable Code 39 Accumulate Mode	5
Enable Start/Stop character transmission	6
Disable Start/Stop character transmission	**7**
Enable Mod 43 Check Digit	8
Disable Mod43 Check Digit	**9**
Enable Check Digit transmission	A
Disable Check Digit transmission	**B**
Caps Lock ON	C
Caps Lock OFF	**D**

- The Start and Stop character for Code 39 is the ***** character. Settings **6** and **7** determine whether or not those characters are transmitted to the computer along with the data. For example, at setting **6**, the data of **1234** would be transmitted as ***1234***. Transmitting the start and stop

2-9

characters can be useful if you need to differentiate between data that comes from a bar code versus data coming from the keypad.

- Enabling use of the Mod 43 check character requires that the last character of your bar code conform to the Mod 43 check character specifications. See **Appendix E;** *Code 39* for more information. Enable transmission (**A**) will send the check digit data along with the rest of the bar code data to your computer. To use **A**, you must also be using **8**.

- **Caps Lock ON** causes lower case letters read as data to be transmitted to the computer as UPPER CASE, and upper case letters to be transmitted as LOWER CASE. Numbers, punctuation and control characters are not affected. **Caps Lock OFF** means that letters will be transmitted exactly as read. This setting applies to **all** bar code types.

- See **Appendix E;** *Code 39* for more information regarding *Accumulate Mode.*

UPC/EAN ‖‖‖‖‖‖‖ 1 w *Bar Codes*

Enable UPC/EAN	**0**
Disable UPC/EAN	1
Enable UPC/EAN Supplements	2
Disable UPC/EAN Supplements	**3**
Enable transmission of UPC-A NSC or EAN 13 1st 2 digits	**4**
Disable transmission of UPC-A NSC or EAN-13 1st 2 digits	5
Enable transmission of UPC-A and EAN-13 check digit	**6**
Disable transmission of UPC-A and EAN-13 check digit	7
Enable transmission of UPC-E NSC and EAN-8 1st digit	8
Disable transmission of UPC-E and EAN-8 1st digit	**9**
Enable transmission of UPC-E and EAN-8 Check digit	A
Disable transmission of UPC-E and EAN-8 check digit	**B**
UPC-E0 Compressed	**C**
UPC-E0 Expanded	D
EAN-8 observing 9&A	**E**
EAN-8 forced to transmit 8 digits always	F

- Use setting **2** to enable reading of the 2 and 5 digit UPC/EAN supplements commonly found on magazines and paperback books as well as the Extended Coupon Codes. Using this setting force left to right reading of UPC codes to assure that the supplement code is not missed.

- ISBN (International Standard Book Numbering) bar codes are EAN-13 with a 5-digit supplement. If the "Bookland" bar code uses 978 (books) or 977 (periodicals) as the first three digits, then the RF Terminal can transmit it in the ISBN format. The settings for this are found under the *Laser Options* parameter. To enable transmission of the ISBN (prior to January

2006) format, set the *Laser Options* parameter to **D.** To return to the default of normal EAN-13 transmission, set it to **C**. For details on ISBN, see **Appendix J**, *UPC/EAN*.

- Use setting **4** and **9** to enable transmission of the NSC character to your computer. The **N**umber **S**ystem **C**haracter is the leading character in the bar code. For details, see **Appendix J**, *UPC/EAN*.

- Use setting **6** and **A** to enable transmission of the check digit character to your computer. The check digit is the last character and is based upon a calculation performed on the other characters.

- Setting **C** transmits UPC-E0 bar codes as is; setting **D** transmits them with inserted zero's to make them the same length as a UPC-A bar code. A NSC of 0 is assumed. It is possible to read UPC-E1 bar codes; by default this option is disabled. Do not enable UPC-E1 if you plan on reading EAN-13 bar codes; you may experience partial reads when reading EAN-13. The UPC-E1 option is set in the *2 of 5 Code* parameter. To enable UPC-E1 reading, set the *2 of 5 Code* parameter to **8**. To turn *off* UPC-E1 reading, set it back to the default of **9.**

- If you prefer to transmit UPC-E bar codes in a 6-digit format while EAN-8 is transmitted in its original 8-digit format use setting **F**. This will allow you to use settings **9** and **A** and still transmit EAN-8 as 8 digits.

- UPC-A can be transmitted in EAN-13 format by adding a leading 0 (USA county code) to the UPC-A data. This setting is found in the **Laser Options** parameter. To transmit in EAN-13 format, set the **Laser Options** parameter to **F**. To return to the default (UPC-A transmitted in original format) set it to **E.**

Code 128

|||||| ||| || | | | | | | | 1 W *Bar Codes*

Disable Code 128	0
Enable Code 128	**1**
Enable UCC/EAN-128	2
Disable UCC/EAN-128	**3**
Enable Storage Tek Code (TriOptic Code 39)	C
Disable Storage Tek Code (TriOptic Code 39)	**D**
Bar Code ID's transmitted	E
Bar Code ID's not transmitted	**F**

- UCC/EAN-128 is a subset of Code 128 that follows certain specifications regarding character content, length and check digits. Enabling UCC/EAN-128 (**2**) causes the RF Terminal to look for a Code 128 bar code that begins with the Code 128 F1 (Function 1) character. See **Appendix H:** *Code 128* for more details.

- The StorageTek Tape Label code is a proprietary variation of Code 39

code used for the storage of computer data tapes. Enabling the tape label code (**C**) does not disable reading of Code 128 or Code 39 bar codes.

- Bar Code ID's are characters assigned to each bar code type to identify that particular type of code. These Bar Code IDs can be output as a prefix to the bar code data to identify what type of bar code you are using. The Bar Code ID's are assigned as follows:

Bar Code	ID	Bar Code	ID	Bar Code	ID	Bar Code	ID
Codabar	a	2 of 5	f	UPC-E (1)	o	LabelCode 4	y
Code 39	b	Code 128	g	EAN-8	p	LabelCode 5	z
UPC-A	c	Code 93	i	RSS-14	r		
EAN-13	d	MSI	j	StorageTek	s		
I 2of5	e	UPC-E(0)	n	Plessey	x		

The ID character is transmitted in front of the bar code data.

Codabar

|||||| ||| ||| | 1 ᵂ *Bar Codes*

Enable Codabar	0
Disable Codabar	**1**
Enable CLSI Codabar	2
Disable CLSI Codabar	**3**
Disable Start/Stop character transmission	**4**
Enable Start/Stop character transmission	5

- CLSI is a form of Codabar often used by libraries.

- Setting **5** will transmit the Codabar *start* and *stop* characters with the bar code data to your computer. If you are varying the start and stop characters to differentiate between different labels, transmitting the start and stop can be helpful. See **Appendix G**; *Codabar* for more information.

2 of 5 Code

|||||| ||| ||| | 1 ᵂ *Bar Codes*

Enable Interleaved 2 of 5	0
Disable Interleaved 2 of 5	**1**
Enable Interleaved 2 of 5 check digit	2
Disable Interleaved 2 of 5 check digit	**3**
Enable check digit transmission	4
Disable check digit transmission	**5**
Enable Standard 2 of 5	6
Disable Standard 2 of 5	**7**
Enable UPC- E1	8
Disable UPC- E1	**9**
Normal Code 39 decode (Laser scanners)	**B**
Loose Code 39 decode (for use with LZ400 thru windshields)	C
Looser Code 39 decode (for use with LZ400 thru windshields)	D

- Setting **2** requires that the last digit in your bar code conform to the specifications for the 2 of 5 check digit calculation. See **Appendix I***; 2 of 5 Code* for more information.

- Transmission of the check digit (**5**) requires the use of setting **2** and will transmit the check digit along with the bar code data to the computer.

- Setting **B** pertains to the decoding algorithms used by the RF Terminal when using a Laser Scanner. In most cases, this should be left at the default **B** setting.

- If scanning VINs (Code 39) through windshields with a laser scanner, (applies to the LZ400 only) try setting this parameter to **C** or **D**. Try **D** first. If you get substitutions, try **C.**

2 of 5 Length

|||||| |||| `1` w

Default setting	06
Valid entries	00-98
To read variable length 2 of 5 codes	00

- 2 of 5 is so susceptible to misreads that the RF Terminal adds an additional safeguard - it can be configured to look for fixed-length data only.

- The default setting of **06** causes the RF Terminal to read **only** 2 of 5 codes that are 6 digits in length. To set the RF Terminal to read a different length, scan any two-digit number from the bar pad table. For example, to change the RF Terminal to accept an 8-digit bar code, scan **0** then **8** from the bar pad table. 2 of 5 code must always be an even number of digits so the length setting must always be an even number.

- Reading variable length I 2of5 or 2 of 5 codes is to be avoided if at all possible. The **00** setting is supplied for the purposes of reading codes of unknown length, counting the digits and setting the length to the proper number.

MSI and Plessey

|||||| |||| `1` w *Bar Codes*

Disable MSI	0
Enable MSI, 1 Mod 10 check digit	1
Enable MSI, 2 Mod 10 check digits	2
Enable MSI, 1 Mod 11/ Mod 10 check digit	3
Transmit no check digits	4
Transmit 1 check digit	5
Transmit 2 check digits	6
Enable Plessey bar code (mutually exclusive with MSI)	7
Enable LabelCode5 (mutually exclusive w/MSI & Plessey)	8
Enable LabelCode4 (mutually exclusive w/all above)	9

- **LabelCode5** and **LabelCode4** are proprietary bar code types used by Follet.

- If you have enabled the Mod 10 or Mod 11 check digits, they will be transmitted along with your bar code data from the RF Terminal to your host.

- For more information regarding MSI or Plessey Code, see **Appendix K**; *MSI Plessey Code.*

RSS-14

||||||||| 1   *Bar Codes*

Disabled	**0**
14 digits with no identifiers, i.e. 10012345678902	1
14 digits + identifiers, i.e.]e00110012345678902	2
14 digits + UCC-128 format, i.e.]C110012345678902	3

- By default, standard RSS-14 is disabled, scan 1 to enable. We support the standard and stacked versions of RSS-14 formats.

    For more information on RSS-14, see the AIM website at **http://www.aimglobal.org/standards/symbinfo/rss_overview.asp**

Code 93

||||||||| 1

Enable Code 93	0
Disable Code 93	**1**
Enable Full ASCII Code 93	2
Disable Full ASCII Code 93	**3**

- Code 93 is similar in character set to Code 39. See **Appendix F;** *Code 93* for more information. Code 93 is not a commonly used bar code symbology.

Beep Tone

||||||||| 1   *Speaker*

Lowest	0
Low	1
Medium	**2**
High	3
Highest	4
No Beep Tone	5

Batteries

||||||||| 1   *Battery*

Alkaline Batteries	**0**
NiMH Rechargeables	**1**

- In order to get an accurate *Battery Status* reading; you must select the correct battery type. If you ordered NiMH batteries (part number L01)

with the RF Terminal, this will be set to Rechargeable before shipping.

- If you didn't order re-chargeable batteries, this shipped setting is Alkaline. *Battery Status* can be displayed by pressing the STATUS key on the RF Terminal keypad.

- Before you can recharge the batteries, this parameter must be set to Rechargeables. Don't try to recharge alkaline batteries. They might explode. This will void your warranty.

- If you decide to use rechargeables after ordering the RF Terminal without rechargeables included, you must change this setting allow recharging.

Date Format

|||||| ||||| | 1 W | *Date/ Time*

| **US Format** | **0** |
| European Format | 1 |

- The US format of **mm/dd/yy** is the default setting.

- If you switch formats, you must reset the date (**SET DATE**) in the new format also.

Set Date

|||||| ||||| | 1 W | *Date/ Time*

For correct date display, the 6-digit date must be set in the date format you plan to use. By default the US terminals use the US date format of **dd/mm/yy**. If you change the date format, you must re-set the date to match the new format. For example, to set a date of January 20, 1999, you would enter 012099 (US format) or 200199 (European format). The date can be scanned in from the bar coded Setup Menu or entered from the RF Terminal keypad. To display the date during operation, press the STATUS key.

Set Time

|||||| ||||| | 1 W | *Date/ Time*

The time is set using a 4-digit military **hhmm** format. For example, to set the time to 3:08 p.m., you would enter **1508.** The time can be scanned in from the bar coded Setup Menu or entered from the RF Terminal keypad. To display the time during operation, press the STATUS key.

Display of Year

|||||| ||||| | 1 W | *Date/ Time*

| **2 digit** | **0** |
| 4 digit | 1 |

- By default, the RF Terminal is configured to display and transmit the year in a **2-digit format**; i.e. 2005 would transmit and display as **05**.

- *Before* you change the RF Terminal to display a 4-digit year, i.e. **2005**, make sure that the software receiving data from the RF Terminal is set up to accept a 4-digit year.

Voice Message Partitions ‖‖‖‖‖‖‖ [1ᵂ] *Other*

This parameter partitions the total amount of voice messages into different message lengths. The default setting is:

303015
xx yy zz

where: **xx** is number of ½ second messages
yy is the number of 1-second messages
zz is the number of 2-second messages

The total time allotted must not exceed **75** seconds. To change the partitions, scan or enter **6** digits total; **2** for the number of **½-second** messages, **2** for the number of **1-second** messages and **2** for the number of **2**-second messages. See the default setting as an example.

*WARNING: changing the **Voice Message Partitions** parameter after you have recorded messages could result in having to re-record some of them; they would still be there but longer messages may get cut up and shorter ones combined.*

Shut Down Time ‖‖‖‖‖‖‖ [1ᵂ] *Other*

By default, if the RF Terminal is inactive (no keystrokes or scanning) for more than **5 minutes**, it will shut itself down in order to conserve batteries. This includes SIGNING OFF if appropriate. To resume operation, you must turn the RF Terminal back on using the ON/OFF key. To change the amount of time the RF Terminal waits before shutting down:

- Scan **Shut Down Time**
- Scan two digits - the default is **05** (5 minutes)- to correspond to the length of time in minutes. For example, *01* would be *1 minute.*

If you want to prevent the RF Terminal from shutting off automatically at all, set the **Shut Down Time** to *00.*

Laser Scanner Options ‖‖‖‖‖‖‖ [1ᵂ] *Other*

None	**0**
Double Decode	1
4.5 second laser beam	3
Transmit EAN-13 normally	**C**
Transmit EAN-13 in ISBN format	D
Transmit UPC-A normally	**E**
Transmit UPC-A in EAN-13 format (with 0 flag character)	F

- By default, the RF Terminal has no special laser options set. If any of the features below seem to fit your situation, set them appropriately. Settings **C** through **F** are not laser-dependent and are for UPC/EAN bar code types only. See the **UPC/EAN** parameter for more information

- **Double Decode** is there to minimize the possibility of misreads when scanning very poor quality bar codes. This option forces the RF Terminal to keep reading until it gets two results that are identical. This "double scan checking" takes longer but will minimize misreads since it must get the same result twice before considering it a "good" read.

- **4-second laser beam** increases the amount of time the laser beam is activated, giving the laser more time to try and read a code. This option is useful for trying to read poor quality code. Using the 4-second laser beam with long range lasers give the operator more time to aim the laser properly at a distant bar code (usually using the "marker" beam). The default beam time is 2 seconds.

Aiming Dot Duration   `1 w`   *Other*

This parameter applies to the built-in internal laser and the LZ200 and LZ400 tethered laser scanners. Before the laser beam spreads, you can create a brighter aiming dot to be sure you are on the bar code you want to read. The default is set to **00**, no aiming dot. You can key in 01 through 99, which creates an aiming dot in $1/10^{th}$ second increments; i.e., 20 would be two seconds.

Reset ||||| ||| |||

While in Setup Mode, **DO NOT** scan the **RESET** bar code unless you want to set *all* of the RF Terminal setup parameters back to the factory default settings. Scanning **RESET** will erase *all* changes you have made.

The following serial parameters Baud Rate, Parity, Data Bits, and Stop Bits apply only to firmware updates and a portable printer such as the QL320 printers.

Baud Rate | | | | | | | | | | | 1 W | *RS232*

4800	0
9600	1
19,200	**2**
38,400	3
57,600	4
115,200	5

Parity | | | | | | | | | | | 1 W | *RS232*

None	**0**
Even	1
Odd	2

- **None** is generally used with 8 data bits

- **Even** or **Odd** parity is generally used with 7 data bits.

Data Bits | | | | | | | | | | | 1 W | *RS232*

7 bits	0
8 bits	**1**

Stop Bits | | | | | | | | | | | 1 W | *RS232*

1 bit	**0**
2 bits	1

Chapter 3
Operational Theory

Before you jump in and start writing a complex host program, it might be nice to be familiar with the theory behind the operation of your RF Terminal.

Basic RF System communications…

A WIFI RF Terminal system consists of three components – *Host Server*, *Access Points* and *RF Terminal*. The *Access Points* are connected to the *Host Server* by Ethernet wiring. The RF Terminal "**signs in**" by establishing communication with a *Server Program* (located on the *Host Server*) through an *Access Point*. After the *RF Terminal* "**signs in**", the *Server Program* can send a prompt to the terminal with the ActiveX program interface provided by Worth Data. The application running on the *Host Server* sends a data prompt to the *RF Terminal* device to the Access Point (using the Ethernet wiring), and then by radio link to the terminal device. The *RF Terminal* displays the data prompt on the display and waits for the operator to enter the requested data. Once the operator enters his data, the *RF Terminal* transmits the data to the *Access Point,* which in turn passes it on to the *Host Server*. The application on the *Host Server* processes the information and sends a new data prompt out to the *Access Point* and the whole process begins again.

A little more in depth…

This RF system's dialogue is Terminal initiated. The Terminal says, "**I'm here, give me something to do**.

When you select **DEVICE SIGN ON?,** the RF Terminal first establishes communication with the network as follows:

1. It looks for an *Access Point* with an identical SSID and WEP Key using the Channel Number in its configuration as the starting channel.

2. If the terminal is configured to obtain its IP address from a DHCP Server, it requests an IP address from a DHCP Server. If it requests an IP address, the terminal will display:

    > **Looking for DHCP Server,**
    > **Please Wait**

3. If the terminal does not have a fixed Server IP address configured, it does a search for an Application Server. While is searches for an Application Server, the terminal will display:

    > **Looking for App Server,**
    > **Please Wait**

4. Now the RF Terminal sends a SIGN ON message to the application Server. All messages include data as well as the transmitter's and receiver's MAC address, IP address, and Port address.

When the Server receives a **SIGN ON** message from a RF Terminal, the Server transmits the SIGN ON information to the host application program. The host application can then do one of two things:

1. If it has something for the Terminal to do, it can send a prompt to the Terminal. The RF Terminal receives the prompt, waits for the operator to enter the requested data, and then transmits the data back to the application program.

2. If the host program does nothing within 2 seconds, the Terminal displays the message:

WAITING FOR PROMPT
FROM HOST COMPUTER

Lets suppose that a RF Terminal and a host application program have been processing data by sending prompts and data back and forth as described in example 1. The host application program sends a data prompt to the RF Terminal. The RF Terminal transmits the operator-entered data back to the Server. If the host application program has another prompt for the terminal, it sends it out, repeating the process above.

If the host application program doesn't respond within 2 seconds, the Terminal Device displays

WAITING FOR PROMPT
FROM HOST COMPUTER

until the prompt is received.

If the Terminal gets no response after 3 transmissions, it will perform an Access Point scan. If it fails to get a good signal from an Access Point with matching SSID and WEP Key, it will display the message:

TERMINAL OUT OF RANGE
PRESS ANY KEY TO RETRY_

You might walk closer to an Access Point or you might simply hold the terminal up high over your head. When you have repositioned the terminal, pressing a key on the Terminal starts the transmission process over again.

If the Access Point scan finds a satisfactory Access Point, the Terminal will display the message:

SERVER NOT AVAILABLE
HIT ANY KEY_

This tells you that the Application Server host program is not running. If you press a key, you will be transferred to the mode menu where you can chose to Sign On again.

Can I change a prompt after it has been sent?

Normally once the Terminal has received a prompt from the host, it goes to sleep and waits (as long as it takes) for the operator to scan or key something in response. The host cannot send another data entry prompt without creating a "Sequence Error." However, you might want to change the prompt to a slow operator or even locate a lost terminal with beeping. You can do this using the "Automatic Check Back" option. You set a predetermined interval (in increments of 5 seconds) of when you want the terminal to send back a message "do you have a change for me?" If there is no change, you simply resend the original prompt; if there is a change, you send the changed prompt. (See Chapter 2, *Automatic Check Back*).

Chapter 4

Performance Issues

Evaluating your area of planned operation

Since every operational environment is different, it is impossible for us to tell you exactly what equipment you need and where you should put it to achieve maximum performance from your RF System. However, since access points are very inexpensive, you should be able to obtain whatever coverage you need. In a typical warehouse, a terminal should be able to achieve communication within about 150 feet of an access point. If you are planning the wiring of a new installation, you will want to lay out your access points so that there is overlap.

Below is a 300 ft. by 500 ft. warehouse area with access points positioned to provide planned coverage over the entire area. You do a site test by positioning one access point in each location and verifying that the projected area of coverage is actually attained. (You don't have to be connected to the network to do this site test; you only need to supply power to the Access Point).

- - - - - - - - - coverage area
            coverage overlap
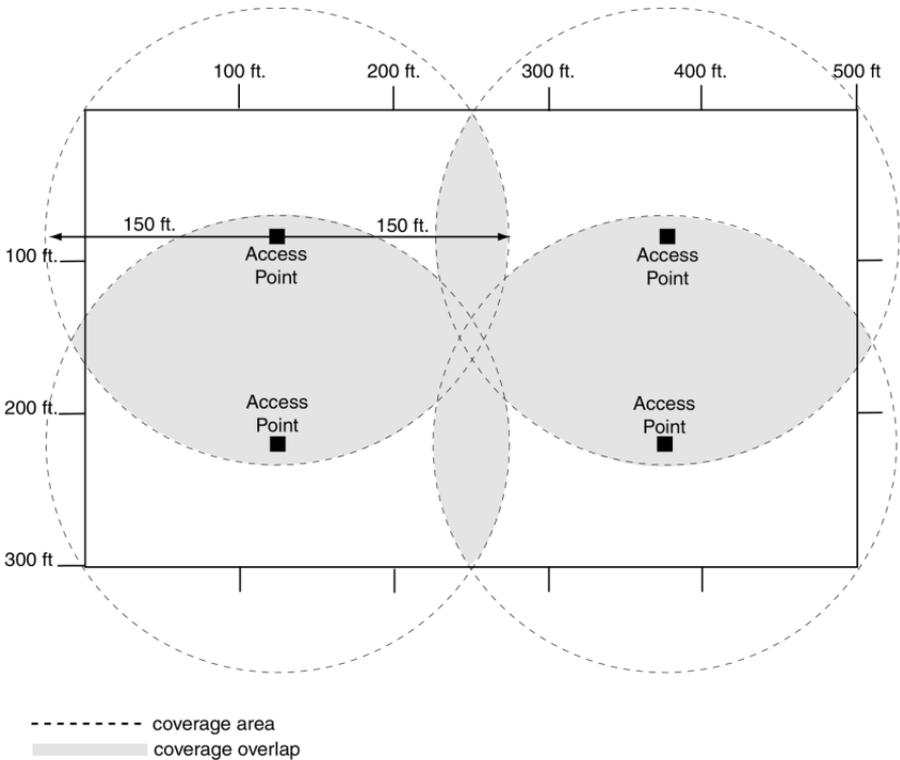
 If you have difficulty somewhere in the area, as long as that area is in an area of overlapped coverage that a different position of the Access Point

covers, you won't have a problem. If you find a spot that none of the planned Access Point locations will cover, you will have to move one of the Access Points closer to the problem spot or plan on adding another closer Access Point. It is best to locate the Access Point in the center as high as possible of the area you intend coverage. The weakest signal will be directly under an access point, (if the antenna is vertical).

Avoid locating antennas close to large metal objects such as filing cabinets, microwave ovens, 2.4GHz cordless phones, or large containers of water. Avoid placing antennas close to an outside wall to minimize signal efficiency. If you need to have coverage outside, place it next to a window.

Once you have determined the Access Points and their locations, you are ready to wire the Access Points to the LAN.

To perform a Site Test, turn the unit on and press any key to go past the opening screen and get to the "Mode Menu" which displays as follows:

<div align="center">

DEVICE SIGN ON ----->1
SETUP MODE----------->2
SITE SURVEY----------->3

</div>

Press the **3** key to start the Site Survey.

The terminal will do an Access Point Scan and report on the three Access Points with the strongest signals contacted, (or fewer than three is less contacted). The display will be updated every two seconds and have the following format:

<div align="center">

ACCESS POINT SCAN

---SSID---	CHAN	SIGNAL
WORTH DATA	11	80%
WORTH DATA	9	65%
WORTH DATA	5	35%

HIT F1 TO EXIT

</div>

Access points without a matching SSID will not be shown, unless the Terminal's SSDI is blank. If no Access Point can be located, nothing will show below the headings.

The "SIGNAL" number on the right that can vary from 0-100, with 100 being best. You have adequate signal strength at 20. If you have less than 20, you need to move or add an Access Point. Typically it operates in the 50% range. (50% is not bad; the radios on the Access Points and the Terminals drop power to conserve batteries and to minimize interference). Remember when doing a site test in a warehouse, as the contents of the warehouse change the interference changes too. So if you have a marginal signal on the Site Survey, it may turn into poor performance later.

There is also some basic information about Radio Frequency itself that can help you make smart choices about the location and composition of your system:

- **Metal walls are almost impenetrable by RF**. If your warehouse

computer is located in a metal shed, you will need at least one Access Point located outside the metal shed.

- **The more walls you try to transmit through, the more the signal breaks down.** Walls that have metal studs (interior office walls) and concrete walls with steel rebar slightly degrade the signal with each wall you try to go through. Metal walls may require the use of Relay Stations to achieve adequate coverage.

- **Organic material absorbs RF energy**. If you are trying to operate in an area with lots of densely packed organic material (bags of beans or corn), expect and plan for reduced operating ranges.

Raise the Access Point. Sometimes just raising the Access Point 12 feet will dramatically increase your operating range, especially in a warehouse or grocery store environment. Mounting the Access Point on the ceiling with the antenna pointing vertically (up or down) is the best.

Chapter 5
Before you begin programming…

The "Application Host Program" or "Server Program" is a program designed and written by the user that incorporates the WD802Term ActiveX control. When an 802 RF Terminal is turned on and "Signs In" to the host, the WD802Term control reports a terminal ID number to the host application that is unique to that terminal. The IP address of a particular terminal can also be obtained.

Once an 802 RF Terminal is signed in, it receives messages from the host user program. The terminal responds back to the host application program with data that was keyed or scanned by the terminal's user. The host application program processes the data and sends back the next prompt. Each 802 RF Terminal has a unique IP address (or at least a unique Mac address). The host program can obtain any terminal's IP address or, for the sake of compatibility with programs written for 70/700 series terminals, resolve terminal addresses to a single character Terminal ID (0-9,A-Z, a-z, and -=) by using the WD802Term ActiveX component.

The dialog between 802 RF Terminal and Application Host is established when a terminal connects to the 802.11 RF network. The host computer application waits until a terminal SIGNS ON, then begins its processing by sending the first prompt out to the terminal via an 802.11/b Access Point.

Before you begin programming, there are some factors you should take into consideration during the planning process.

- **Plan for system failures**. This includes hardware failures, software failures and operator failures. In order to create an efficient application, you must put some thought into what you will do when different parts of the system fail.

- **Look for All Errors**. Be sure your program is trapping all possible error conditions that the Server may return to you. The list includes:

  > *Sequence Errors detected*
  > *Illegal Command detected*
  > *Server Re-Initialized*
  > *Addressing a Terminal Not Signed In*
  > *Command without an ID*

  All of these error conditions are detailed in the next chapter. Don't forget to program for them; this is a common mistake. Failure to trap them will give create very strange, unpredictable results.

  Even though you don't think your code will ever make a mistake, take advantage of feedback that the Server provides. Failure to do so is a common mistake that eventually results in serious program failure, sometimes due to hardware problems that go undetected.

- **Parse the Returned Strings thoroughly**. Don't assume anything about the next response from the Server to your program and look only for the partial string such as the ID only. Parse the string returned completely, and be sure you are examining every possibility. Failure to do so is a common mistake.

- **Plan for expansion**. You may start small (1 Terminal) but try to create an application that will allow for easy expansion.

- **Use the Test Program**. The test program can at least allow you to see how the system functions and whether you can anticipate any system-wide problems. The test program should also be used as a response-time benchmark.

- **Study the Demo Programs**. Demo programs are included for examples of how to use the ActiveX tool provided.

Failure Planning

Hardware Failures

Let's assume that each part of the system has failed. How are you going to know what has happened and how are you going to recover?

- The most frequent failures are at the Terminal level. If a Terminal has a hardware failure, it will not be able to SIGN OUT. It is possible for the Terminal operator to press the ON/OFF key or the F1 key by accident, forcing the Terminal to SIGN OUT - sometimes in the middle of a transaction. This happens at battery-changing time also. You need to plan for partial transactions - do you trash the data you do have and start over, or pick up where you left off?

- Keep in mind that if a Terminal has SIGNED OUT in mid-transaction, the Server clears any pending message for that Terminal before it will allow it to SIGN ON again. Make allowances to re-send messages or prompts that were cleared upon SIGN ON if necessary.

Operator Errors

- Plan on your operator walking out of range and going to lunch in the middle of a transaction. What do you do with the data you do have, and where are you going to start up again?

- Let's say your operator is SIGNED ON and decides it's time to take a break. Instead of pressing the F1 key to SIGN OUT, he presses the OFF key. Pressing the OFF key is OK (it will SIGN him OUT) but there is a delay until the SIGN OUT is acknowledged. Because of the delay, the operator might think he didn't press the key hard enough and press it again - this time actually powering down the Terminal *before* the SIGN OUT was complete. If this happens, you need to plan to *re-send* the last prompt to the Terminal when he SIGNs ON again.

Chapter 6

Programming for the 802 RF Terminal

The programming support offered for the 802 RF Terminal is an ActiveX drop-in component. Every necessary function is defined - you just complete the code for each function.

The ActiveX component functions as a Server for managing data traffic to and from one or more terminals (your "terminal network") and as an interface for your host application. There is no other software required, besides this control and your host application, to run a terminal network.

Introduction

It is important to note that creating working programs for the 802 Terminal requires significant programming skills. In order to create a working application you will not only need to be familiar with a programming language such as Visual Basic or Delphi or C++; you will need to be experienced and comfortable building real applications with one of these (or similar) programming environments.

You should be familiar with the concepts of objects, methods, event handlers, properties, scope, arrays, pointers, variable and value parameter passing, etc.

Database connectivity, data structures, and state management techniques are key to creating a program that can work with multiple terminals.

If you do not understand the references mentioned here and the implications of the pseudo code illustrations, you may not have the skills necessary to create a working application using the 802 Terminal WD802Term ActiveX programming tool.

What follows are just examples to get you started and show some basic technique. There are lots of different ways to do this and it is possible to create sophisticated transactions that intelligently instruct the terminal operator and collect complex data.

Objects, Properties, Methods, and Events

The programming model for the 802 Terminal is based on the WD802Term ActiveX component. This component is an "object" that is embedded in your application that you build using a compatible programming environment such as Visual Basic or Delphi.

The WD802Term "object" has a number of methods, event handlers, and properties that it publishes (makes available) to your program.

Properties are generally initialization and configuration settings that you set once when your application starts. Examples are ServerActive and LogFileName.

Methods are how you initiate communication with the WD802Term object. You can request that a prompt be sent to a terminal, map a terminal ID to an IP address, and a variety of other services.

Events are how the WD802Term object initiates communication with your application. You write "event handlers" in your program to respond that respond appropriately when WD802Term "fires" an event that activates its associated event handler. Examples are OnTermSignIn and OnTermData.

Creation of the source code "shell" for an event handler is generally handled by your development environment (IDE for Integrated Development Environment). For example, in Delphi, simply double click in an event field in the Object Inspector; or in VB, from the source code window, select the Object from the pull down list at the top left and then click on the desired event in the Procedures pull down list at the top right.

You will notice that the IDE creates a "skeleton" function (or procedure or sub) in source code that will include any parameters required to retrieve the data delivered to the event handler by the WD802Term object.

It is your job to add functionality to the skeleton event handler that is relevant to your application. It is important to remember to keep event handlers short and efficient. Do not make method calls to WD802Term from within a WD802Term event handler. Instead set up a state management and polling or threading scheme as outlined below.

Signing In, Data Structures, Transactions, and State Management

When a terminal **SIGNS ON**, it sends a signal to your application via the WD802Term object, which fires the OnTermSignIn event. When the event fires, the terminal has already been assigned an ID number by WD802Term and this ID number is passed to your application in the event handler.

Once it has signed in, the terminal is now waiting for your application to make a call to one of WD802Term's methods that sends a prompt to the terminal. Keep in mind that it is important to keep event handlers short and to try to avoid making method calls from inside an event handler. This brings us to transactions, state management, and data structures

Generally, you will have some kind of **transaction** process that you will define. Typically a transaction would be defined by a series of prompts and the data returned in response to the prompts.

Here is an example of a series of prompts that represent a transaction. When a transaction is completed, it repeats as controlled by the host application

Go to location XX
Press enter when ready:

Pick Item YY qty N
Scan barcode:

Enter Qty Picked:

Of course you can see how you might handle incorrect items or wrong
quantities by having your application generate prompts such as

Incorrect Item
Scan correct item:

Too many items
Pick item YY qty N

Enter Qty picked:

These are just examples and there are other ways to design a transaction of
this sort. The point is that you will need to create a **data structure** that
defines the transaction and another data structure that keeps track of where
in the transaction each terminal is (**state management**), independent of any
other terminals that might be active.

You will need to create a data structure or record of some sort that keeps
track of each terminal's state. The structure might keep track of where in a
transaction process a terminal is; any pending data from, or prompt for, the
terminal; and any other information that is relevant to a terminal in the
transaction process you have defined.

An easy way to create a data structure for each terminal is to define an array
of User Defined Type (VB) or Records (Delphi) or Structs (C++). The array
would be large enough to accommodate all of your terminals (one array
element for each terminal) and might look something like this in VB

```
Type TermData
        TermID as integer
        TransactionIndex as integer
        PendingPrompt as string
        PendingData as string
        ErrorCode as integer
        Transaction as TransactionData
        Etc.
End Type

dim Terminals(25) as TermData
```

You will also need to define a transaction. Typically the transaction is
applied to all terminals so it is a single structure (there is not a copy for each
terminal)

```
Type TransactionElement
    commandcode as integer
    promptline1 as string
```

```
    promptline2 as string
    promptline3 as string
    NextIfError as integer
    NextIfOK   as integer
End Type

dim TransactionSequence(10) as TransactionElement

TransactionSequence(1).commandcode = 1 'InputAny
TransactionSequence(1).promptline1 = "Go to Location " +
GetLocationCode
TransactionSequence(1).promptline2 = "Press Enter When
Ready "
TransactionSequence(1).NextIfError = 1
TransactionSequence(1).NextIfOK = 2
Etc.
```

As mentioned above, it is important to keep your event handlers short and efficient. This means that your program should spend as little time as possible "inside" the event handler (running the handler's code). Also, it is important to NOT call WD802Term methods from inside WD802Term event handlers. So a solution is needed that allows your program to respond to events outside of the event handlers.

An easy way to do this is with a polling scheme. Add a timer object to your application and in the timer's event handler check the **TermData** structure for the state of each terminal and make any appropriate WD802Term method calls from within the timer object's event handler. The timer can be set to fire every 100 milliseconds or every 10 seconds or anything in between that is appropriate for your application.

Another, more advanced way to decouple the WD802Term method calls from the event handlers is using threading techniques where each terminal is "running" in a thread that monitors that terminal's state.

WD802Term/ActiveX

WD802Term is a drop in ActiveX component that allows programmers to easily add the ability to send prompts to and receive data from their R/F Terminal across a wireless 802.11b Ethernet network connection.

The ActiveX component is compatible with Visual Basic, Visual C++, Delphi, and most other 32-bit development platforms.

Programming Considerations

Remember, plan for every error that the Server might return including:

> *Sequence Errors detected*
> *Illegal Command detected*
> *Addressing a Terminal Not Signed In*

Programming languages that can interface with the Active X tool include VB, C++, Delphi, Access, FoxPro, etc.

If the Application Server receives any of:

1. 5 Addressing a Terminal not **SIGN**ed **ON** messages in a row or
2. 5 Sequence Errors in a row, or
3. 5 illegal commands in a row,

the Server transmits the following message to the Terminal and shuts down:

> **Server Shut Down**
> **Due to Host Logic**
> **Error**

Check your program to correct these errors before starting again. The host application program will have to restart and you will have to cycle power on the Terminal and **SIGN ON** again in order to continue.

Network Setup

- The network settings on the server must support TCP/IP communications.

- It is critical that the Terminal(s) and Server are "visible" to each other across your network. Both must have an IP address in the same subnet. Both the Server and the Terminal Device(s) can either have a static address or use an assigned IP address via a DHCP server or equivalent. Refer to your Windows networking administration utility in the Control Panel to configure computer IP address settings.

- **WD802Term** uses port 54140

- You can link server and terminal through a dial-up or DSL internet link as long as the server has a static IP address and your router passes the above port.

- If you are unsure of how to set up your IP configuration properly, refer to your network administrator for help.

Server Communications

- Run the 802 Test Program on the server computer. Now go to an 802 RF Terminal and attempt to SIGN IN to the 802 Test Program. If the terminal connects and responds with a prompt "Enter Data", you are configured properly. Go to the server computer, shut down the 802 Test Program and begin work on your **WD802Term** server application.

- Before making any **WD802term** method calls in your application, make sure to turn the Server on by calling

    WD802Term.InitializeServer

    WD802Term.ServerActive = True

Test For Good Communication

- Implement an event handler for **OnTermSignIn** that causes a beep or displays a message when called. If communication between the host PC and the terminal is good, your event handler will fire when your program is running and you sign in a terminal on your network.

Terminal Tracking

- Since you get only one set of event handlers, you will need some scheme for keeping track of where each terminal (up to 1000) is in its transaction sequence. Remember, **WD802Term** will give you a unique ID number for each Terminal that signs in and that number is "locked" to that Terminal until it signs out. One possible solution is to use a "state" variable for each terminal (perhaps stored in an array). Test the state variable to determine the next prompt for any given terminal. See the samples for more ideas.

- It is very important to keep track of "login status" for each terminal. Every SignOut event should have an associated **SignIn** event and a given terminal should not be allowed to **SignIn** twice without and an intervening **SignOut**. Multiple **SignIn**s from one terminal without appropriate **SignOut**s indicate either:

    1. A terminal going out of range and having its power cycled before returning within range OR

    2. Two (or more) terminals using the same IP address (terminal ID conflict).

Control Keys for Possible Programming

There are some keys on the 802 RF Terminal keypad that when pressed, can transmit special ASCII characters back to the host program. This feature might be used by a programmer to allow the operator to review transactions. **You can use these keys for special program functions, such as scrolling thru data, backing up steps, jumping, finishing a process, etc** The keys are as follows:

Key	Code transmitted to Host
UP ARROW key	FS (ASCII 28)
DOWN ARROW key	GS (ASCII 29)
LEFT ARROW key	RS (ASCII 30)
RIGHT ARROW key	US (ASCII 31)
BEGIN key	ETB (ASCII 23)
END key	CAN (ASCII 24)
SEARCH key	VT (ASCII 11)

The STATUS key is reserved to only display the Time and Date.

The Control keys can be used *without* pressing the ENTER key by using the **Control Keys Only** Terminal Setup parameter. See **Chapter 2;** *RF System Setup* for details.

Concepts – WD802Term ActiveX

Drop-in components are tools that are added to your programming environment "tool kit". Only the ActiveX variety are widely compatible with almost all development environments. When you use drop-in components in your program you will follow the standard object-oriented programming paradigm that uses properties, methods, and events to implement the functionality of the drop-in component.

Properties are the various configuration variables used by the drop-in component. An example of a property is the **ServerActive** setting.

Methods are function calls used to issue commands and access features of the drop-in component. An example of a method is sending an **Input** command to the terminal.

Events are function definitions placed in your application's source code. The function definitions in your source code are called Event Handlers. The skeleton structure of the event handler's source code is automatically generated. The code in the Event Handler is called ("fired") by the drop-in component when a specific event occurs. An example of an event is when a terminal returns data and the **OnTermData** event is fired.

The details of how to access Properties/Methods/Events varies between development platforms. Details of how it works in some of the most popular platforms is illustrated in the samples included with the RF Utilities CD or available for download from our website at **www.barcodehq.com**

Properties – WD802Term ActiveX

Properties are the various configuration variables used by the **WD802Term** control. They are directly assignable in your application (eg. "WD802term.ServerOn = true") and can be set in your development environment's object browser.

Note that your development environment may show more properties for the **WD802Term** control than are listed here. This is normal. You may ignore properties you see listed in your development environment that are not listed here.

ActiveTerminal

Valid values: *0-999*

Function: This is the terminal ID (0-999) to which method call instructions are directed.

Terminal ID "number" is mapped to actual terminal IP address dynamically.

See method "GetIPAddress" to get terminal IP address associated with an ID.

Keep in mind that unless your terminal is configured with a static IP address, each time it is powered on it can have a different IP address (issued by your DHCP server). Also, regardless of the terminal's IP address, it can be assigned a different ID (by WD802Term) each time it Signs On to the server. Keep this in mind and design your application accordingly if you require specific physical terminals to perform specific individual tasks.

ServerPort

Valid values: *5000-65536*

Function: These are the IP ports used by WD802Term to pass command information to and from each terminal. This setting must match the PORT setting in all terminals used with this host application. Do not use port values less that 5000. If you are not familiar with IP ports, leave this value at the default setting.

ServerActive

Valid values: *True, False*

Function: Set ServerActive to True to begin listening for terminals. Before setting to True, be sure to call the InitializeServer method (See Methods)

LogFileName

Valid values: *Any valid file path and name*

Function: Leave blank if you do not want a log file kept. If you enter a filename here, WD802Term will create the file (or add to it if it already exists) in standard text file format that you can open using Windows Notepad.

LogFileSize

Valid values: *1000 through 2GB (2000000000)*

Function: This is the maximum log file size that WD802Term will keep. If the file exceeds this size, the oldest entries are removed to make room for new entries.

Quiet

Valid values: *True, False*

Function: If **Quiet** is set to *True* then any status and error message generated by **WD802term** will be suppressed.

Methods – WD802Term ActiveX

Methods are commands that you issue to the **WD802term** control. All of the "**Inputxxx**" commands cause the terminal to wait for operator input.

*Note that your development environment may show more available methods for the **WD802term** control than are listed here. This is normal. You may ignore methods you see that are not listed here.*

InitializeServer

Parameters: *none*

Function: Prepares the Server to be started. Follow this call by setting the ServerActive property to True. This must be called before any of the methods described below.

InputAny

Parameters: *line, position, prompt, shifted, timestamped*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from either terminal keypad or scanner. If shifted is set to "true", the terminal will start in shifted mode. Timestamped appends a (hhmmss) prefix to the returned data.

InputKeyBd

Parameters: *line, position, prompt, shifted, timestamped*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from the terminal keypad only.

InputExtKeyBd

Parameters: *line, position, prompt*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be received from the PS/2 keyboard attached using an adaptor to the terminal serial port. Waiting for external keyboard input can be bypassed by pressing the enter key on the terminal which will send an empty data string to the host (fires the OnTermData event handler). External keyboards are supported by terminals using firmware version RFU1010 or later.

InputScanner

Parameters: *line, position, prompt, allowbreakout, timestamped*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from the terminal scanner only. Setting allowbreakout to true allow user to "breakout" of scanner only mode by pressing the end key on the terminal. A termID+CR will be sent to the host.

InputYesNo

Parameters: *line, position, prompt*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for a Yes (Enter key or C key) or a No (0 key or B key) from the terminal keypad.

Note: C and B keys are used to facilitate keypad entry while scanning with the integrated laser.

InputPassword

Parameters: *line, position, prompt, shifted*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be entered from the terminal keypad only. The entered data is not displayed on the terminal.

InputSerial

Parameters: *line, position, prompt*

Function: This instructs the ActiveTerminal to display the prompt at line and position and wait for data to be received through the terminal serial port. Waiting for serial input can be bypassed by pressing the enter key on the terminal which will send an empty data string to the host (fires the OnTermData event handler).

InputMagStripe

Parameters: *data*

Function: This command is for a printer initialization and magstripe input on the Zebra Cameo printer equipped with the magstripe option.

This instructs the ActiveTerminal to send the string data to an attached Cameo printer with the magstripe option and wait for data to be received through the terminal serial port. Waiting for serial

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input can be bypassed by pressing the enter key on the terminal which will send an empty data string to the host (fires the OnTermData event handler).

Data might be

! U1 MCR 80 T1 T2+ CR + LF

(Refer to the Cameo manual for the exact string sequence you need to send.

The above example sends over a 10 second request for reading Track 1 and Track 2). There is no reply to the host except the magstripe data.

OutputSerial

Parameters: *data*

Function: This instructs the ActiveTerminal to send data to the terminal's serial port. Data must be less than 232 characters in length for each call to OutputSerial. If you are sending data to a printer attached to the terminal, make sure to set the Protocol parameter in the 802 RF Terminal to XON/XOFF. See the 802 RF Terminal Manual for details.

Special Considerations:

- After an **OutputSerial** call is successfully completed, the terminal will return (as data) a CR (ASCII #13 Carriage Return). This will fire the **OnTermData** event. If there is a problem with the serial data you will see an error message at the client and in the log (if enabled). If the data string is too long, the **OnTermIllegalCommand** event will be fired.

- Do not call **OutputSerial** for the Terminal again until a return code is received.

- Do not call an Inputxxx method for the same Terminal until a return code is received.

- If you need to send more than 232 characters, send the first part, wait for the acknowledge (#13) and then send the next part.

- Calls to **OutputSerial** cannot be combined with other method calls.

SendDisplay

    Parameters: *line, position, prompt*

    Function: This instructs the ActiveTerminal to display the prompt at line and position. Must be followed by an "Input" method call to take effect.

ClearScreen

    Parameters: *none*

    Function: This instructs the ActiveTerminal to clear its display. Must be followed by an "Input" method call to take effect.

ClearLine

    Parameters: *line*

    Function: This instructs the ActiveTerminal to clear the specified line on its display. Must be followed by an "Input" method call to take effect.

SendDate

    Parameters: *line*

    Function: This instructs the ActiveTerminal to display date and time on the specified line number. Must be followed by an "Input" method call to take effect.

Beep

    Parameters: *count*

    Function: This instructs the ActiveTerminal to beep count times. Count may be a value from 1 to 9. Must be followed by an "Input" method call to take effect.

PlayVoice

    Parameters: *msgnum*

    Function: This instructs the ActiveTerminal to play voice message number msgnum. Msgnum may be a value from 1 to 99. Must be followed by an "Input" method call to take effect.

ReInit

    Parameters: *none*

    Function: This instructs the ActiveTerminal to re-initialize. Must be followed by an "Input" method call to take effect.

ReInitAll

    Parameters: *none*

    Function: Instructs all attached terminals to re-initialize.

OutputRaw

    Parameters: *data*

    Function: This allows you to override all of WD802Term's Input methods (or any other method, for that matter) and send whatever data you want to the Active Terminal. This is most useful for adapting old DLL-based code to use the new ActiveX system.

MapTermID

    Parameters: *TermNumber*

    Function: Returns the actual terminal ID letter code for a given terminal number. Use the returned character to match with the Terminal ID programmed into a non-802 RF Terminal. This is provided for backwards compatibility and should not be used for new host applications.

GetIPAddress

    Parameters: *TermNumber*

    Function: Returns the actual IP address of the terminal associated with a given ID code.

GetErrCode

    Parameters: *none*

    Function: Returns code for the most recent error. Calling this method resets the Error Code to 0.

    Error Codes

    0. No Error

    1. Command Data Too Long

    2. Error on Close Device

    3. Serial Out Data Too Long

    4. Invalid Terminal ID On Last Command

    5. Terminal ID Format Error

Events – WD802Term ActiveX

WD802term events occur when a specific condition is met. When an event is "fired", an event handler function in your application is called.

Though the details of exactly how it is done varies from one programming environment to the next, the source code skeletons for the various event handlers are automatically generated and inserted into your source code for you. See the samples for more specific information.

Each event passes relevant information to your event handler function. For example, **OnTermData** passes the data that was keyed or scanned into the terminal.

Terminal ID is always passed as 0-999.

Once you have the event handler skeletons, you can proceed to add whatever functionality you desire to each event.

Before any **WD802term** events will fire, you must make sure to turn the Server on by calling

>*WD802Term.InitializeServer*
>
>*WD802Term.ServerActive = True*

OnServerActivate

Data passed: *none*

Event: Called when the ServerActive property is set to True immediately after the Server begins listening for terminals.

OnTermSignIn

Data passed: *terminal*

Event: A terminal has signed in. Terminal ID is passed in *terminal*.

OnTermSignOut

Data passed: *terminal*

Event: A terminal has signed out. Terminal ID is passed in terminal.

OnTermData

Data passed: *terminal, data*

Event: A terminal has sent *data* in response to an **Input** method call.

OnTermNotSignedIn

Data passed: *terminal*

Event: A command has been sent to a *terminal* that is not signed in.

OnTermSequenceError

Data passed: *terminal*

Event: The *one-for-one host prompt/terminal response* protocol has been violated. The host cannot send a second Input command until it has received a response from the first Input command. If WD802Term receives 5 sequence errors in a row, a Host Logic error is generated and the server shuts itself down.

While WD802Term/ActiveX will intercept and prevent most logic errors, they are still possible so you should implement this event handler!

OnTermIllegalCommand

Data passed: *terminal*

Event: An illegal command has been sent to a terminal.

WD802Term /ActiveX is designed to prevent illegal commands but software is not always perfect and we may not have imagined all the ways in which our customers will want to use it!

OnTermUpArrow

Data passed: *terminal*

Event: The up-arrow button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermDownArrow

Data passed: *terminal*

Event: The down-arrow button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermLeftArrow

>   Data passed: *terminal*
>
>   Event: The left-arrow button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermRightArrow

>   Data passed: *terminal*
>
>   Event: The right-arrow button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press an arrow key, this event will not fire.

OnTermBeginKey

>   Data passed: *terminal*
>
>   Event: The BEGIN button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press the Begin key, this event will not fire.

OnTermEndKey

>   Data passed: *terminal*
>
>   Event: The END button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press the End key, this event will not fire.

OnTermSearchKey

>   Data passed: *terminal*
>
>   Event: The SEARCH button has been pressed on a terminal. You must issue another Input method call before WD802Term can respond to another keypress on the terminal. If you have already entered some data on the terminal and press the Search key, this event will not fire.

Portable Printers

Cameo and QL 320 Common Information

Both of these printers are stocked by Worth Data for the convenience of our users who need portable printing.

These printers do **not** require any special protocol; they do not require the "wake-up byte" as do other printers. They do require a special cable that can be ordered from Worth Data (part #C12); cable pin-outs are available in **Appendix C**: *Cable Pin-outs*.

Shipped with every Cameo or QL 320 printer ordered is a CD ROM with the Programmers Manual in PDF format and a label design program – *LabelVista*. This program allows you to design the program and create multiple format files that can be sent to the printer where they become resident in flash. Variable fields are defined and can then be filled in by the program when in operation.

Keep in mind the following information when using these versatile printers:

- The printer turn on ("Wake-up") is accomplished by the 802 RF Terminal toggling the DSR line on the printer, so only the @S command and the data you are sending to the printer is needed.

- Once the 802 RF Terminal has turned on the printer, it stays on until the host program turns it off using the POWER OFF COMMAND "ESC(0x1b)`p'(0x70)" described in the **Printing Systems Programming Manual**, or until the automatic shutdown takes place (2 minute default).

- The 231 character limit applies to your command string. See your **Portable Printing Systems Programming Manual** for details on programming your printer.

Zebra Cameo Printer

The Zebra "Cameo " Printers are portable direct thermal receipt printers, (**not** label printers – the QL 320 below prints labels). Bar codes can be printed on the receipts, but you can't print labels.

One model of the Cameo printer is available with a magnetic stripe reader, allowing magnetic stripe input to the 802 RF Terminal using the @M (magstripe input) command.

- The Cameo printer with magstripe input is capable of reading Track 1, Track 2 or Tracks 1&2. See your **Portable Printing Systems Programming Manual** for the correct character string to send in the @M command to turn on the magstripe reader. (see page 6-2 for details).

- When the Terminal sends data to the host, it sends it in the following format:

    Terminal ID + *DATA* **+ CR**

    Typically, the data is simply a string of characters, but in the instance of data coming from the magstripe reader, there are some additional characters you need to be aware of. The magstripe reader sends its data in the following formats:

    Track 1:

    T1: *DATA*

    Track 2:

    T2: DATA

    Track 1&2:

    T1: DATAT2: DATA

    So, when the 802 RF Terminal transmits the data to the host, it will be in the following format:

    Terminal ID + *T1: DATA* **+ CR**

    or

    Terminal ID + *T2: DATA* **+ CR**

    or

    Terminal ID + *T1: DATA* **+** *T2: DATA* **+ CR**

    For further information, see your **Printing Systems Programming Manual** on the CD ROM shipped with the printer.

Zebra QL 320 Printer

The QL 320 Printer is used for label printing. It doesn't have Magstripe input. The classic application is for printing shelf labels during shelf price verification:

1. The operator scans a shelf label.
2. The Terminal transmits scanned data to the host computer.
3. The host computer looks up the price, description, etc. and transmits the computer price back and sends the necessary commands to the attached QL 320 printer to prints a new shelf label with the correct price.
4. The terminal operator then peels off the label and applies it to the shelf.

Each printer is shipped with a no charge roll of thermal paper that can be used for development, including determining the exact label size that best fits you needs and the capabilities of the printer.

We stock the 2" and 3" QL 320 printers with several label sizes immediately available including:

Part Number	Description	Price/ Roll
E2L1	2"x1" Vinyl Shelf Adhesive Labels	$3.50
E2L2	2"x1.25" Paper Permanent Adhesive Labels	$2.50
E2L3	2"x2" Paper Permanent Adhesive Labels	$2.50
E2L4	2"x1.25" Vinyl Shelf Adhesive Labels	$3.00
E3L1	3"x1" Vinyl Shelf Adhesive Labels	$7.50
E3L2	3"x1.75" Paper Permanent Adhesive Labels	$5.00

Shelf adhesive labels are designed for ease of removal to facilitate replacement. Permanent adhesive labels are designed to stick and stay stuck, making removal difficult without leaving a residue.

Chapter 7

Voice Message Operations

The 802 RF Terminal's exclusive use of voice prompts allows you to overcome problems such as literacy, language and lighting. With proper planning, voice prompting can enhance your 802 RF Terminal application, making it faster and simpler. Voice messages are recorded in the 802 RF Terminal, and then triggered by a prompt from the host computer.

Why Use Voice Messages and Prompts?

- Voice messages can be in *any* language.

- The operator does not have to be able to read to perform some jobs.

- Audible instructions can be heard in poor lighting where it is difficult to read a LCD screen. MOST IMPORTANTLY, the data collection process is faster because the operator does not have to continually look at the screen for instructions. This is especially useful when you do not want or need to enter data from the keypad. Scanning bar coded numbers from a Quantity BARPAD can make keying unnecessary.

Voice messages and prompts are a good way to keep the operator's attention focused on the job at hand. Audible error messages and warnings also help to limit mistakes and downtime.

Tips for Using Voice Prompts

Over 90 voice messages can be recorded in the 802 RF Terminal. Here are some tips on making your voice prompts user-friendly:

- Short messages are preferable for prompts; most English prompts can be stated in ½ second. Instead of saying, "Enter the Item Number," say "Item". The typical 802 RF Terminal operator does not want to hear long messages thousands of times. Error messages are typically longer because they are the exception and need to provide more precise instruction to the user.

- **Record your voice prompts calmly**. A frantic sounding voice can become irritating, especially when heard repeatedly.

- **Speak clearly**. Correct pronunciation will make the voice prompts easier to follow for all users. Use common words that all users will understand.

- **Vary the tone of your voice for different prompts**. Using a different tone of voice or even a different voice for consecutive

prompts or error messages will make it easier for the user to distinguish between them.

- **Be sure to record error messages for *all* possible problems** that the user may encounter during a session. Once the operator becomes accustomed to listening to the voice prompts, it may become easy to overlook a "display only" error message.

802 RF Terminal's Voice Message Mapping

The 802 RF Terminal is shipped with 75 seconds of total recording time. The time allotted for each message is partitioned as follows:

30 – *½ second* **messages** (message numbers 01-30)
30 - *1 second* **messages** (message numbers 31-60)
15 - *2 second* **messages** (message numbers 61-75)

Messages are sequentially numbered beginning with the ½-second messages, followed by the 1-second messages, and finally the 2-second messages. You can change the partitions to allow for more or less of a particular length message. For example, if you decide you do not want *any* ½ second messages and you want 15 *more* 1-second messages, your allocation would look like this:

00 – *½ second* **message**
45 - *1 second* **messages** (message numbers 01-45)
15 - *2 second* **messages** (message numbers 46-60)

Voice message partitions are set in the 802 RF Terminal either from the bar coded *Setup Menu* or by the keypad setup. From the Setup Menu, scan the bar code for "Voice Messages", and then scan six digits. The first 2 digits correspond to the ½ second messages, the second 2 digits for the 1-second messages and the last 2 digits for the 2-second messages. See **Chapter 2;** *RF System Setup* for details on Terminal setup (by bar code setup menu *and* keypad). Remember that the total amount of time must add up to 75 seconds.

Programming Voice Messages

To record and playback messages you have to get to SETUP MODE and enter the password. If you don't know how to do this, see **Chapter 2**; *RF System Setup* for details on how to get into the SETUP MODE. Once you have entered the password (password is "WDTRI") you will see the following prompt:

R/F Terminal Setup->1
Voice Operations---->2

Press 2 to select **Voice Operations.** The next screen gives you your options:

Record/Playback--->1
Cloning Master----->3
Cloning Receiver-->4

Pressing the "**1**" key takes you into the voice recording and playback function. "**3**" and "**4**" allow you to clone voice messages from one 802 RF Terminal to another. Each option is shown in detail below:

Recording and Playback of Voice Messages

If you respond with a "**1**" at the menu, you will see the following Record/Playback prompt:

RECORD/PLAYBACK?
KEY [R/P]?

First, we will playback a message that has already been recorded. Let's use message #01 for this example. Press the **P** key (for Playback) to get to the next prompt:

KEY [R/P]?
MESSAGE #: _

At this prompt, enter a two digit number for the message number you want to listen to. Enter "**01**" and then press the **ENTER** key. You will probably hear the "ITEM" prompt recorded at the factory unless you have edited or reset the default messages. If you heard nothing, a new message can be safely recorded in the area assigned to message # 01. After you have heard the message (or static if no message has been recorded), the 802 RF Terminal displays the RECORD/PLAYBACK prompt again:

RECORD/PLAYBACK?
KEY [R/P]?

To record a message, get out the microphone (no, it's not an earphone) shipped with the 802 RF Terminal and plug it into the AUX jack located next to the POWER jack on the bottom of the 802 RF Terminal. Answer the prompt by pressing the **R** key to record a message. The bottom line of the display now reads:

MESSAGE #: _

Enter the message number you are going to record. For this example, enter message #**03** (by default this is a blank message) by pressing **03**, then the **ENTER** key. The 802 RF Terminal screen now shows:

HIT ANY KEY TO
START RECORDING

To record a message, press any key and hold it down. When you release the key, immediately start speaking into the microphone. To practice, let's record something in message #03. Get ready to say ITEM (in English or

your language) into the microphone of the 802 RF Terminal. When ready, press the **ENTER** key and the *instant* you release it, speak ITEM into the microphone. Remember to speak clearly – you have plenty of time to say ITEM in ½ second. When the message time is over, you will hear two beeps. The display is back to the RECORD/PLAYBACK prompt:

<div align="center">

RECORD/PLAYBACK?
KEY [R/P]?

</div>

Now you're ready to listen to your first recording. Press the **P** key and key in **03** for the message number. Do not be discouraged if you didn't record the entire message. Our first attempt produced "EM" in a very frantic tone of voice. Practice speaking clearly and calmly (think of the poor guy who has to hear it 10,000 times next week) as soon as the key is released. You will get the hang of it with just a little practice.

That is the way all messages – prompts *and* errors - are recorded. If you are not sure which message numbers are blank, you can listen to messages until you find a blank for recording.

The host computer relies on the fact that the voice messages are stored in the 802 RF Terminal itself and *not* generated by the host. The host computer will trigger the broadcast of a voice message by sending a prompt to the 802 RF Terminal that tells it which message number to play. If the host thinks that message #05 is STOP when it's really GO, it can cause confusion for the operator. That is why it is important to keep track of what messages are recorded where.

Default Voice Messages

Here are the default messages and the numbers they are recorded under:

Message Recorded	Message #
Prompts	
ITEM	#01
QUANTITY	#02
Error messages	
LOW BATTERIES	#31
CHANGE BATTERIES	#32
TERMINAL OUT OF RANGE	#33
SERVER NOT AVAILABLE	#34

Cloning Voice Messages and Setup from 802 RF Terminal to 802 RF Terminal

If you have several 802 RF Terminals, you can record all of your voice messages in one 802 RF Terminal and then simply "clone" them to your other 802 RF Terminals. Cloning also copies the 802 RF Terminal setup (except for Terminal ID).

You need 2 cables to clone 802 RF Terminals; the **Data Cloning Cable #F38** and the **Voice Cloning Cable #T15**. The *Data Cloning Cable* plugs into the "Computer" port on each 802 RF Terminal. This cable must be connected to clone properly.

One jack on the Voice Cloning Cable has two black rings on it – this end must plug in to the **RECEIVING** 802 RF Terminal (the one you are transmitting to). Plug the single-banded jack end into the **MASTER** 802 RF Terminal (the one you are going to record *from*).

Once both cables are plugged in to both Terminals, go to the Setup Menu on both Terminals. Select **3** for **Voice Operations** from the menu.

The "Receiving" 802 RF Terminal must be started first. On the receiving Terminal, press the **4** key for **Cloning Receiver.** The "Receiving" unit will display:

> **Recv Setup/Voice**
> **Please Wait_**

Now you can start the "Master" 802 RF Terminal by pressing the **3** key for **Cloning Master**. The "Master" Terminal will display:

> **Xmit Setup/Voice**
> **Please Wait_**

During the cloning process, you will hear the voice messages played aloud as they are copied. The process takes about 75 seconds to complete. After the Terminals are done cloning, they will both display:

> **End of Cloning**
> **Hit Any Key_**

If you did not hear the correct messages or you heard no messages at all, check your cables and receiver/master setup - **you may have transmitted from the wrong 802 RF Terminal**.

> **DATA XMIT ERROR**
> **CYCLE POWER**

If you get the DATA XMIT ERROR message, you have to restart the whole cloning procedure.

Chapter 8
Troubleshooting

General Considerations

System Test
If your program fails to run successfully, you can run the 802 Test Program to check out the host/network/access point/terminal link.

Radio Test
If you are not Signed In, the best way to test the radio is to perform a Site Survey. If you are already Signed In and operating, you can check the Signal Strength of the Access Points by pressing the Status Key and reading the Signal Strength on the last line displayed. Do this test at about 50 feet or less from the Access point (no walls). If either test reads less than 20%, chances are that you have a Terminal Device's radio that needs repair.

Changing Batteries
For RF Terminals, the most frequent cause of problems is low batteries that have either been ignored or undetected. The real test for batteries is to remove batteries from a working unit and place them in a suspect unit. Don't assume that just because the batteries are new they are good. We have purchased "new " batteries off the shelf and tested them immediately to discover they are bad.

Most of the time batteries become the problem as a result of two failures:

1. The operator ignores the **Low Batteries** message and doesn't finish up the transaction and immediately change the batteries. If you turn the unit off and turn it on again, the batteries may have had time to "almost" recover. Unfortunately they will have so little reserve power that they will likely operate just long enough to produce some very screwy behavior on the RF Terminal. Intermittent laser beams, continuous beeping, black bars on the screen, etc. are just a few of the disastrous symptoms that can be exhibited.

2. NiMH rechargeable batteries are being used, but the Terminal thinks that Alkalines are still being used. The Terminal ships with Alkaline batteries in the Setup. Alkalines and rechargeable batteries have different voltage profiles, so the Terminal has to know if you have decided to use rechargeables in order to properly notify you that the batteries have reached the low point requiring the batteries to be changed.

If you are using rechargeable batteries, you must change the **Batteries** parameter in the **Terminal Setup** to reflect the usage of rechargeable batteries, otherwise you will strange behavior on the Terminal including:

Intermittent laser beams, continuous beeping, black bars on the screen, etc. See **Chapter 2:** *Batteries* to change the setting. To display the remaining battery life of the AA batteries and the type of batteries the Terminal is expecting, press the **STATUS** key shows:

<div align="center">

XXXBAT■■■■■■■■■■■■-zz%

</div>

*XXX=***ALK** *when Alkaline batteries are specified in* <u>Battery</u> *setup*

*XXX=***RCH** *when NiMH batteries specified in* <u>Battery</u> *setup*

Press the **STATUS** key again to resume processing.

If using the Active X program with XP, be sure "connection pooling" is disabled.

Terminal Error Messages

Message	Meaning – Action Required
Looking for App Server Please Wait	This is a normal message, generated when the Terminal Device first tries to establish contact with a Server.
TERMINAL OUT OF RANGE, PRESS ANY KEY TO RETRY	The Terminal is not within range of any Access Point – regardless of SSID or encryption settings. Move closer or hold up to retry. If persistent, do a Site Survey.
Server Not Available Press Any Key	Terminal is configured to search for Application Server, but it could not find it.
Looking for DHCP Server Please Wait	Terminal is configured to get its IP address from a DHCP Server. It is broadcasting search.
No DHCP Server Found	Terminal is configured to obtain IP Address from DHCP Server, but it could not find a DHCP Server
WAITING ON HOST PROMPT, Please Wait	The Server has been found. The host program has not sent out a prompt yet. If this lasts more than 6 seconds, check the host application program for a logic bug.
Transmission Delayed, Press Any Key	This is an indication that the Radio was reset by the firmware – normally a rare condition. If you see it more than once per week, please call us with information on what you were doing at the time it occurred.
Server Shut Down Due to Host Logic Error, Press Any Key	Problem is in host program. Notify programmer! If the Server detects 5 **Sequence Errors** in a row, or 5 messages to a Terminal not Signed In, or 5 Illegal Commands, the Server transmits the message to all terminals signed in and shuts down. Check your host program and correct the logic error before starting up again.
Server Re-initialized Press Any Key	The Server was rebooted. Press any key to be transferred to the Mode menu.
LOW BATTERIES Finish, Sign Off Change Batteries	Finish the transaction you have started. The Press F1 to Sign Out. Then turn off the Terminal and change the batteries.
CHANGE BATTERIES UNIT SHUT DOWN	The terminal will display this message for 20 seconds, sign out, and turn off. Change the batteries immediately. Don't let someone else pick it up and operate with partially recovered batteries
Cannot Communicate with PIC Processor	The Terminal cannot communicate with the radio's PIC processor. Cycle power. If message persists, call for RMA.
Radio not Responding	The terminal's radio is not responding, Call for an RMA.

Troubleshooting specific problems

My response time is poor...

- First, do Site Survey 50 feet from the Access Point. If it's not 40-50+ the Radio in the Terminal or the Access Point is the problem.

- Second, run the 802 Test Program. If it runs fast, your program that is slow.

- If you have good response time everywhere but on the outer fringe area, you may need to add another Access Point.

- If using the Active X program with XP, be sure "connection pooling" is disabled.

I'm not getting the distance I need...
To maximize range, the Access Points should be located:

1. At the center of the area of intended coverage, and
2. As high as possible - mounted on the ceiling of a room with the antenna pointing downward works the best. Sometimes just raising the Access Point to 12 feet will dramatically increase the distance, especially in warehouses or grocery stores with tall shelving. Access Points mounted on the wall with the antenna parallel to the floor is the worst position.

   To accurately determine the hardware required to cover a particular area, you should use Site Survey option on the mode menu.

RF Terminal Problems

When laser is triggered, it cycles power by itself – 1st screen
When a voice message plays, it cycles power by itself –1st screen
I get black bars on the display when I turn it on
When I turn it on, it just beeps continually.

- If the batteries are way low, when turned on, the Terminal will just keep beeping; it is cycling power, over and over because the batteries are too low.

- If the batteries are at a specific low point, the laser triggering or playing a voice message will be just enough extra power draw to force the terminal to cycle power.

- Change to known good batteries, preferably out of a working unit and try again. Some "new" batteries are not good.

The unit won't power up with batteries (good batteries)
- Your battery terminals inside the case may be corroded with battery acid or just contamination. Open up the case and clean the battery

terminal s with alcohol soaked cloth. Battery acid leaks are not
covered by the Worth Data warranty, however, many battery
manufacturers provide warranty for their damage.

I get 6 beeps when the RF Terminal powers up...
- The unit needs repair. Call Worth Data for an RMA.

Problems reading Bar Codes

The reader won't beep when I try to read bar codes...
- Try reading a known good bar code - try the **1** on the Setup Menu
  bar pad table. Follow the steps for proper scanning technique
  discussed in **Appendix M;** *How to scan a bar code*.

- Make sure the reader is configured to read the type of bar code you are
  trying to scan. Most bar code types are ***disabled*** by default and need
  to be enabled using the Setup Menu or keypad while in Setup Mode.

I get extra characters at the beginning or end of my bar code data...
- Clear the Preamble and Postamble settings.

I have very poor read rates when scanning bar codes...
- Carefully follow the scanning instructions in **Appendix M;** *How to
  scan a bar code* when reading any and all bar codes. As
  straightforward as scanning may seem, many people who call with a
  complaint about poor read rates simply aren't doing it right.

- Try reading the following bar code below as an example of a
  known "good" bar code. This bar code is a Code 39 bar code and is
  readable by the RF Terminal set to its default settings.

TEST LABEL

- Make sure *your* bar codes have clearly defined dark bars and clean
  white spaces. If the bars are so light that they are gray instead of
  black or are so dark that they "bleed" into the white spaces, the
  printing of the bar codes is the problem. Whoever is printing the
  bar codes needs to make the necessary corrections.

- The bar code should also have a "quiet zone" of at least ¼" to the
  left of the first bar and to the right of the last bar. Make sure to
  start your scanning to the left of the bar code in the "quiet zone",
  moving the scanner quickly and smoothly as if drawing a line

through the bar code. If using a laser scanner or CCD scanner, make sure the beam covers the bar code completely.

- If using a laser or CCD, clean the window of the scanner with a soft cloth.

If you have a problem…

- If you have a problem with your RF System, **consult the troubleshooting section of this manual FIRST**. As a last resort before calling for an RMA, you can perform a diagnostic reset on your terminal. This resets everything back to the factory defaults, so be prepared to remake any setup changes (i.e. Terminal ID) you had made prior to the reset.

    1. At the **SIGN ON** prompt, press the **F1** key and release it.
    2. then press the **SHIFT** key and release it.
    3. press the **D** key and release (you will now see a menu)
    4. press the **K** key and release.

    If you cannot find the answer here, or the diagnostic reset does not work, call your Dealer or Worth Data for help.

- **Save the shipping box**. If you ever need to send the RF Terminal or any of its' parts back for repair, us this box.

- Before you call your dealer or Worth Data for technical support, have your RF Terminal and related equipment in front of you and **be prepared to explain your problem in detail to the Technical Support Engineer**.

- The Engineer may ask you to go through some troubleshooting procedures while on the telephone. This will help them determine what is wrong and what the course of action should be. **Many problems can be resolved over the telephone and will not require that you return the equipment to us**. If you *do* need to return any of the RF equipment to Worth Data, the Engineer will issue an RMA number.

- If you do need to return the RF Terminal for ANY reason, **you MUST have an RMA number** first. Write the RMA number on the outside of the original shipping box and make sure to insure the shipment. All RMAs should be shipped back to the following address unless directed otherwise:

    RMA #XXXXXX
    Worth Data Inc.
    623 Swift St.
    Santa Cruz, CA 95060
    831-458-9938

Appendix A
Printer Pin-outs

These are the pin-outs for the cable needed to connect the Zebra Cameo or QL 3 Printer to a Worth Data R/F Terminal. You can order our **C12** cable for $25, or if you already have a cable from Zebra and feel confident in your cable-making abilities, you can simply clip off the connector end that should connect to the RF Terminal (**not** the 8 pin din end) and replace the clipped-off connector with an RJ45 connector according to the pin-outs on the next page:
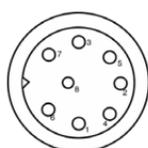
Cameo Connector
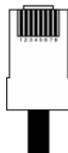
RJ45 connector for RF Terminal

Function	Printer 8 pin	RF Terminal RJ45	Function
Receive	1	2	Transmit
Transmit	2	3	Receive
CTS	3	not connected	none
RTS	4	7	CTS
Ground	5	4	Ground
DSR	7	8	DTR
DTR	8	not connected	none

Zebra Cameo/ QL 3 - to - RF Terminal Pin-outs

Laser and CCD

The laser and CCD TTL pin-outs are:

Pin	Function
1	5 volts
2	Data
3	Phase
4	LED
5	Trigger
6	Enable
7	Shield(drain)
8	Ground

Laser and CCD Pin-outs

Remember:
If you make your own cables, you are on your own. We accept **NO RESPONSIBILITY** *for damages resulting from incorrect wiring.*

Appendix B

Firmware Upgrades

Occasionally it is necessary to get firmware fixes for problems discovered with the ***R/F Terminal System.***

R/F Terminal Firmware Upgrades

The R/F Terminal firmware can be upgraded by downloading new firmware into the R/F Terminal from your computer over the radio link or using the serial port of the RF Terminal connected to your computer using the 802 Firmware Loader Utility.

You can always get the latest RF Terminal firmware from our website at the address: **http://www.barcodehq.com/download.html**

Firmware Download via Radio Link
The RF Terminal's firmware can be updated using the radio link only, (no need to connect to the serial port of computer and terminal). This firmware download can take place while other terminals are in normal operation.

The **WD802Term** ActiveX component must be running either within your application program or you can run the **802 Test Program.**

The firmware version to which you intend upgrade needs to be in a folder named "802 Firmware" on the root directory of your "**c:**" hard drive. (If you don't have a **c:** drive, map another drive to it using Windows Explorer).

At the mode menu which shows:

> **DEVICE SIGN ON ------>1**
> **SETUP MODE------------>2**
> **SITE SURVEY------------>3**

Press the F1 key and release it.
Press the Shift Key and release it.
Press the D key and release it.

You will now see the following screen displayed:

> **L-Serial Firmware Update**
> **W-WiFi Firmware Update**
> **K-Reset EEPROM**
> **I-R/Clone   J-T/Clone**

When you press the **W** key for a WiFi radio firmware radio update, you will next see the prompt:

Enter Firmware Rev.
Number (3 digits)

Now, assuming the firmware can be found, the update will proceed. If the firmware can't be found, you will get an error message displayed and be transferred back to the previous menu.

Serial Firmware Download for a Terminal
The RF Terminal firmware can also be upgraded by downloading a file with the current firmware into the RF Terminal's flash EPROM using the RF Terminal EPROM Loader Windows program found on the 802 Terminal Utilities Disk. However, you will need a Worth Data F36 Serial cable to perform the download.

Download the firmware into the R/F Terminal by following the instructions on the screens of the program for a normal Terminal firmware update.

The normal firmware update is done through RF. If there is some bug in the RF communication there is a failsafe firmware download through the serial port using an F36 Serial Cable.

Failsafe Firmware Download for a Terminal
If the firmware gets completely wiped out, you will get a blank screen or a blank screen with a cursor in the upper left. There is a failsafe download still possible, but you will need to open up the RF Terminal case and move a jumper to the **FDL** position as shown below.
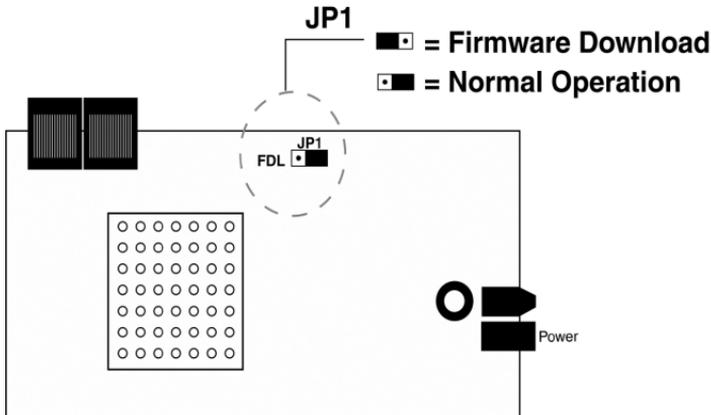
After moving the jumper, reassemble the case, plug the power into the RF Terminal, and connect the F36 Serial Cable to the host computer and proceed to download firmware using the 802 RF Terminal EPROM Loader program. Specify a failsafe terminal firmware update and follow the program's directions.

Appendix C
Code 39 Specifications

Code 39 (or Code 3 of 9) is the de facto standard of non-retail American industry. It is widely used in the automotive industry (AIAG specifications) as well as in government and military applications (LOGMARS specifications). Code 39 is flexible, features a large character set, variable data length and density, and bi-directional readability. Code 39 is extremely accurate; substitution errors are almost nonexistent. Its character set consists of numbers **0** through **9**, upper case **A-Z**, and characters *Space*, **$**, **%**, **/**, **+** and **-**.

C39

The name "Code 39" comes from both the fact that its character set originally contained 39 characters (it now has 43) and from its structure. Each character is formed of three wide and six narrow elements, made up of five bars and four spaces. Code 39's density can vary from a low of .75 characters per inch (cpi) to a high of 9.4 cpi. There should be a ¼" "*quiet zone*" (white space) to the left and right of the bar code.

Code 39 uses an asterisk (*****) as a start and stop character. This character must precede and follow the data in the bar code. The RF Terminal gives you the option of transmitting or not transmitting these characters when the bar code is read.

Exact specifications for Code 39 and other bar code symbologies can be obtained from ANSI at the address below:

> **American National Standards Institute**
> **Customer Service**
> **11 West 42nd St.**
> **New York, NY 10036**
> **http://web.ansi.org**
>
> ***document ANSI/AIM BC1-1995***

Code 39 has several advanced features and functions that are discussed further in this appendix.

Code 39 Advanced Features and Functions

Mod 43 Check Character

Standard Code 39 can be printed with a "**Mod 43 Check Character**". This Mod 43 check character *cannot* be used with **Full ASCII Code 39**. Assigning a value to each character in the data to be bar coded from the table as follows derives the check character:

Char	value	Char	value	Char	value	Char	value
0	0	B	11	M	22	X	33
1	1	C	12	N	23	Y	34
2	2	D	13	O	24	Z	35
3	3	E	14	P	25	-	36
4	4	F	15	Q	26	.	37
5	5	G	16	R	27	space	38
6	6	H	17	S	28	$	39
7	7	I	18	T	29	/	40
8	8	J	19	U	30	+	41
9	9	K	20	V	31	%	42
A	10	L	21	W	32		

Mod 43 Check character calculation for Code 39

Here is an example to illustrate how the check character is calculated for bar code data of **123XYZ**:

1. Take the sum of the values assigned to each character:

    1 + 2 + 3 + 33 + 34 + 35 = 108
    1   2   3   X   Y   Z

2. Divide the sum by **43**: (thus the name modulus 43)

    108/43 = 2 with a Remainder of 22

3. Find the character corresponding with the remainder.

    M (value 22) is the CHECK CHARACTER

The data becomes **123XYZM**, with **M** added as the Mod-43 check character.

Full ASCII Extension to Code 39

"**Full-ASCII Code 39**" expands the Code 39 character set to include all 128 ASCII characters. Symbols 0-9, A-Z and punctuation characters and are identical to their Code 39 representations. Lower-case letters, additional punctuation characters, and control characters are represented by sequences of *two Code 39* characters.

This table depicts the Full ASCII character set as a function of Code 39 characters:

ASCII	Code 39	ASCII	Code 39	ASCII	Code 39	ASCII	Code 39
NUL	%U	SP	Space	@	%V	'	%W
SOH	$A	!	/A	A	A	a	+A
STX	$B	"	/B	B	B	b	+B
ETX	$C	#	/C	C	C	c	+C
EOT	$D	$	/D	D	D	d	+D
ENQ	$E	%	/E	E	E	e	+E
ACK	$F	&	/F	F	F	f	+F
BEL	$G	'	/G	G	G	g	+G
BS	$H	(	/H	H	H	h	+H
HT	$I	)	/I	I	I	i	+I
LF	$J	*	/J	J	J	j	+J
VT	$K	+	/K	K	K	k	+K
FF	$L	,	/L	L	L	l	+L
CR*	$M	-	- or /M	M	M	m	+M
SO	$N	.	. or /N	N	N	n	+N
SI	$O	/	/O	O	O	o	+O
DLE	$P	0	0 or /P	P	P	p	+P
DC1	$Q	1	1 or /Q	Q	Q	q	+Q
DC2	$R	2	2 or /R	R	R	r	+R
DC3	$S	3	3 or /S	S	S	s	+S
DC4	$T	4	4 or /T	T	T	t	+T
NAK	$U	5	5 or /U	U	U	u	+U
SYN	$V	6	6 or /V	V	V	v	+V
ETB	$W	7	7 or /W	W	W	w	+W
CAN	$X	8	8 or /X	X	X	x	+X
EM	$Y	9	9 or /Y	Y	Y	y	+Y
SUB	$Z	:	/Z	Z	Z	z	+Z
ESC	%A	;	%F	[	%K	{	%P
FS	%B	<	%G	\	%L	|	%Q
GS	%C	=	%H	]	%M	}	%R
RS	%D	>	%I	^	%N	~	%S
US	%E	?	%J	_	%O	DEL	%T, %X

Full ASCII Table

Accumulate Mode

Accumulate Mode is an option allowing the RF Terminal to accumulate multiple bar codes in its buffer, then transmit them to the computer as if they had been a single bar code. This is useful for entering quantities and other variable data.

Accumulate Mode works with Code 39, Code 93 and Code 128 only and can't be used with a check digit. When the RF Terminal reads a bar code with a **space as the first character**, it beeps and buffers the data without transmission. It continues to read and buffer bar codes (up to 40 characters) until it reads a bar code **without a leading space**. Once it reads this last bar code, the entire buffer (including that last code) is transmitted as one long bar code. A "double-minus" sign (--) bar code clears the buffer. The **ENTER** code on this Barpad is a Code 39 *Start/Stop Character* only.

Accumulate Mode must be turned on using the bar coded Setup Menu or by using the keypad. *Accumulate Mode* is located in the Code 39 parameters. Choose **4** to *Enable* or **5** to *Disable* this feature.

This numeric Code 39 "Barpad" illustrates ACCUMULATE Mode. Scan **5**, **3**, **8**, and **Enter**. The RF Terminal transmits a single message of "**538**".

‖‖‖‖‖‖‖	‖‖‖‖‖‖‖	‖‖‖‖‖‖‖
0	**1**	**2**
‖‖‖‖‖‖‖	‖‖‖‖‖‖‖	‖‖‖‖‖‖‖
3	**4**	**5**
‖‖‖‖‖‖‖	‖‖‖‖‖‖‖	‖‖‖‖‖‖‖
6	**7**	**8**
‖‖‖‖‖‖‖	‖‖‖‖‖‖‖	‖‖‖‖‖
9	**Clear**	**Enter**

Appendix D

Code 93 Specifications

Code 93 is variable length, continuous, bi-directional, compact code. Code 93 is an alphanumeric bar code which consists of *43 data characters* (**0-9**,**A-Z**,**$/+%.-** and **Space**), *4 control characters*, and a *unique start/stop character*. The entire set of 128 ASCII characters is represented in Code 93 using combinations of *control characters* and *data characters*.

The control characters are $, %, /, and +. Pairing these control characters with normal data characters creates full ASCII 93. It is almost identical to the pairings for Code 39; Code 39 uses $M to produce a

Carriage Return (ASCII 13) character -- Code 93 uses $M to produce the Carriage Return.

Code 93's two built-in check digits greatly minimize the possibility of reader substitution errors. The bar code reader never transmits digits the check digits. Code 93's Start and Stop characters are also never transmitted.

If you have not decided which bar code type to use for your application and are considering using Code 93, while we agree that Code 93 is an excellent code, we believe that Code 128 is generally preferable because:

> 1. Code 93 **does not** have the numeric compression capability that 128 does, and
>
> 2. Code 93 requires pairings to make all Full ASCII characters while 128 does not.

Appendix E
Codabar Specifications

a12345b

Codabar is widely used in libraries, blood banks, the cotton industry and transportation industries. Its' character set consists of numbers **0** through **9**, and punctuation characters **+ . - / :** and **$**. Symbols **a, b, c, d, t, n, *** and **e** are used as start and stop characters. Characters are constructed of four bars and three spaces.

Codabar is a numeric-only code, but different combinations of start and stop characters can be used to identify different types of labels. Codabar's variable data length and extremely low error rate make for a versatile bar code.

Codabar start/stop transmission
The Codabar section on the RF Terminal Setup Menu lets you determine whether Codabar start/stop characters are transmitted or not. If you are varying start/stop characters with different types of labels, you'll want to "**Enable Stop/Start character Transmission**". Start/stop character transmission can also be helpful if you want your program to differentiate between data coming from the RF Terminal and data coming from the keyboard. If neither of these situations apply, you'll probably want to disable it.

Appendix F

Code 128 Specifications

Code 128 is a very powerful bar code, combining an extensive character set and variable length with compactness and error checking. The character set contains all 128 ASCII characters with each character made up of three bars and three spaces. Each element (bar or space) varies from one to four units in width, totaling 11 units of width per character. Code 128 contains two levels of error checking:

- Each character is checked for internal parity, **and**
- The last character is a checksum.

Code 128 has three subsets, A, B and C. Subset A contains alphanumeric characters and unprintable control characters, subset B contains alphanumeric characters plus printable control characters and subset C contains only numeric characters and uses a 2-character encoding scheme to create a more compact bar code. Code 128 uses an internal Mod 103 check character that is not displayed by the bar code reader. Code 128 bar codes can be made up of only one subset or may be a combination of several.

12345

The Code 39 features of **Accumulate Mode**, **Caps Lock ON** and **Caps lock OFF** also apply to Code 128.

UCC-128/ EAN-128

UCC-128/EAN-128 Code is a subset of Code 128 adopted by the UCC and EAN council's for use as a shipping label symbology. UCC/EAN-128 bar codes always start with a Function Code 1 character. In addition, a Function Code 1 character terminates all variable length fields unless they are the last field in the bar code.

The RF Terminal outputs the following for the special function codes and start sequences:

]C1   Start C/Function Code 1

^]   (GS) Function Code 1 as a variable string terminator

If **UCC/EAN 128** is *enabled*, the reader looks for the Start C/Function Code 1 to indicate a UCC/EAN 128 bar code.

The **UCC Serial Shipping Container Code** specification calls for a 19 digit UCC/EAN 128 code with an additional Mod 10 Check digit (20 digits in all). The Mod 10 Check digit is calculated the same as the *Interleaved 2 of 5* example in *Appendix D*. It is the data length as well as the MOD 10 check digit that distinguishes the *UCC Serial Shipping Container Code* from other UCC /EAN 128 bar codes.

Scanning the appropriate bar codes on the RF Terminal Setup Menu enables **UCC/EAN 128**; or you can use the keypad in the PROGRAMMING MODE "Change Setup" option. If UCC/EAN 128 is *enabled*, you will be able to read both standard Code 128 bar codes as well as the UCC/EAN 128 bar codes with the *Function 1* character and the Mod 10 check character.

```
(00) 1 0028028 300055004 6
```


UCC-128 Shipping Container Code

If UCC/EAN-128 is enabled on the R/F Terminal reader, all Function 1 codes are transmitted as]C1. In addition, should you be reading a 20 digit Shipping Serial Container code, the Mod 10 check digit is also compared with the computed Mod 10 value to give further assurance of no substitutions. The UCC/EAN-128 Shipping Serial Container Code is a subset of UCC-128 or EAN-128 adopted for voluntary marking of shipping boxes with the exact serial number of the box, (used with EDI typically to identify a specific boxes contents. The code consists of the following format:

Start C	*not transmitted*
Function Code 1	*transmitted*
2 Digit Qualifier	*transmitted*
7 Digit Data Portion	*transmitted*
1 Digit Mod 10 Check Digit*	*transmitted-*
1 Digit Modulus 103	*not transmitted*
Stop Code	*not transmitted*

Calculated using 19digits-UPC method

The UCC 128 specification is used extensively by the retail industry. If you have a requirement for a **UCC 128 Serial Shipping Container** bar code, be sure to follow the specification as closely as possible as many vendors will impose fines for non-conformance. For more information on UCC 128, contact the Uniform Code Council at:

Uniform Code Council, Inc.
7887 Washington Village Drive, Suite 300
Dayton, OH 45459
937-435-3870
937-435-7317
info@uc-council.org
8:00 a.m. to 6 p.m. EST

Specifications are available online at:**http://www.uc-council.org**

Appendix G

Interleaved 2 of 5 Code Specifications

Interleaved 2 of 5 Code is a numeric-only, even-number-of-digits bar code. It is widely used in warehouse and industrial applications. A combination of five elements, two wide and three narrow represent each character. Odd-number position digits are encoded in the bars, even-number positions in the spaces.

123456

Interleaved 2 of 5 Code is so susceptible to partial scans being interpreted as valid reads that we recommend at least one of the following safeguards:

- **Use one length of I 2 of 5 code.** Using one length of data allows you to tell the RF Terminal to look for one length of I 2 of 5 code only. By default, the RF Terminal is set to look for a 6 digit I 2 of 5 code but you can set the length to something different using the RF Terminal Setup Menu. Setting the length to **00** digits allows variable length bar codes scanning. If you must use the **00** setting, we recommend that you then use the "*Minimum/Maximum*" data length field when creating a program in the RF Terminal to check each field for the proper length.

- **Use a check digit.** Worth Data's **LabelRIGHT** printing program automatically calculates and prints a check digit upon request using the method below:

Interleaved 2 of 5 Mod 10 check digit calculation

1. Assume that the bar code data is **1987**.

2. Starting with the least significant digit (in this case, a 7), label the digits alternatively even and odd.

<div align="center">

7 - even
8 - odd
9 - even
1 – odd

</div>

3. Take the sum of the odd digits:

<div align="center">

8 + 1 = 9

</div>

4. Multiply the sum of the even digits by 3:

$$(7 + 9) \times 3 = 48$$

5. Add the results of steps 3 and 4:

$$9 + 48 = 57$$

6. Subtract the result of step 5 from the next highest multiple of 10:

$$60 - 57 = 3$$

7. The checksum becomes the low-order digit:

1987**3**

8. Because the data now has an odd length, a leading zero is added, for the final result of

019873

Appendix H

UPC / EAN Specifications

UPC symbols are found on almost all grocery products and many other retail items. The UPC code most people are familiar with (UPC-A) is a fixed-length (12 digits) numeric only code, with the first digit controlled by UPC coding assignments and the last digit a checksum. UPC-E and UPC-E1 are variations of the standard UPC-A code. Each digit is constructed of two bars and two spaces. UPC has very precise standards of code size, structure, and numbers to be used.

EAN is an international superset of UPC. EAN-13 has 13 digits, with the first two digits representing a country code. The final digit is, as with UPC, a check digit. EAN-8 is a shorter version on the EAN-13 code containing seven data digits and ending again with a checksum.

The exact UPC/EAN symbol specifications are available from:

> **Uniform Code Council, Inc.**
> **7887 Washington Village Drive, Suite 300**
> **Dayton, OH 45459**
> **937-435-3870**

Specifications are also available via the internet at:

> **http://www.uc-council.org**

Keep the following guidelines in mind when printing UPC bar codes:

- If you plan to use a "supermarket-type" in-counter scanner to read the codes, specify a bar code height of at least .9" for an optimal first read rate.

- Make it an early practice to observe the numbering conventions of the UPC Council. Do not label unmarked merchandise with a bar code whose numbers may conflict with those already assigned. If products with these numbers are not in your store now, they are likely to be in the future, causing conflicts in your inventory system.

- The leading **N**umber **S**ystem **C**haracter, (the first number of the 11 digits to be entered) should conform to these UPC assignments:

  0,6,7,8   Regular UPC 12 digit codes with numbers assignedby the UPC Council. (Do not use **0** as the leading number for in-store marking).

  2   Store-marked random weight items of meat and produce.

  3   Reserved for National Drug Code and Health Related Items.

  4   Use this leading digit for in-store marking of non-food items.

  5   Reserved for coupons. Do not use this today, or you will not be able to process coupons through your system tomorrow.

Supplemental codes
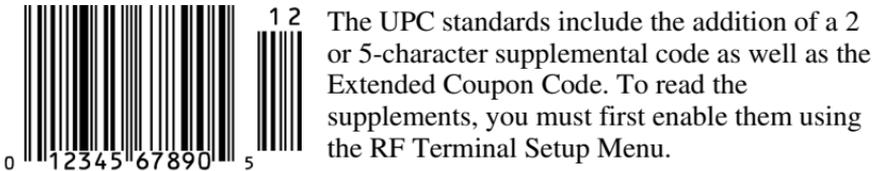
The UPC standards include the addition of a 2 or 5-character supplemental code as well as the Extended Coupon Code. To read the supplements, you must first enable them using the RF Terminal Setup Menu.

NOTE: *Enabling the supplements disallows the reading of UPC codes from right to left to assure that the 2 and 5 digit supplements are not get missed. Coupon codes can be read from right to left or left to right.*

ISBN Specifications

ISBN (International Standard Book Numbering) bar codes are essentially EAN-13 with a 5 digit supplement, where the first 3 digits are the Bookland country codes of **978** for books and **977** for periodicals. Although the bar code contains 18 characters, the ISBN format uses only 9 of them, along with a newly calculated Mod-11 check digit. For example, a bar code containing the numbers 978055337062153495 would transmit as 0553370626 in the ISBN format.

The RF Terminal has the option of transmitting in the ISBN format.

ISBN 0-553-37062

ISBN specifications are available from:

American National Standards Institute
Customer Service
11 West 42nd St.
New York, NY 10036
http://web.ansi.org
document ISO 2108:1992

The UPC/EAN checksum character

The last character in a UPC-A, UPC-E, UPC-E1, EAN-13 or EAN-8 bar code is the checksum. For reference, these are the methods of calculation:

Checksum calculation for UPC-A, EAN-13 and EAN-8

Use Worth Data's phone number (it's not a real UPC-A code) as sample data:

18314589938

Assign even and odd positions, starting at the right and moving left:

8	3	9	9	8	5	4	1	3	8	1
odd	even	odd	even	odd	even	odd	even	odd	even	odd

1. Starting with the leading digit, 8, take the sum of all the characters in the odd positions.

$$8 + 9 + 8 + 4 + 3 + 1 = 33$$

2. Multiply the result of step 1 by 3.

$$33 \times 3 = 99$$

3. Now take the sum of all the even-position characters.

$$3 + 9 + 5 + 1 + 8 = 26$$

4. Add the result in Step 2 to the result in Step 3.

$$99 + 26 = 125$$

5. Subtract the result from the next higher multiple of 10.

Next higher multiple of 10 over 125 = 130

$$130 - 125 = 5$$

5 is the *Modulo-10* check character. The data to be printed becomes:

183145899385.

This same formula is used for EAN-13 (using the 1-12 digits) and EAN-8 (using the 1-7 digits).

UPC-E Checksum Calculation
Use the sample data of 123456 to demonstrate the UPC-E checksum calculation:

1. The 6 digit UPC-E code is converted to a 10-digit code, using an expansion scheme based on the sixth digit:

If the code ends in:	UPC-E Data	Insertion Digits	Insertion Position	10 digit code
0	abcde**0**	**00000**	3	ab**00000**cde
1	abcde**1**	**10000**	3	ab**10000**cde
2	abcde**2**	**20000**	3	ab**20000**cde
3	abcde**3**	**00000**	4	abc**00000**de
4	abcde**4**	**00000**	5	abcd**00000**e
5	abcde**5**	**0000**	6	abcde**00005**
6	abcde**6**	**0000**	6	abcde**00006**
7	abcde**7**	**0000**	6	abcde**00007**
8	abcde**8**	**0000**	6	abcde**00008**
9	abcde**9**	**0000**	6	abcde**00009**

Because the sample UPC-E code ends in a **6**, the insertion digits **0000** are inserted at the **sixth digit** (insertion position 6):

<div align="center">1234500006</div>

2. Add the **N**umber **S**ystem **C**haracter of 0 to the sample data:

<div align="center">01234500006</div>

3. Use the UPC-A check digit calculation described in the previous section to produce a check digit as if it were a UPC-A code. The check digit for the sample data is:

<div align="center">5</div>

4. The complete 8 digit code consists of the *Number System Character*, the *original 6 digit code* and the *check digit*:

<div align="center">01234565</div>

Appendix I

MSI/Plessey Specifications

Plessey is a variable length numeric only bar code. **MSI** Bar Code is a variable length, numeric-only code with an automatically appended Modulus 10 check digit. MSI is sometimes called *Modified Plessey Code*. If the user specifies an additional check digit, the MSI code can be 14 digits long, otherwise it has a maximum length of 13 characters. This is how the MSI check digit(s) are calculated:

The MSI **Mod 10** check digit is calculated as follows:

The example bar code data is:

<div align="center">82345</div>

1. Form a number from the odd positions, starting in the units position.

<div align="center">835</div>

2. Multiply the new number by 2

<div align="center">**(835) x 2 = 1670**</div>

3. Add the digits of product

<div align="center">**1 + 6 + 7 + 0 = 14**</div>

4. Add the even digits of the original number to the result in 3

<div align="center">**2 + 4 + 14 = 20**</div>

5. Subtract the result from the next highest multiple of 10

<div align="center">**20 - 20 = 0**</div>

6. New Check Digit

<div align="center">**0**</div>

7. Data with check digit is:

<div align="center">**823450**</div>

The MSI **Mod 11** check digit is calculated as follows:

The example bar code data is:

943457842

1. Assign a checking factor to each number, starting with the units position of the number (in this example, the **2**) up to the highest order position (the **9**). Use checking factors of:

2,3,4,5,6,7,2,3,4,5,6,7...

2. Multiply the checking factor with its assigned number and add the products:

4 + 12 + 32 + 35 + 30 + 28 + 6 + 12 + 36 = 195

3. Divide the sum by 11

195/11 = 17 remainder 8

4. Subtract remainder from 11

11 - 8 = 3

5. New Check Digit

3

(If the remainder is 10, no check digit is added.)

6. Data with check digit is:

943457823

Appendix J

How to scan a bar code

The RF Terminal can be used with either a laser or a CCD scanner. Which one you choose is dependent upon your application and the quality and density of your bar codes. This section will include information on different scanners as well as how to use each one.

Laser and CCD Scanners

If you are using a laser or CCD scanner, technique is not critical. The scanners are "point-and-shoot"; you can't miss. Upon triggering the beam, the laser and CCD scans the bar code multiple times (36 scans per second) until it has a good read, at which point it automatically shuts off. These scanners are more expensive, but virtually foolproof. They read from a distance, so they are much more convenient for distance shelf scanning or scanning in tight spots. Different laser scanners have different distance capabilities. **Table M-1** shows the comparison of all the laser and CCD scanners available from Worth Data.

Scanner	Hi Density Code 39	UPC 100%	40 mil Code 39	Paper 100 mil Code39	Retro-Reflective 100 mil Code 39
LI50 CCD	0.5" – 4"	0.5 - 7"	1" – 12"	na	20" – 40"
LZ300 Laser	0 – 6"	0 – 12"	2" – 41"	7" – 41"	28" – 7.5 ft.
LZ400 Laser	0.5" – 9"	0 – 17"	3" – 44"	9" – 50"	18" – 9.5 ft.
Integrated Laser in Terminal	1'" – 7"	0 – 10"	4" – 29"	10" – 32"	18" – 6.5 ft.
PSC Long Range	7" – 11"	7" - 31"	11" – 9 ft.	24" – 15 ft.	48" – 17 ft.

Table M-1. Scanner Comparison Chart

6 mil = high density   40 mil = low density   100 mil = very low density (with paper and retro-reflective label stock)

To try scanning a bar code using your laser or CCD scanner, (whether it be a handheld or integrated)

1. Have your 802 RF Terminal either at the opening screen or at the Mode Menu.

2. point the laser scanner at the bar code at about 6" away.

3. Pull the trigger (or push the button on an integrated model) and line up the beam on the bar code. If you don't get a read, vary the distance of the scanner from the bar code by pulling up or moving down. The idea is to scan through the center of the bar code.

Laser Options

Several options are applicable to all laser and CCD Scanners that are used with the RF Terminal. These options are: 1) Longer timeout on the laser reading, and 2) Double decode required.

Longer Laser Reading: A temporary solution to problem bar codes is sometimes to increase the length of the time the scanner attempts to read, from the default 2-second beam to a 4-second beam. To select the 4-second beam:

>   Scan **Start Setup**
>   Scan **Laser Options**
>   Scan **3** to select the 4-second beam
>   Scan **End Setup**

>   *To return to the default 2-second beam, scan **2**.*

Double Decode: The default setting for the RF Terminal is one successful decode results in a "good read". If you are getting incorrect reads, (due to defective bar codes), a temporary solution is to turn on make the RF Terminal perform two straight identical decodes before beeping, outputting data, and completing a "good read" read.

To activate the double decode:

>   Scan **Start Setup**
>   Scan **Laser Options**
>   Scan **1** to select double decode
>   Scan **End Setup**

>   *To return to the single decode beam, scan **0**.*

There are two **Setup Options** that do not apply to the LZ300. The two options are:

1. "**Aiming Laser Dot**" for a predetermined time before the laser beam expands into a "line" for reading. The RF terminal requires a no charge feature to be added to it before shipping for the Aiming Dot to be used. This feature applies to the LT70x models of the RF Terminal with its built-in laser and the external tethered LZ400 Laser Scanner.

2. "**Difficult Code 39 Reading**" for reading Vehicle Identification Numbers (VIN) through the automobile windshield. This applies only to the external tethered LZ400 Laser Scanner.

Aiming the Laser Dot:
Sometimes it is difficult to see the laser beam and know you are on the bar code, especially if you are attempting to read outdoors in direct

sunlight. The laser can be outputted as a brighter dot for a few seconds, allowing the user to place the dot in the middle of the bar code; then the laser beam starts sweeping for the read. As shipped, the laser beam never forms an aiming dot, but you can program a number of seconds that you wish the aiming dot to appear before the sweeping beam by scanning the following:

From the Keypad, go to **RF Terminal Setup**. Choose "**Other**". Press Enter repeatedly until you get to the parameter labeled "**AIMING DOT**". The default is **00**. Enter the time in 1/10s of a second you wish the dot to appear before the laser beam spreads, (i.e. enter 30 for 3 seconds).

"Difficult Code 39 Reading":
This setting facilitates reading of difficult Code 39 bar codes such as the Vehicle Identification Number (VIN number) on automobiles, especially reading through a windshield. VIN numbers are long, often weathered, often dirty, and challenging to read.

To enable the more aggressive Code 39 algorithms necessary to read windshield VINs with a LZ400:

Scan **Start Setup**
Scan **2 of 5 Code**
Scan **D** for windshield reading
Scan **End Setup**

*To return to the default Code 39 decode algorithms, scan **B** instead of **D**.*

Don' forget the common sense things you can do to facilitate reading the VIN:

1. Be sure the window on the laser scanner is clean.

2. Be sure the windshield itself is wiped clean before reading

Appendix K

Using the Scan Stand

Stand mode allows the operator to use an LZ300 laser in "hands free" mode while attached to an RF Terminal. This is useful in shipping applications or any application where the operator requires both hands to perform their function.

Stand Mode is actually a fast cycling laser looking for a bar code (many transitions between black and white). The user scans the bar code on the Stand to activate it. A scan of the same bar code while in "Stand Mode" will deactivate it. The "Stand Mode" on the RF Terminal only supports the external LZ300 Scanner, not the internal scanner and not the LZ400 Scanner. When the scanner detects a suspect bar code, the beam spreads wider and stays on for 2 1/2 second or until a bar code is successfully read. If successfully read, the scanner turns off until the next prompt. If no read occurred, it resumes the cycling looking for a prospective bar code.

When in Stand Mode, if a key is pressed, we assume the user wants to key data instead of scan data, so the scanner is turned off; at this point the scanner can be used if triggered. Once the data entry is finished and transmitted and the next prompt is received from the host program requesting either 1) scanner only input, or 2) scanner/keyboard input; the "Stand Mode" operation is resumed.

The Stand itself is available in two models, one with a weighted base (if you need to move the stand from site to site) or a gooseneck-only model that must be permanently mounted to a surface.
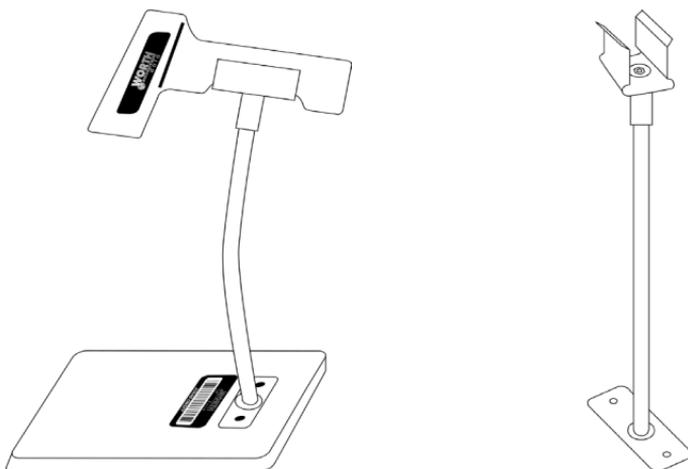
Appendix L

Optional Features

The following are the features available for the RF Terminal:

Item #	Description
F15	9V Power Supply for recharging
F38	RF Terminal Cloning Cable
T15	Voice Cloning Cable
T12	Headphone
B12	Rubber Boot for RF Terminal
F41	RF Terminal Carrying Case
T46	Holster for RF Terminal using Rubber Boot
F88	Belt Holster for tethered Laser Scanner Gun
H11	Laser Holder for LZxxx
LZ300	Worth Data Laser Scanner
LZ400	Worth Data Laser Scanner
PSC LR	PSC Long Range Laser Scanner
LI50	Long Range CCD Scanner

CCD Scanners

LI50 Linear Imager Scanner
This CCD scanner reads typical UPC codes from a 0.5" to 7" distance.
It acts just like a laser scanner, except the beam is fuzzier than the
lasers sharp line across the bar code. The cable (rated for 1,000,000
bends). The warranty is 2 years.

Laser Scanners

The LT802 model RF Terminal is available with an integrated laser
scanner for one-handed scanning. This laser uses the Symbol SE900
Scan Engine with a lifetime warranty on the scan element. We also offer
cabled laser scanners (the **LZ300, LZ400** and **PSC Long Range**) as an
add-on, plugging directly into the **SCANNER** port of the RF Terminal.

LZ300 Laser Scanner
This laser scanner uses the Symbol 1200WA Scan Engine with a
lifetime warranty on the scan element. The 10 ft. cable is durability
rated for 1,000,000 bends. It reads all densities of bar codes down to a
3 mil narrow bar and reads a typical UPC code at about 12". The
warranty on the LZ300 is 2 years.

LZ400 Laser Scanner
This laser scanner is the equivalent of the lasers used in the LT802. The LZ400 uses the Symbol 1200HP Scan Engine with a lifetime warranty on the scan element. It can read a 10 mil bar code at 17", a 40 mil bar code at 44 " ft., and a reflective 100 mil bar code at 9.5 ft. It can read high density code down to a 3 mil narrow bar width.

This scanner supports the aiming dot mode, useful for difficult aiming and scanning in bright sunlight.

Durability features include a cable tested to withstand 1,000,000 bends of operation, as well as a scan engine tested to withstand 2000 G's of force. It is an extremely rugged product, made to withstand harsh treatment including repeated drops.

PSC Long Range Laser
This laser is a long-range laser (it reads a 100 mil reflective bar code from up to 17 ft.), but it also reads normal codes. This makes it ideal for reading shelves so high you can't even reach them, (i.e. a forklift operator can scan the shelves without getting up); but it can still read desktop bar codes at close range. It actually has two lasers built-in; one for close up reading, and one for distance reading. It has a two position trigger; the first position stop is an aiming spot, the second position stop triggers the beam. Warranty is 2 year.

Laser Accessories

H11 Laser Holder
The H11 Laser Holder is for the LZ300 and LZ400 laser scanners. The H11 Laser Holder can be mounted vertically (wall) or horizontally (table top). Double-sided tape is included to use for mounting, or you can use wood or metal screws (not provided) to mount the holder.

Laser Holder (back view)

Remove screw

Mounting holes

Laser Holder (back view)

Vertical mount

Horizontal mount

Insert (side view)

Laser Holder (side view)
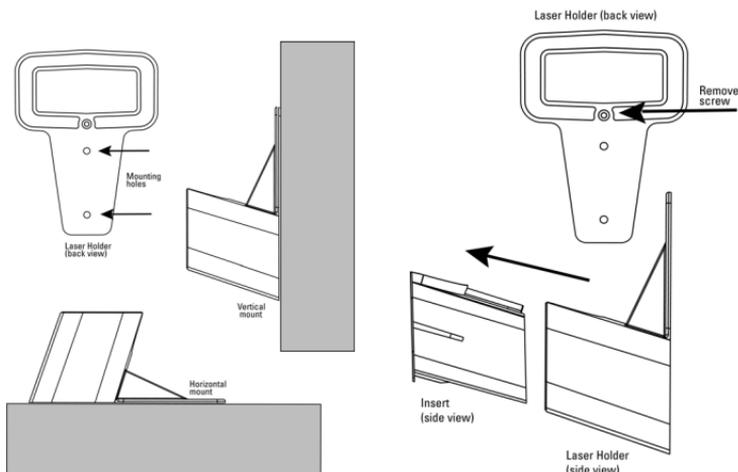
RF Terminal Cases and Holsters

The RF Terminal has a variety of carrying cases and holsters available for use, depending upon the configuration and function of your RF Terminal. Choosing the correct carrying case or holster can increase productivity by making the RF Terminal more accessible and portable.

The RF Terminal can use the following carrying cases and holsters:

F41 Leather RF Terminal Carrying Case

The F41 Leather Carrying Case features either a shoulder strap or belt loop attachment. The RF Terminal is worn upside down to make it easier for the operator to simply lift the RF Terminal up and view the display and keypad in the correct orientation. The case has openings for all cable and scanner attachments, making it unnecessary to remove the case for uploading. This case has a clear plastic keypad window to protect the RF Terminal keypad from the elements.

T46 Holster for RF Terminal

The T46 RF Terminal holster is worn on a belt and provides a convenient way to store and carry the RF Terminal during use. The holster can accommodate all 700 RF Terminal models with a boot included.

L-3

It provides quick extraction and insertion.

<u>Rubber Boot for RF Terminal</u>
The B12 Rubber Boot is shipped standard with every RF Terminal ordered. It is a rugged, protective rubber boots intended to protect the RF Terminal in the most hostile environments.

This boot doesn't have to be removed to change batteries or connect any of the cables or recharging power supply.

Appendix M
ASCII Code Equivalent Table

The 128 ASCII codes, their 3-digit decimal equivalents and 2-digit hex equivalents are detailed in the below table.

char	hex	3 digit ASCII	char	hex	3 digit ASCII	char	hex	3 digit ASCII	char	hex	3 digit ASCII
NUL	00	000	SP	20	032	@	40	064	`	60	096
SOH	01	001	!	21	033	A	41	065	a	61	097
STX	02	002	"	22	034	B	42	066	b	62	098
ETX	03	003	#	23	035	C	43	067	c	63	099
EOT	04	004	$	24	036	D	44	068	d	64	100
ENQ	05	005	%	25	037	E	45	069	e	65	101
ACK	06	006	&	26	038	F	46	070	f	66	102
BEL	07	007	'	27	039	G	47	071	g	67	103
BS	08	008	(	28	040	H	48	072	h	68	104
HT	09	009	)	29	041	I	49	073	i	69	105
LF	0A	010	*	2A	042	J	4A	074	j	6A	106
VT	0B	011	+	2B	043	K	4B	075	k	6B	107
FF	0C	012	,	2C	044	L	4C	076	l	6C	108
CR	0D	013	-	2D	045	M	4D	077	m	6D	109
SO	0E	014	.	2E	046	N	4E	078	n	6E	110
SI	0F	015	/	2F	047	O	4F	079	o	6F	111
DLE	10	016	0	30	048	P	50	080	p	70	112
DC1	11	017	1	31	049	Q	51	081	q	71	113
DC2	12	018	2	32	050	R	52	082	r	72	114
DC3	13	019	3	33	051	S	53	083	s	73	115
DC4	14	020	4	34	052	T	54	084	t	74	116
NAK	15	021	5	35	053	U	55	085	u	75	117
SYN	16	022	6	36	054	V	56	086	v	76	118
ETB	17	023	7	37	055	W	57	087	w	77	119
CAN	18	024	8	38	056	X	58	088	x	78	120
EM	19	025	9	39	057	Y	59	089	y	79	121
SUB	1A	026	:	3A	058	Z	5A	090	z	7A	122
ESC	1B	027	;	3B	059	[	5B	091	{	7B	123
FS	1C	028	<	3C	060	\	5C	092			7C	124
GS	1D	029	=	3D	061	]	5D	093	}	7D	125
RS	1E	030	>	3E	062	^	5E	094	~	7E	126
US	1F	031	?	3F	063	_	5F	095	DEL	7F	127

Full ASCII Equivalent Table

Appendix N

802 Display Character Code Mapping

ASCII Value	Display Ch	ASCII Value	Display Ch	ASCII Value	Display Ch	ASCII Value	Display Ch	Ascii Value	Display Ch
32	space	70	F	108	l	208	Đ	246	ö
33	!	71	G	109	m	209	Ñ	247	÷
34	"	72	H	110	n	210	Ò	248	ø
35	♯	73	I	111	o	211	Ó	249	ù
36	$	74	J	112	p	212	Ô	250	ú
37	%	75	K	113	q	213	Õ	251	û
38	&	76	L	114	r	214	Ö	252	ü
39	'	77	M	115	s	215	×	253	ý
40	(	78	N	116	t	216	ø	254	þ
41	)	79	O	117	u	217	Ù	255	ÿ
42	*	80	P	118	v	218	Ú		
43	+	81	Q	119	w	219	Û		
44	,	82	R	120	x	220	Ü		
45	–	83	S	121	y	221	Ý		
46	.	84	T	122	z	222	Þ		
47	/	85	U	123	{	223	ß		
48	0	86	V	124			224	à		
49	1	87	W	125	}	225	á		
50	2	88	X	126	~	226	â		
51	3	89	Y	127	⌂	227	ã		
52	4	90	Z	128	€	228	ä		
53	5	91	[	163	£	229	å		
54	6	92	\	192	À	230	æ		
55	7	93	]	193	Á	231	ç		
56	8	94	^	194	Â	232	è		
57	9	95	_	195	Ã	233	é		
58	:	96	`	196	Ä	234	ê		
59	;	97	a	197	Å	235	ë		
60	<	98	b	198	Æ	236	ì		
61	=	99	c	199	Ç	237	í		
62	>	100	d	200	È	238	î		
63	?	101	e	201	É	239	ï		
64	@	102	f	202	Ê	240	ð		
65	A	103	g	203	Ë	241	ñ		
66	B	104	h	204	Ì	242	ò		
67	C	105	i	205	Í	243	ó		
68	D	106	j	206	Î	244	ô		
69	E	107	k	207	Ï	245	õ		

802 RF Terminal Setup Menu

To change a setting using the 802 RF Terminal Setup Menu:

- Scan **START SETUP** to enter setup mode
- Scan the **parameter** you want to change (i.e. Code 3 of 9)
- Choose the **setting** you want to change and scan the corresponding letter or
  number from the Barpad Table (0-9, A-F)
- When all changes have been made, scan **END SETUP**
- * indicates default settings

Start Setup

End Setup

Code 3 of 9

∗**0 Enable Code 39**
 1 Disable Code 39
∗**2 Enable Full ASCII Code 39**
 3 Disable Full ASCII Code 39
∗**4 Enable Accumulate Mode**
 5 Disable Accumulate Mode
 6 Transmit Start/Stop characters
∗**7 Don't transmit Start/Stop characters**
 8 Enable Mod 43 Check Character
∗**9 Disable Mod 43 Check Character**
 A Transmit Mod 43 Check Character
∗**B Don't transmit Mod 43 Check Character**
 C Caps Lock ON
∗**D Caps Lock OFF**

UPC/EAN

∗**0 Enable UPC/EAN**
 1 Disable UPC/EAN
 2 Enable Supplements
∗**3 Disable Supplements**
∗**4 Transmit UPC-A NSC**
 5 Don't transmit UPC-A NSC
∗**6 Transmit UPC-A Check Digit**
 7 Don't transmit UPC-A Check Digit
 8 Transmit UPC-E NSC & EAN-8 Flag Ch
∗**9 Don't transmit UPC-E NSC & EAN-8 Flag Ch**
 A Transmit UPC-E & EAN-8 Check digit
∗**B Don't transmit UPC-E & EAN-8 Check digit**
∗**C UPC-E Compressed transmission**
 D UPC-E Expanded transmission
∗**E EAN-8 observes 9 & A above**
 F EAN-8 is forced to transmit 8 digits always

2 of 5 Code

 0 Enable I 2 of 5
∗**1 Disable I 2 of 5**
 2 Enable check digit
∗**3 Disable check digit**
 4 Transmit check digit
∗**5 Don't transmit check digit**
 6 Enable 2 of 5
∗**7 Disable 2 of 5**

2 of 5 Length

 Scan 2 digit length (default is 06)

RSS-14

 0 Disable RSS-14   2 14 + Identifiers
 1 Standard 14 digits   3 14 + UCC-128 Emulation

Start Setup	End Setup

Code 93

0 Enable Code 93
*1 **Disable Code 93**
2 Enable Full ASCII Code 93
*3 **Disable Full ASCII Code 93**

Code 128

*0 **Disable 128**
1 Enable 128
*2 **Disable UCC/EAN-128**
3 Enable UCC/EAN-128

Codabar

0 Enable Codabar
*1 **Disable Codabar**
2 Enable CLSI Codabar
*3 **Disable CLSI Codabar**
*4 **Suppress start/stop characters**
5 Enable start/stop characters

MSI/Plessey

*0 **Disable MSI**
1 Enable MSI 1 Mod 10 check digit
2 Enable MSI 2 Mod 10 check digits
3 Enable MSI Mod 11/10 check digits
*4 **Transmit no check digit**
5 Transmit 1 check digit
6 Transmit 2 check digits
7 Enable Plessey
8 Enable Labelcode 5
9 Enable Labelcode 4

Laser Options

*0 **None**
1 Double Decode
2 4.5 second scan

Batteries

*0 **Alkalines in use**
1 Rechargeables in use

Shut Down Time

Scan 2 digits for number of minutes till shut down.

Beep Tone

0 Lowest	3 High
1 Low	4 Highest
*2 **Medium**	5 No Beep Tone

Date Format

*0 **US Format**
1 European Format

Voice Messages

Scan 6 digits for message partitioning

1 - 2 = number of 1/2 second messages
3 - 4 = number of 1 second messages
5 - 6 = number of 2 second messages

Start Setup	End Setup

‖‖‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖‖‖

Data Bits	**Stop Bits**

‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖

0 7 bits   *0 1 bit
*1 8 bits   1 2 bits

Parity	**Baud Rate**

‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖

*0 **None**
 1 Even   0 4800   3 38,400
 2 Odd   1 9600   4 57,600
                       *2 **19,200**   5 115,200

Channel	**Printer IP**

‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖

Scan 2 digits 01 - 11 to set channel   For future use.

Server IP	**Device IP**

‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖

To use a fixed server IP address, enter the IP address nnn.nnn.nnn.nnn (where each n is a value of 0-9. **The default setting in the terminal is to search for the server IP address,** (a setting of 0.0.0.0).

Enter in the address in the format of nnn.nnn.nnn.nnn (where each n is a value of 0-9); or if you wish to use a DHCP Server, enter 0.0.0.0. **The terminal's default setting is to use a DHCP Server.**

Subnet Mask	**WEP Key**

‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖

Enter 12 digits in the format xxx.xxx.xxx.xxx You must enter the . character as well as the numbers. **The default is 255.255.155.0**

10 (short form) or 26 (long form) hex characters - (0-F)

SSID	**Authentication**

‖‖‖‖‖‖‖‖‖‖‖   ‖‖‖‖‖‖‖‖‖‖‖

To restrict the terminal to a specific network name, enter the name here (up to 32 chs). The default setting is NONE. You will need to change it to sign on to your network. SSID is case-sensitive; if you want an SSID with lower case characters, use Shift F2 to go into lower case or you will have to scan the Full ASCII Menu.

* **0 Open System**
   1 Shared Key

Before a wireless client device can communicate on a network, it must authenticate to the access point and the network. You must enter a WEP Encryption key to access the Authentication settings.

Start Setup

|||||||||||||||||||||||

End Setup

|||||||||||||||||||||||

Set Date

|||||||||||||||||||||||

Enter 6 digits in **mmddyy** format

Set Time

|||||||||||||||||||||||

Enter 4 digits in **hhmm** military time format

Skip Opening Screen

|||||||||||||||||||||||

*0 **Disabled**
 1 Enabled

BARPAD TABLE

0	8
1	**9**
2	**A**
3	**B**
4	**C**
5	**D**
6	**E**
7	**F**

SET

|||||||||||||||||||||||

CLEAR

|||||||||||||||||||||||

*Resets current individual parameter
back to default settings.*

RESET

|||||||||||||||||||||||

Warning: *Scanning this bar code
after scanning START SETUP will
reset the reader back to all of the
default parameter settings.*

Full ASCII Menu

NUL	SOH(f1)	STX(f2)	ETX(f3)
000 00	001 01	002 02	003 03

EOT(f4)	ENQ(f5)	ACK(f6)	BEL(f7)
004 04	005 05	006 06	007 07

BS	TAB	LF	VT(Pg Up)
008 08	009 09	010 0A	011 0B

FF(Pg Dn)	CR	SO(f8)	SI(f9)
012 0C	013 0D	014 0E	015 0F

DLE(f10)	DC1(Del)	DC2(Ins)	DC3(←)
016 10	017 11	018 12	019 13

DC4(→)	NAK(↓)	SYN(↑)	ETB(Home)
020 14	021 15	022 16	023 17

CAN(End)	EM(Shift On)	SUB(Shift Off)	Esc
024 18	025 19	026 1A	027 1B

FS(Ctrl On)	GS(Ctrl Off)	RS(Alt On)	US(Alt Off)
028 1C	029 1D	030 1E	031 1F

SP	!	"	#
032 20	033 21	034 22	035 23

$	%	&	'
036 24	037 25	038 26	039 27

(	)	*	+
040 28	041 29	042 2A	043 2B

,	-	.	/
044 2C	045 2D	046 2E	047 2F

0	1	2	3
048 30	049 31	050 32	051 33

4	5	6	7
052 34	053 35	054 36	055 37

8	9	:	;
056　　38	057　　39	058　　3A	059　　3B

<	=	>	?
060　　3C	061　　3D	062　　3E	063　　3F

@	A	B	C
064　　40	065　　41	066　　42	067　　43

D	E	F	G
068　　44	069　　45	070　　46	071　　47

H	I	J	K
072　　48	073　　49	074　　4A	075　　4B

L	M	N	O
076　　4C	077　　4D	078　　4E	079　　4F

P	Q	R	S
080　　50	081　　51	082　　52	083　　53

T	U	V	W
084　　54	085　　55	086　　56	087　　57

X	Y	Z	[
088　　58	089　　59	090　　5A	091　　5B

\	]	^	_
092　　5C	093　　5D	094　　5E	095　　5F

`	a	b	c
096　　60	097　　61	098　　62	099　　63

d	e	f	g
100　　64	101　　65	102　　66	103　　67

h	i	j	k
104　　68	105　　69	106　　6A	107　　6B

l	m	n	o
108　　6C	109　　6D	110　　6E	111　　6F

p	q	r	s
112　　70	113　　71	114　　72	115　　73

t	u	v	w
116 74	117 75	118 76	119 77

x	y	z	{
120 78	121 79	122 7A	123 7B

|	}	~	DEL
124 7C	125 7D	126 7E	127 7F

Index