

*Worth Data*  
*WDP Keyboard*  
*Wedge Reader*  
*Users Manual*

*For Model P11/12*

For Models purchased prior to 8/00

# Introduction

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Worth Data' WDP Readers are versatile bar code readers that attach to the IBM PC, XT and AT; all IBM PS/2 Models; any PC keyboard-compatible or bus-compatible unit; and all Macintosh ADB models. The WDP provides bar code input data to any host computer program exactly as if the data had been typed at the keyboard, including function and control key support. WDP Reader features include:

- **Bar codes**

The WDP Reader automatically reads and discriminates between Code 39, Full ASCII Code 39, Interleaved 2 of 5, Codabar, Code 128, EAN-13, EAN-8, UPC-E, UPC-A (with or without supplements), MSI, LabelCode4, LabelCode5, Code 93, and Plessey.

- **PC or Macintosh Interface**

The WDP Reader is presently the only reader capable of internal or external installation on PCs (External-only on Microchannel PS/2's and the Macintosh.) For external mounting, its lightweight, unobtrusive case can be attached to the side of the computer, monitor or desk with Velcro. For internal mounting, the board is easily removed from the case and inserted into a PC's ISA slot. If your MAC or PC has only a USB port for keyboard attachment, the USB Wedge Saver bridges the WDP to a USB port.

- **Scanner options**

The WDP Reader comes with a high quality USA-made stainless steel wand scanner. Additional scanner options include moving-beam laser scanners, CCD scanners, MagStripe scanners for reading credit card magnetic strips, and bar code slot scanners for badges and other thin, flat surfaces.

- **Integrated Laser & Integrated CCD Wedge Reader**

The Integrated Laser Readers and the Integrated CCD Readers are complete WDP Readers with the decoder built into the scanner handle. Just plug the unit in between your computer and keyboard and you're ready to go. They work with any PC keyboard-compatible computer, all Macintosh ADB models and USB computers (using the Wedge Saver).

- **Configuration is easy**

The WDP Reader is easily configured for your system by scanning a bar coded Setup Menu. There are no dip switches to set. On the separate decoder models, opening of the reader's case is required only for internal bus installation, Track 1&2 Magstripe, and for setting the decode light on a laser or CCD Scanner. The PC/PS2 Y cable can be switched from 5 pin to 6 pin and vice versa.

# Installation

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## Components of WDP Reader

In the event the shipping box shows damage on arrival, please note the damage on the carrier's receipt log. Open the box and inspect the contents for damage. If there is visible damage, or if the unit fails to work, contact us with the details of the trouble; we will be happy to send you a replacement.

The contents of your WDP Reader shipment should include the following:

1. A WDP Reader in a lightweight box, or an Integrated Laser Reader or an Integrated CCD Wedge Reader.
2. Velcro strips which can be used to conveniently attach the reader to the side of your computer, monitor or desk.
3. A "Y" cable for attaching the WDP Reader between your computer and keyboard to a 5 pin din or 6 pin minidin keyboard connector; or if you have a USB only computer, a straight cable with the USB Wedge Saver for attachment to the USB port of your computer.
4. A rugged stainless-steel bar code wand (unless you have an Integrated Laser or Integrated CCD Wedge Reader, or ordered a different input device such as a laser scanner or slot scanner).
5. A plastic wand or laser-scanner holder.
6. A laminated Reader Setup Menu sheet (or slot-scanner card deck).

You probably didn't receive a power supply with your WDP - even though your external WDP decoder box has a Power jack. Power supplies are rarely needed. Using a power supply other than a Worthington Data Power Supply, (i.e. our part number F10 for 110v), will probably burn out the WDP circuit board. Damage caused by non-Worthington power supply which is *not* covered by warranty. **DON'T PLUG OTHER POWER SUPPLIES INTO THE WDP** -- even if the connector does fit, you will fry the WDP board.

# Installation

The several methods of WDP attachment are:

- **External Wedge**

The Reader is placed near the computer, and is connected between the computer and keyboard. Velcro is included for convenient attachment to your computer, monitor, desk, etc. Bar code data is received via the computer's keyboard port.

- **Internal Installation on PC (P11/12)**

The WDP Reader Models P11/12/P01 have a printed circuit board which can be removed from the case and mounted in any unused PC's ISA slot.

Internal Wedge mounting uses the slot for physical mounting only -- it doesn't communicate with the bus. Cables connect the board level reader between the computer and keyboard; bar code data is received by the keyboard port. DOS users can also install the WDP P11/12 so that it communicates with the bus instead of the keyboard interface. If you prefer Internal Installation, see Appendix B for details.

The Lasers and CCD are available in the decoder built into the scanner housing, thereby eliminating the separate decoder. These models of the WDP are:

- **Integrated Laser WDP Readers**

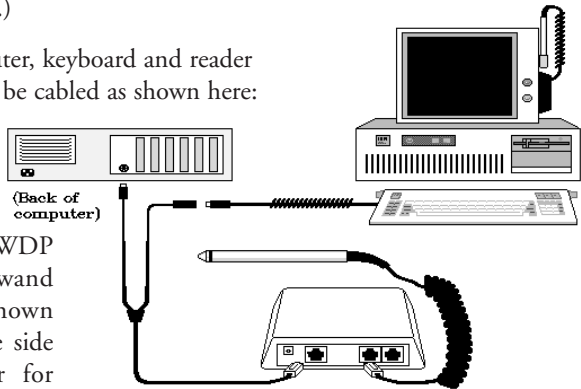
These readers have to be attached externally. The LZ100-WDP and LZ200-WDP Readers are laser scanners with the decoder built into the scanner housing. They are connected between the computer and keyboard using a Y cable or the USB Wedge Saver. Decoded bar code data is transmitted as though it has been keyed. These readers do not require a separate decoder box; however there is no power supply option for low powered PCs, and there is no second scanner attachment possible. 99.99% of PCs have sufficient power.

- **Integrated CCD Wedge Reader**

This reader has to be attached externally. The Integrated CCD Reader has the decoder built into the scanner case. Connected between your computer and keyboard, or to the USB Wedge Saver, it transmits decoded bar code data to the computer's keyboard port. These readers do not require a separate decoder box; however there is no power supply option for low powered PCs, and there is no second scanner attachment possible. 99.99% of PCs have sufficient power.

## External Wedge Installation on PC or Mac

1. Unplug the keyboard cable from where it plugs into the back of the computer, and note its location. (Note: the PC's F30/1 Y cable is convertible from a 5 pin cable to a 6 pin minidin by simply switching the adapter from one side of the Y cable to another, so match your keyboard requirement. Be sure not to plug into the mouse port by mistake.
2. Plug the keyboard cable into the "Y" cable's round female DIN connector.
3. With the power OFF on the computer, Plug the "Y" cable's male DIN connector into the back of the PC where the keyboard previously plugged into. For the Mac, plug into any ADB port; but, preferably on the host.
4. Plug the modular telephone style jack at the Y end of the "Y" cable into the WDP Reader's "Y" cable port. If you have an Integrated Laser or Integrated CCD, the RJ45 telephone connector end of the "Y" cable will plug into the Integrated Laser or Integrated CCD's small black "coupling connector" instead.
5. If you have a decoder box, plug the wand, laser scanner, CCD touch scanner or bar code slot scanner into the WDP Reader's Wand port. (If you have a MagStripe slot scanner, see page 21 for its installation instructions.)
6. Your computer, keyboard and reader should now be cabled as shown here:



Notice how the WDP Reader and wand holder are shown mounted on the side of the monitor for convenient access without clutter.

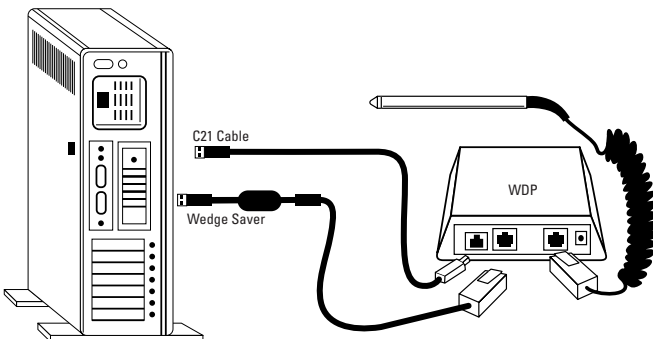
Laser and CCD scanners can also be mounted on the side of your monitor, computer or other surface using the laser scanner holder. Slot scanners can be permanently mounted to a desk, wall or other surface by using the threaded holes on the bottom. If have a Laser or CCD Scanner attached to a decoder box, you may want to change the decode light jumper. See page 37.

# USB Installation on a PC or Mac

If you are attaching a WDP to a computer which doesn't have a traditional keyboard port, (5 or 6 pin din on PC or ADB on Mac), and only has a USB port for attaching a keyboard, you must use the Wedge Saver to bridge the WDP to the USB port.

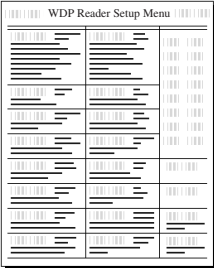
When you plug the Wedge Saver into the USB port, Windows-98 or the Mac will sense the new device and proceed to install the necessary software. You don't need any additional drivers other than what is already on Windows or Mac OS. After the software installation completes, follow these instructions:

1. Plug the Wedge Saver into a USB port on the host computer, keyboard, or a USB hub.
2. You can then plug the C20 cable, (a cable with an RJ45 telephone connector on one side and a 6 pin minidin connector on the other), between the WDP and the Wedge Saver.
  - If you have a WDP with an external decoder box, plug the RJ45 end into the WDP's "Y" Cable Port.
  - If you have an Integrated CCD (WDP-P16) or Integrated Laser Reader (LZ100-WDP or LZ200-WDP), plug the RJ45 end of the "Y" cable into the black RJ45 Connector Block on the end of the Integrated Reader's cable.
3. If you have an Integrated CCD or Integrated Laser Reader, you can begin scanning immediately.
  - If you have a WDP with an external decoder box, you may now plug your scanner into the Wand Port of the WDP. If you also have a MagStripe Scanner, plug it into the MagStripe Port, (if you have a dual track or triple track scanner, you will need to change a jumper -- see page 21). If you are using a "Y" Cable, you can plug you legacy keyboard into the other end of the Y Cable, but to get the lights properly working on the legacy keyboard, plug in the keyboard first and then plug in the USB Wedge Saver.



# WDP Reader Setup

## Configuring the WDP Reader for your computer and application...



Turn on your computer: You should hear three beeps -- an indication the WDP Reader is functioning correctly.

Find the laminated Reader Setup Menu sheet and look it over. (For bar code slot scanners, the Reader Setup Menu is a deck of bar coded cards.) This simple menu lets you easily configure the WDP Reader to work with almost any computer system, and tailor its bar code reading and data format characteristics precisely to your needs. To scan Reader Setup Menu bar codes and configure your reader,

you must know the right way to scan bar codes. If you are new to scanning, be sure to read **Appendix K - Scanning Instruction**.

These are the WDP Reader's default settings. The WDP Reader is shipped configured to these settings, and can be reset to them at any time by reading the **Start Setup** and **Reset** bar codes on the Reader Setup Menu. If you need to change any settings, or want to learn more about the WDP Reader options, the next pages explain, step by step, how to set them and what they do.

Parameter	Default Setting	Parameter	Default Setting
Code 39	Code 39 enabled	MSI/Plessey	MSI/Plessey disabled
	Check Digit disabled		Check Digits not transmitted
	Start/Stop characters not transmitted		Label Code 4/5 disabled
	Accumulate Mode enabled		
	Caps Lock OFF		
2 of 5	1 2of 5 disabled	Code 128	Code 128 disabled
	6 digit code length		UCC-128/EAN disabled
	Check digit disabled		
UPC/EAN	UPC/EAN enabled	Code 93	Code 93 disabled
	UPC Supplements disabled		Full ASCII extension disabled
	UPC-E compressed, NSC of 0		
	Transmit UPC-A in UPC-A format		
	ISBN conversion disabled		
	UPC-A NSC and EAN-13 first two characters and check digits transmitted		
	UPC-E NSC and EAN-8 first two characters and check digits not transmitted		
General			
Configuration	AT with USA keyboard		
Settings	Data Transmission timing NONE		
	NO preamble or postamble set		
	CR as Terminator Character		
	Medium pitch beep tone		
	No MagStripe slot scanner attached		

## Using the WDP Reader Setup Menu

**1** If you have never scanned before, refer to Appendix K for Scanning Instructions. To configure your reader using the Reader Setup Menu, you must first scan the **Start Setup** code at the top left corner. Do this now. You'll hear two beeps. During Setup, nothing will be transmitted to your computer; the Reader Setup Menu codes are strictly for configuring the reader. If you did not hear two beeps, try scanning the code again, until you hear the two beeps.

**2** Next, choose the topic you want to change an option for, and scan its code. Let's use **Beep Tone**, at the lower left corner of the menu, as an example. Scan the **Beep Tone** code now. You'll hear two beeps.

**3** Then, choose the option you want to change, from the list next to the topic bar code you just scanned. For **Beep Tone**, the options range from **0** for the lowest pitch to **4** for the highest pitch. Using the "Barpad Table" on the right side of the Reader Setup Menu, scan the number or letter associated with the option you have selected. Let's change the beep pitch to **Highest**. Now scan the **4** on the "Barpad Table". You will again hear two beeps.

**4** Now scan **End Setup** (at the top-right corner of the Reader Setup Menu) to complete the setup exercise. You'll hear three beeps. If you followed the instructions correctly and successfully changed beep tone to "highest", the three beeps will be higher in pitch than the other beeps had been. If they aren't higher in pitch, repeat the steps on this page until you are successful at changing the beep tone.

Now that your beep tone is at the "highest" pitch, you may want to change it back to "medium" or a different setting. Repeat the steps above, selecting the option you prefer to "highest" in step 3.

When you've successfully changed the beep pitch, and are ready to configure the reader for your specific application, scan Start Setup again. Continue scanning topics and options until you've made all the changes you desire, and then scan End Setup to complete setup.

The next chapter will take you step by step through configuring each WDP Reader option. Default settings are shown in bold in this manual and marked with an \* on the Reader Setup Menu.



## WDP Setup Parameters

### Beep Tone

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Lowest	0
Low	1
Medium	2
High	3
Highest	4
Turn Beeper OFF	5

The WDP Reader gives you a choice of five different beep pitches. (Beep volume is also adjustable -- see page 32 for the details.)

### Code 39

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Enable Code 39	0
Disable Code 39	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 Mod 43 Check Digit	9
Enable Check Digit Transmission	A
Disable Check Digit Transmission	B
Caps Lock ON	C
Caps Lock OFF	D

For information about **Code 39**, **Full ASCII Code 39** and **Accumulate Mode**, see *Appendix D*.

**Enabling Start/Stop character transmission** means that the WDP Reader will transmit the \* Start/Stop characters to your computer along with the data. For example, data of 1234 would be transmitted as \*1234\*. Most people don't need this option, but it is useful if you want your software to be able to differentiate between keyboard and bar code data.

**Enabling the Mod 43 Check Digit** requires the units position of your data to match the calculation for the check digit explained in *Appendix D*. If you've enabled the check digit, **enabling Check Digit transmission** causes the reader to transmit the check digit to your computer along with the bar code data.

"**Caps Lock ON**" means that lower case letters read as data will be transmitted as upper case, and upper case as lower. Numbers, punctuation and control characters are not affected. "**Caps Lock OFF**" means that letters will be transmitted exactly as read.

## UPC/EAN

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Enable UPC/EAN	0
Disable UPC/EAN	1
Enable UPC/EAN Supplements	2
Disable UPC/EAN Supplements	3
Enable transmission of UPC-A NSC and EAN-13 first two digits	4
Disable transmission of UPC-A NSC and EAN-13 first two digits	5
Enable transmission of UPC-A/EAN-13 Check Digit	6
Disable transmission of UPC-A/EAN-13 Check Digit	7
Enable transmission of UPC-E NSC and EAN-8 first digit	8
Disable transmission of UPC-E NSC and EAN-8 first digit	9
Enable transmission of UPC-E/EAN-8 Check Digit	A
Disable transmission of UPC-E/EAN-8 Check Digit	B
UPC-E Compressed	C
UPC-E Expanded	D
EAN-8 observes 9 and A above	E
EAN-8 if forced to transmit 8 digits	F
UPC-A transmitted in UPC-A format	(see below)
UPC-A transmitted in EAN-13 format	(see below)
ISBN conversion disabled	(see below)
ISBN conversion enabled	(see below)

For general information about UPC and EAN, see Appendix G.

**Enabling supplements** allows you to read 2 and 5-digit supplemental codes used with magazines and books. This disallows right-to-left reading of UPC/EAN codes, to assure that the supplement doesn't get skipped.

**Enabling transmission of UPC or EAN NSC's** (leading digits, 1 for UPC;2 for EAN-13) or Check Digits means that these digits will be transmitted to your computer along with the rest of the UPC or EAN data.

**UPC-E Compressed Format** transmits UPC-E codes as is; Expanded Format adds zeros to make them the same length as UPC-A.

UPC-E can be used in either normal **UPC-E format** (implicit NSC of 0) or **UPC-E1 format** (NSC of 1). UPC-E1 is enabled by wandng 2 of 5 Code and 8 (9 disables UPC-E1). It is very easy to read an EAN-13 bar code partially as UPC-E1, so don't enable UPC-E1 when reading EAN-13.

If you wish the **UPC-A data to be transmitted in EAN-13 format**, (with an additional leading 0 for the USA's country code), you should scan Terminator Character and F. Scanning E, the default, sets UPC back to no country code transmitted.

**ISBN bar codes** are EAN-13 bar codes where the first three digits are the "Bookland" country code of 978 for books and 977 for periodicals, and the following nine are the first nine digits of the ISBN. To enable transmission of ISBN

bar codes in ISBN format (the nine ISBN digits plus a new calculated mod-11 check digit), scan Terminator Character and 11D. Scanning C, the default, disables conversion to ISBN format.

## Code 93

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Enable	0
Disable	1
Enable Full ASCII	2
Disable Full ASCII	3

For more information about Code 93, See Appendix J

## 2 of 5 Code

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Enable Interleaved 2 of 5	0
<b>Disable Interleaved 2 of 5</b>	1
Enable Interleaved 2 of 5 check digit	2
<b>Disable Interleaved 2 of 5 check digit</b>	3
Enable check digit transmission	4
<b>Disable check digit transmission</b>	5
Enable Standard 2 of 5	6
<b>Disable Standard 2 of 5</b>	7

For information about Interleaved 2 of 5, see Appendix E.

**Enabling the check digit** requires that the data's units position (last character) match the calculation for the check digit explained in Appendix E. If you have enabled the check digit and want to transmit the check digit to the computer along with the rest of the bar code data, choose "Enable check digit transmission".

## 2 of 5 Data Length

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Default Length	06
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2 of 5 Code is so susceptible to interpreting partial scans as valid reads that the WDP Reader uses fixed-length data as a safeguard. To choose a data length, scan it as a two-digit number using the Barpad Table. For example, to select 8-digit data length, you would scan a 0 and then a 8. Because Interleaved 2 of 5 is required to be an even number of digits in length, you must use an even number. If you're unsure of your bar code length, temporarily set length to 00, read a bar code, and count its digits. Variable-length 2 of 5 codes are not recommended.

## Codabar

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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

For information about Codabar, see Appendix E.

CLSI format is a form of Codabar often used by libraries

Enabling Start/Stop character transmission means that the WDP will transmit the Start and Stop characters to your computer along with the bar code data. Enable transmission if you are varying the Start and Stop characters according to label type in order to differentiate between bar code data and data from the keyboard. Most people do not need to transmit the Start/Stop characters.

## Code 128

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Disable Code 128	0
Enable Code 128	1
Disable UCC-128/EAN-128	2
Enable UCC-128/EAN-128	3
Enable Storage Tek Tape Label Code	C
Disable Storage Tek Tape Label Code	D
Bar Code ID's transmitted	E
Bar Code ID's not transmitted	F

Bar Code ID's are characters assigned to each bar code type to identify that particular type of code. These Bar Code ID's can be used to identify what type of bar code you are using when you are not sure or you want your application to differentiate between the different types. The Bar Code ID's are assigned as follows:

Bar Code	ID	Bar Code	ID
Codabar	a	Code 39	b
UPC-A	c	EAN-13	d
I 2 of 5	e	2 of 5 (standard)	f
Code 128	g	Code 93	i
MSI	j	magstripe data	m
UPC-E(0)	n	UPC-E1 (1)	o
EAN-8	p	Storage Tek	s
Plessey	x	LabelCode 4	y
LabelCode 5	z		

## MSI and Plessey

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Disable MSI and Plessey	0
Enable MSI with 1 Mod 10 check digit	1
Enable MSI with 2 Mod 10 check digits	2
Enable MSI with 1 Mod 11 and 1 Mod 10 check digit	3
Transmit no check digits	4
Transmit 1 Check digit	5
Transmit 2 Check digits	6
Enable Plessey Code	7
Enable LabelCode5	8
Enable LabelCode4	9

Plessey has two check digits which are not transmitted. MSI, Plessey, LabelCode4, and LabelCode5 are mutually exclusive. For information about MSI codes, see Appendix H.

If you've enabled the Mod 10 or Mod 11 check digit(s), enabling transmission of one or two check digits causes the WDP Reader to transmit it/them to your computer along with the bar code data.

Enabling check digit transmission (if check digit(s) are enabled) causes the WDP to transmit it/them to your computer along with bar code data.

## Computer Interface

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XT	0
AT and IBM Compatibles	1
PS/2 Models	2
AT "learned timing"	3
PS/2 "learned timing"	4
Macintosh SE,II and Portable	5
Same as 1 But for Non-Dedicated Servers & Certain Clones	7

The WDP automatically senses if you have an AT. It cannot sense a PS/2 or a Macintosh; if you have either, you will have to change the setting. Scan the number on the Barpad Table corresponding to the type of system you're using. If you are connecting to the USB Wedge Saver, you must use the AT Setting 1 even if you are attaching to a Mac's USB port. Learned timing does not apply to a USB connection of any kind.

If you have any doubt as to which category to use, and you get "garbage" reads, try switching types. Test the keyboard first -- if it gets messed up by the wrong keycodes, you'll need to reboot your PC before continuing.

The AT and PS/2 "learned timing" can learn your keyboard timing and save it. Scan **Start Setup, Computer Interface, 3** for AT or **4** for PS/2 and then press a key on the computer keyboard (the WDP beeps once). Now scan **End Setup** and the timing is captured by the WDP. Learning does not apply to USB attachment.

# Preamble

A "Preamble" is a user-specified data string transmitted at the beginning of each bar code. For example, if you specify the preamble @@ and read data of 123456, "@@123456" would be transmitted to your computer.

The default is no preamble. To select a preamble, scan up to 15 characters from the "FULL ASCII MENU" on the back of the Reader Setup Menu, and then scan SET when you're done. To return to the no preamble setting, scan CLEAR here instead of scanning SET or any characters from the FULL ASCII MENU.

You can trim 1-15 leading characters from bar code codes by scanning a ~ (tilde -- ASCII 126) followed by a single digit, 1 through F (A through F are for 10 to 15), as part of the Preamble. (Bar codes which are shorter than the amount-to-trim are transmitted with no trimming.) Consider the examples in the following table to understand how trimming works:

Bar Code Data	Preamble	Data Transmitted
123	XYZ	XYZ123
12345678	-3XYZ	XYZ45678
12345678	-9	12345678
12345	-A	-A12345
123456	-5	6

You can also trim selectively by bar code type. For example, you can trim 2 characters from Code 39 and a different amount from other bar code outputs. This is done by using the bar code ID character in conjunction with the tilde. A preamble of ~b2~c1 says trim 2 characters from the front of Code 39 output and trim 1 character from the front of UPC-A. Refer to the Code 128 parameter's previous discussion for a list of the ID character associated with each bar code type.

*For advanced PC users: Emulating special keys in the preamble:* Programmers and other advanced PC users can also embed keyboard hex scan codes in the preamble, for emulation of key presses specific to their computers, such as the left shift key or F12 key. This is done by specifying the make and break hex scan codes for one or more keys enclosed in "left" and "right" apostrophes ( ` and ` ).

Make and break codes are hardware-specific -- see the keyboard section of your computer's manual or tech references for descriptions of its make and break codes. Break codes follow one of two conventions depending on which "keycode set" a keyboard uses. Keycode set 1 (usually on XT-style systems) uses a two-digit break code formed by adding hex 80 to the make code. Keycode set 2 (usually on AT-style systems) uses two digit break codes: the first is F0 and the second is identical to the make code.

For example, let's say you want to emulate the left shift key. First, using the FULL ASCII MENU, you'd scan a left apostrophe, to identify subsequent characters as keyboard scan codes. Next, the two-digit hex make code -- let's say it's 12. First

you'd scan a 1 and then a 2. Next, the break code. Let's say your computer uses keycode 2 break codes of F0 followed by the make code. Finally, a right apostrophe to mark the end of the scan codes. ` 1 2 F 0 1 2 ' (scanned from the Full ASCII Menu) The preamble is limited to 15 characters. As the single scan code example above uses eight characters, you can see that you can't put very many keyboard scan codes in the preamble.

A final use of the Preamble/Postamble is to enter a minimum/maximum length check for bar code data read. Use the Preamble or Postamble by entering |nmm where "|" is ASCII 124, "nn" is the two digit minimum to be read and "mm" is the two digit maximum to be read.

## Postamble

"Postamble" refers to a user-specified data string transmitted at the end of each bar code. For instance, if you specify the postamble @@ and read data of 123456, "123456@@" would be transmitted to your computer.

To select a postamble, scan up to 15 characters from the "**FULL ASCII MENU**" on the back of the Reader Setup Menu, scanning **SET** when done. To return to no postamble (the default setting), scan **CLEAR** here instead of scanning **SET** or any characters from the **FULL ASCII MENU**.

You can trim 1-15 trailing characters from bar code codes by scanning a ~ (tilde - ASCII 126) followed by a single digit, 1 through F (A through F are for 10 to 15). (Bar codes which are shorter than the amount-to-trim are transmitted without trimming.) Consider the examples in the following table to understand the options of the Postamble:

Bar Code Data	Postamble	Data Transmitted
123	XYZ	123XYZ
12345678	~3XYZ	12345XYZ
12345678	~9	12345678
12345	~A	12345~A
123456	~5	1

Bar codes which are shorter than the sum of the Postamble trimming and Preamble trimming will be transmitted without trimming.

You can also trim selectively by bar code type. For example, you can trim 2 characters from Code 39 and a different amount from other bar code outputs. This is done by using the bar code ID character in conjunction with the tilde. A postamble of ~b2~c1 says trim 2 rightmost characters from Code 39 output and trim 1 rightmost character from the UPC-A. (Use m for trimming Magstripe). Refer to the Code 128 parameter's previous discussion for a list of the ID character associated with each bar code type.

*For advanced PC users:* Emulating special keys in the postamble

See the previous page's "emulating special keys in the preamble" section.

A final use of the Preamble/Postamble is to enter a minimum/maximum length check for bar code data read. Use the Preamble or Postamble by entering |nnmm where "|" is ASCII 124, "nn" is the two digit minimum to be read and "mm" is the two digit maximum to be read.

## Data Transmission Timing

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None	0
Short	1
Short Medium	2
Medium	3
Long	4

Timing does not apply to Mac ADB or any USB attachment.

Before trying this, try the "learned timing" discussed on page 12.

For Computer Interfaces 0,1,and 2, the WDP Reader can transmit bar code data at five different rates. Most computers work at the fastest speed ("None"), but some systems require slower rates. Try the "None" setting, and (when you're done configuring it) try reading some codes. If you get partial or garbled reads, try other timing settings to solve the problem. (The Mac needs no timing adjustments.) Try each timing rate (fast to slow); don't assume that if the slowest and fastest don't work, the intermediate settings won't either. After each failing attempt at timing setting, type "12" in the upper keyboard row to be sure the keyboard has not been locked or confused; if the "12" doesn't type correctly, reboot before trying a new timing setting.

## Reset

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Don't scan **Reset** unless you're sure you want to restore the WDP Reader to its default settings (as described on page 7), erasing all changes you've made, because that's exactly what **Reset** will do.

## MagStripe

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None (or triggered Integrated CCD)	0
Track 1 (or triggerless Integrated CCD)	1
Track 2	2
Track 3	3
Dual Track Scanner,Output both only	4
Dual Track Scanner,Output both or 2 only	5
Track 1 or 3 Only on Dual Track Scanner	6
Track 2 only output on Dual Track Scanner	7
Track 1&2&3 Scanner, all 3 or 1&2 only	8
Track 1&2&3 Scanner, all 3 or 1 only	9
Caps Lock Off (just for MagStripe)	E
Caps Lock On (upper case alpha for mag)	F



Use **None** (the default), if you don't have a MagStripe scanner. If you have a single-track scanner, use 1, 2 or 3 to match its track. If you have a dual-track scanner and want to read both tracks, use 4 for tracks 1 and 2, or 5 for 2 and 3.

Use **6, 7 or 8** if you have a dual-track scanner but want to read only track 1, 2 or 3 respectively.

For all Driver's licenses,(including California) use **8** or **9**. See page 21 for more information on the MagStripe scanner.

## Characters

This setup option allows you to output ASCII characters different from the ones scanned. (Don't use this option to configure the WDP Reader for your non-US keyboard -- instead, use the *Keyboard Country* option described below.)

For example: Suppose you want the WDP Reader to output a hex 92 character every time you scan a 1 (hex 31); you want to remap hex 31 to hex 92, (If you're using 8 data bits, output of 80-F8 codes is possible.) Your Full ASCII Menu has ASCII and hex values for the 128 characters.

- 1) Scan the **Start Setup** Bar Code
- 2) Scan the **Characters** Bar Code on the Setup Sheet.
- 3) Scan **3 1** and **9 2** to output hex **92** when reading a "**1**".
- 4) Scan up to 7 other pairs of character reassignments.
- 5) Scan **Set** when complete.
- 6) Scan **End Setup** to exit setup mode.

You can also eliminate characters by reassigning hex codes to FF. For example, to strip all \$ (dollar sign) characters from transmission, you would follow the above instructions and scan **2 4 F F** in step 3.

Magstripe output is frequently required to be changed to conform to some specific software package's requirement. For example, you might want to change the = and ^ separator characters to spaces or CRs. Between trimming and replacement, you should be able to reformat the Magstripe output to conform to most requirements.

## Keyboard Country

This option configures the WDP Reader for your choice of 15 keyboard country settings, such as USA (the default), UK, French, German, etc.

Scan the keyboard country bar code and then the two-digit code for your keyboard country (listed on the Reader Setup Menu), such as 14 for UK.

USA	00	French	02	German	02	Belgian	03
Fr. Canadian	04	Danish	05	Dutch	06	Italian	07
Latin America	08	Norwegian	09	Portuguese	10	Spanish	11
Swedish	12	Swiss	13	U.K.	14		

## Terminator Characters

---

Enter (carriage return)	0
None	1
Tab	2

Depending on your application, you may wish the WDP Reader to transmit bar code data to your computer with an Enter (carriage return), a Tab at the end, or with no extra terminating character at all.

If you need a terminator character other than CR or HT (such as LF for UNIX), you can get it by specifying None here and then selecting your desired terminator character(s) through the Postamble specification.

# Testing the WDP reader with your computer

*Windows and Mac users should use the Notepad or a text editor so that the scanned test data will be "typed" on the screen where you can see it. Similarly, DOS users should scan at the DOS prompt or while in a text editor.*

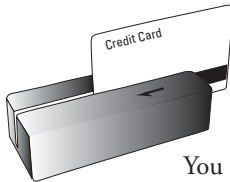
## Bar-code wands, laser scanners and CCD touch scanners:

If you are new to scanning, read Appendix K -- Scanning instructions, and then scan the **Test Label** at the bottom of the page.



### Bar Code and MagStripe Slot Scanners:

For a bar-code slot scanner, take the Reader Setup Menu "A" card and turn it so the **A** bar code is pointing down and facing the lighted side of the scanner. Make a continuous swipe motion through the slot in either direction.



For a MagStripe slot scanner, take a magnetic-strip card of the type you will be using, and turn it upside down so the stripe is pointing down. Move the card through the scanner in a continuous swipe in the direction of the arrow.

You should hear a beep, and see **Test Label** displayed on your screen. (Or an **A**, if you're using a bar-code slot scanner, or your magnetic-strip-card data, if you're using a MagStripe slot scanner.) You should also be able to type on your keyboard and have the computer respond normally.

## If you are unable to read the "TEST LABEL":

- Re-check all your connections.
- Unless you ordered a high-resolution, infrared-light wand, you should see a red light coming out of the tip of the wand. If you don't see a red light, make sure the wand's cable is firmly plugged into the WDP Reader.
- Try scanning at several different speeds. The most common mistake is scanning too slowly; be sure you are "drawing a line" quickly through the code.
- Work through the troubleshooting section beginning on page 30.



**TEST LABEL**

# Scanners and Scanning Technique

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## Wands

### Matching your wand to your bar code type

The WDP Reader comes with a low, medium or high-resolution bar code wand, or a medium-resolution wand specially designed to read through plastic or glass, depending on your application. The number and letters on your wand's cable identify its resolution and the type of light it uses -- visible red or infrared (invisible):

- 10 MILRED Low-resolution visible-light
- 8 MILRED Medium-resolution visible-light
- 6 MILRED High-resolution visible-light
- 6 MILIR High-resolution infrared-light

These are the five types of wands and their associated characteristics:

### Low-resolution visible-light wand

This is a low-resolution visible-red LED wand designed specifically for dot-matrix printed bar codes. It reads any low or medium-resolution bar code printed by any technology, but can't easily read high density codes.

### Medium-resolution visible-light wand

A versatile, general-purpose medium-resolution visible-red LED wand which reads well-printed dot-matrix bar codes and high-density codes up to 10 cpi for Code 39. It reads well-printed dot-matrix codes with the same high read rate as the low-resolution wand. With poorly-printed codes, however, the low-resolution wand significantly outperforms it.

### Refocused medium-resolution infrared-light wand

This is a medium-resolution infrared (invisible) light wand designed to read through plastic or glass 1/100" (.025 mm) to 1/4" (6.35 mm) thick. This is especially useful for applications such as reading compact disks with the bar codes under the cases. Bar codes must be printed with infrared-quality ink. Bar codes printed on thermal printers (not *thermal-transfer* printers) are often unreadable to infrared light wands. There is an additional charge of \$60 for this wand.

### High-resolution visible-light wand

This is a high-resolution visible red light wand designed to read high-density bar codes up to 13 cpi for Code 39. It can also read any well-printed dot-matrix or other lower-density codes, providing there are no voids (white spots in the bars) in the codes.

### High-resolution infrared-light wand

This high-resolution infrared-light wand is designed to read high-density bar codes up to 13 cpi for Code 39. It also reads well-printed dot-matrix or other lower-density codes, providing they're printed with infrared-quality ink (bar codes printed on thermal printers are often unreadable to infrared scanners) and don't have any voids (white spots in the bars).

## Wand Scanning Technique

Using the illustration as a guide, follow these tips for proper scanning with a wand:

**1** Hold the "wand" as you would a pencil, lightly placing your fingers around the wand. If you do not see a red light at the tip of the wand, check to make sure that you are using a **VISIBLE** light wand, not an **INFRARED** light wand. Infrared wands show no light at the tip of the wand.

**2** Your scanning should start in the white space about  $\frac{1}{4}$ " to the left or right of the bar code. This area is called the "quiet zone". If you are reading a UPC code with a supplement, you **MUST** scan from left to right; otherwise, you can scan from either direction.

**3** You should be holding the wand as if it were a pencil, approximately 30 degrees from perpendicular. Some bar codes, especially those that are high density, may require that you adjust the angle of the wand to be almost perpendicular to the bar code. Starting in the "quiet zone", quickly and lightly draw an imaginary line through the entire bar code, ending within the  $\frac{1}{4}$ " "quiet zone" at the other end of the bar code. **DO NOT** scan slowly or press down hard with the wand - neither one will make it easier to read your bar code.

**4** Never stop in the middle of the bar code. Pass the wand smoothly across the bar code, stopping only when you have reached the "quiet zone" at the other end.

**5** Do not move the wand tip above or below the lines of the bar code. Keep the wand tip within the confines of the bar code during the entire scan; the whole point is to draw as straight a line as possible through the middle of the bar code.

To practice scanning, go to the DOS prompt or open up Notepad or a similar program in Windows or on the Macintosh. Use the Test Label on the next page and the technique illustration above to practice scanning with your wand. You should hear an audible beep and see TEST LABEL displayed on computer screen after every scan. If you do not see TEST LABEL, check your technique, especially the angle and speed of the scan.



## Using the Bar Code Slot Scanner

Depending on your application, you may wish to use a slot scanner as your bar code input device instead of or in addition to a wand. Worth Data makes a bar code slot scanner that plugs into the WDP Reader's Wand port, and is designed for reading bar codes printed on badges or ID cards. It can also be used for reading bar codes on file folders, envelopes and any other thin, flat surfaces with bar codes printed along an edge. There are two types of bar code slot scanners:

- The standard bar code slot scanner is a medium-resolution scanner using visible-red light. It also reads high-density bar codes.
- Optionally, you can specify a medium-resolution infrared-light scanner.

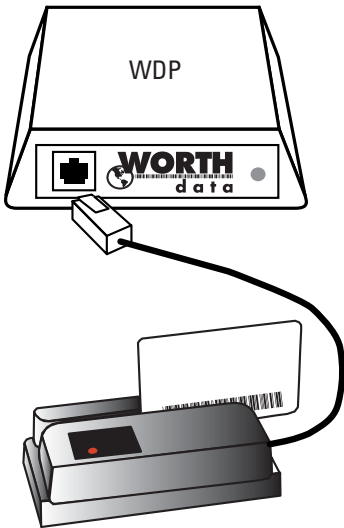
To read a card or other object with the bar code slot scanner, orient the card so that its bar code faces the lighted side of the scanner. Now make a continuous wipe motion through the slot.



For optimum use with the slot scanner, bar codes should be printed or applied so that the center of the bar code is .5" from the edge of the card.

The Slot Scanner can be permanently mounted to a desk or wall through the threaded mounting holes. If you have ordered only a slot scanner (you don't have a wand), you will need the WDP Card Setup Deck in addition to the Reader Setup Menu.

Providing you have Jumper 9 set to **wand** (the factory shipped default), you can plug a wand or a slot badge scanner into the Magstripe connector. If you wish to check the setting of the jumper, refer to page 37 for Jumper Settings.



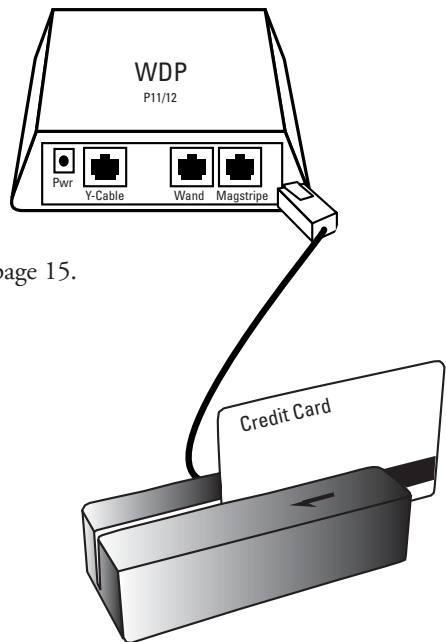
## Using the MagStripe Slot Scanner

The MagStripe Slot Scanner options (track 1, track 2, track 3, or track 1 and 2 or 2 and 3 or Track 1/2/3) enable the WDP Reader to read credit and other magnetic-strip cards without disconnecting or disabling the bar code wand. It's a stationary scanner which reads tracks 1 and 2 of magnetically-encoded cards meeting the standards defined by ANSI x 4.13, ANSI x 4.16 1983, ISO 3554 and ISO 2894.

There are three requirements for using a MagStripe Slot Scanner:

- The MagStripe Slot Scanner must be plugged into your WDP Reader's MagStripe port (next to the Wand port).
- If using a dual or tripple track reader, Jumper 9 must be set to M (for MagStripe) for dual or triple track scanner instead of W (for Wand or bar code slot scanner). Single Track Magstripe reading is will work with either the W or M setting. See Appendix A, Opening the WDP Reader's Case, and Appendix B, Jumper Settings, for instructions on how to do this. You must enable the proper track using the WDP Setup Menu as described on page 15.
- The MagStripe scanner can be permanently mounted to a surface using the threaded holes on the bottom. To use the MagStripe Slot Scanner, turn the card upside-down so the stripe can be read. Move the card through the scanner in a continuous swipe in the direction of the arrow.

When the reader makes a good read, it will beep once and transmit the data to the computer. Plug the MagStripe Slot Scanner into the WDP Reader as shown below, and use the MagStripe section of the Reader Setup Menu to configure your reader for your MagStripe scanner track setting, as described on page 15.



## Laser and CCD Scanners

Wand scanners can satisfy most bar code reading needs. However, we also offer Integrated Laser Wedge Readers and the Integrated CCD Wedge Reader (complete WDP Readers built into a laser scanner and CCD scanner) as well as laser and CCD scanners that plug directly into WDP Reader wand ports. Laser scanners add these abilities to the WDP Reader:

- Fast reading of difficult bar codes.
- Reading bar codes from a distance: 1 to 21 inches with Worth Data' model LZ200, up to 35 feet with the Symbol 3200ER, and typically 3 to 14 inches with other laser scanners.
- Reading moving objects, such as on an assembly line.
- No-hands operation. Some scanners can be mounted to turn on automatically when an object passes under them.
- Reading through thick (up to five inches) glass or plastic laminates.
- Reading curved surfaces, such as plastic bags of items.

**Warning:** *These laser scanners use low-power, visible-light laser diodes. Although momentary exposure to the beam is not known to be harmful, the user should avoid staring directly into the beam, or shining the beam into people's eyes.*

These laser scanners are triggered, 5-volt, visible-light, moving-beam scanners which attempt to read 36 times per second. If the code misreads ten times, you don't even know it. Non-triggered hand laser scanners are awkward at best. These laser scanners are the world's best:

### Worth Data LZx00 series

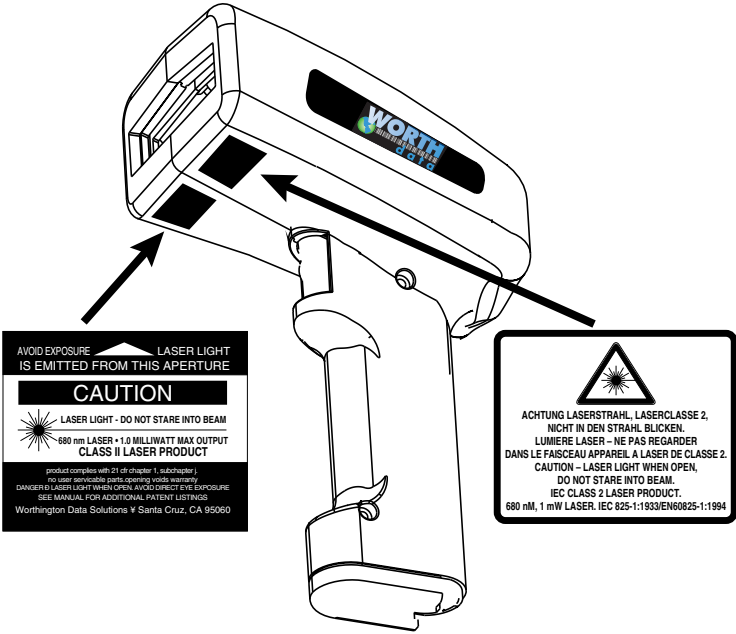
These scanners are manufactured by Worthington using the Symbol 1200 Scan Engine family. They are very lightweight, easy to handle, rugged, and aggressive scanners on all types of codes and densities. The scan element has a lifetime warranty. They are tested with repeated drops at 10 ft. to concrete. The cord has a 1,000,000 bend lifetime.

The LZ200 reads at twice the distance most other lasers read -- 1 to 21" with a 4.2 cpi Code 39 bar code or about 15 inches on a 100% UPC Code. The decode is very quick. The price is \$695. The LZ200-WDP is the same laser with the decoder built into the scanner, thus eliminating the decoder box. The lower cost LZ100 reads from 1-14" on the same Code 39 code as above and about 10" from a UPC code. It has a less powerful laser but it is just as reliable and decodes very quickly like the more powerful LZ200.

These laser scanners use a low-power, visible laser diode. Although momentary exposure to a CDRH II laser scanner is not known to be harmful, avoid staring directly into the beam or shining the beam into other people's eyes. The required safety label to advise the user of the laser cautions appears on these lasers as shown:



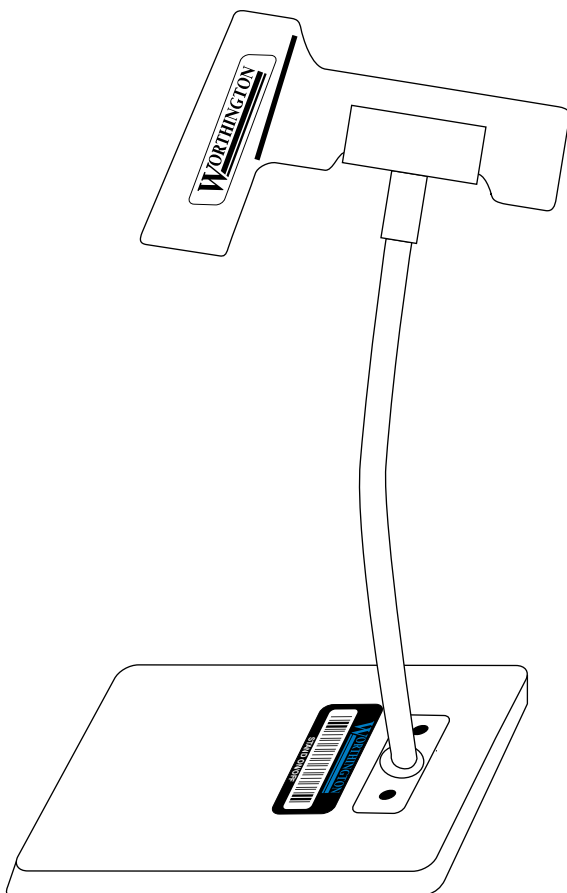
Remember, even though momentary exposure to these low-power, visible-light lasers is not known to be harmful, you must never stare into the beam or aim it into anyone's eyes. See the following pages for tips on solving problems with laser and CCD scanners and difficult codes.



The LZ100,LZ200,LZ100-WDP, and LZ200-WDP are covered by one or more of the following U.S. patents:

Patent#: 4,360,798; 4,387,297; 4,460,120; 4,496,831; 4,593,186; 4,603,262; 4,607,156; 4,652,750; 4,673,805; 4,736,095; 4,816,660; 4,845,350; 4,896,026; 4,897,532; 4,923,281; 4,933,538; 4,992,717; 5,015,833; 5,017,765; 5,021,641; 5,029,183; 5,047,617; 5,103,461; 5,113,445; 5,140,144; 5,142,550; 5,149,950; 5,157,687; 5,168,148; 5,168,149; 5,180,904; 5,229,591; 5,230,088; 5,235,167; 5,243,655; 5,247,162; 5,250,791; 5,250,792; 5,262,627; 5,280,163; 5,280,164; 5,280,498; 5,304,786; 5,304,788; 5,321,246; 5,377,361; 5,367,151; 5,373,148; 5,378,882; 5,396,053; 5,396,055; 5,399,846; 5,404,081; 5,410,139; 5,410,140; 5,142,198; 5,418,812; 5,420,411; 5,436,440; 5,444,231; 5,449,891; 5,449,893; 5,468,949; 5,479,000; 5,479,002; 5,479,441; 5,504,322; 5,528,621; 5,532,469; 5,543,610; 5,545,889; 5,552,592; 5,578,810; 5,589,680; 5,612,531

A stand is available for all of the Worthington lasers which allows hands free reading of bar codes. Just before placing the scanner in the stand, scan the bar code on the stand to set the laser into a automatic reading mode. When a bar code is presented the narrow searching beam is turned on fully to read the bar code presented. The stand is available in a mountable goose neck (S10) or in a free standing version (S20). The stand can also be used with the F86 CCD Scanner and WDP-P16 Integrated CCD Reader. Below is a drawing showing how the Lx00 Laser Scanner or the Lx00 WDP mounts into the stand with the weighted base. (The WDP P11/12 must have JP8 set to L for the stand mode to work correctly. See Appendix B.)



## CCD Scanners

The F86 CCD Scanner or the WDP P16 Integrated CCD Reader can also mount in the stand, but the bar code must be presented within 0-4" of the scanner. These quick, durable units(F86 CCD Scanner) work like a laser, but with more limited range. Just aim the scanner at the bar code and by aligning the top of the rather wide beam so that it is within the bar code, pull the trigger and a read occurs instantly. There are 50 scan attempts per second made. This CCD scanner can also be programmed for triggerless scanning on the WDP by scanning the bar code below:



The Integrated CCD Wedge Reader is a complete WDP Reader built into the F86 CCD Scanner. Just plug it in between your computer and keyboard and you're ready to go. It works with any PC keyboard-compatible computer and all Macintosh models.

### Tips for using CCD's and Lasers:

The CCD scanner works best when positioned about 3" from the bar code. The operating range is about 0-4" for most codes. It can read curved and uneven surfaces well. Both the CCD and laser scanners are simply aimed straight at the bar code so that the scanner's beam must cross every bar and space on the bar code,



without touching any other bar codes, as shown in the first example below.

To read large bar codes with laser scanners, you'll need to hold the scanner further away to produce a wider beam, and for bar codes with bars very close together, you'll need to hold the laser scanner closer.

## Laser scanner options:

**"Double-scan checking":** To minimize the possibility of misreads with very poorly printed bar codes or when reading through windshields, you have the option of forcing the WDP to keep reading until it gets two results that are exactly the same. This "double scan checking" takes a little longer, but it will eliminate misreads. To activate double scan checking:

Scan **Start Setup**  
Scan **Code 39**  
Scan **E** to enable double scan checking.  
Scan **End Setup**

To *disable* double scan checking, scan **F** instead of **E**.

**4-second beam:** Another option with problem reading conditions is to increase the length of the time the scanner attempts to read, from the default 2-second beam to a 4-second beam. This would be very helpful using long range scanners which needs additional aiming or scanning time. To select the 4-second beam:

Scan **Start Setup**  
Scan **2 of 5**  
Scan **F** to select the 4-second beam  
Scan **End Setup**

To return to the *default 2-second beam*, scan **E** instead of **F**.

**Continuous Scanning Option for the CCD scanner:** Sometimes it is desirable to read sheets or lists of bar codes without having to activate the trigger before each read. To activate the CCD continuous scanning:

Scan **Start Setup**  
Scan **Computer Interface**  
Scan **B** to select continuous scanning  
Scan **End Setup**

To *disable* continuous scanning, repeat the above, substituting **C** for **B**.

To use continuous scanning with a laser scanner, scan **D**; however, you will have to hold down the trigger while scanning. In either case, if you want to read the same bar code twice in succession, you will need to release the trigger and pull it again.

**Small quiet zones:** Although we recommend quiet zones (white space on either side of a bar code) of at least 0.25", this option lets the laser and CCD scanners read bar codes with less than 0.2" quiet zones, the only drawback being an extremely small increase in the possibility of substitution errors.

Scan **Start Setup**  
Scan **Computer Interface**  
Scan **F** to select small quiet zones  
Scan **End Setup**

To return to normal quiet zones, repeat the above, substituting **E** for **F**.

# Special Features

## Function and Control Key Support

The WDP Reader can also transmit key sequences for function, control, alt (command and option keys on Macs), cursor and shift keys, for ease of use with the many software packages using these keys for menus or commands.

FA or C128	Code 39	IBM Key	Mac Key
SOH	\$A	F1	F1
STX	\$B	F2	F2
ETX	\$C	F3	F3
EOT	\$D	F4	F4
ENQ	\$E	F5	F5
ACK	\$F	F6	F6
BEL	\$G	F7	F7
SO	\$N	F8	F8
LF	\$J	Numpad 5	Enter
CR	\$M	Enter	Return
SI	\$O	F9	F9
DLE	\$P	F10	Cmnd On
DC1	\$Q	Del	Del
DC2	\$R	Insert	Cmnd Off

FA or C128	Code 39	IBM Key	Mac Key
DC3	\$S	Lft Arrow	Lft Arrow
DC4	\$T	Rt Arrow	Rt Arrow
NAK	\$U	Dn Arrow	Dn Arrow
SYN	\$V	Up Arrow	Up Arrow
VT	\$K	Pg Up	Pg Up
FF	\$L	Pg Down	Pg Down
ETB	\$W	Home	Home
CAN	\$X	End	End
EM	\$Y	Shift ON	Shift ON
SUB	\$Z	Shift OFF	Shift OFF
FS	%B	Control On	Control On
GS	%C	Control Off	Control Off
RS	%D	Alt On	Option On
US	%E	Alt Off	Option Off

When the WDP reader reads a Code 128 or Full-ASCII Code 39 (or the equivalent two-character Code 39 sequences) bar code containing one of the control characters in the table above, it transmits the appropriate key code(s) for the IBM or Mac computer interface.

### Function keys F1 through F10, and numeric-pad keys

Function keys F1 through F10, and numeric-pad keys (such as Left Arrow and Del), are encoded by a single control character (or the equivalent two-character Code 39 sequences) as shown in the table above.

For example, if the WDP Reader reads bar code data of SOH (ASCII 001 -- a control-A), it will transmit an F1 key sequence to your computer.

### Function keys F11 and F12

Function keys F11 and F12 require two characters to be paired to make these functions keys. The F11 key is created by combining the Null Character (%U in Code 39) and SOH (\$A in Code 39). The F12 key is created by combining the Null Character (%U in Code 39) and the STX (\$B in Code 39).

## **Shift, Ctrl and Alt keys**

Shift, Ctrl and Alt keys require three sequences

- 1) The ON code generated when the Shift, Ctrl or Alt key is pressed.
- 2) The other key to be used in conjunction with the Shift, Ctrl or Alt key.
- 3) The OFF code generated when the Shift, Ctrl or Alt key is released.

For example, to properly encode a bar code sequence for Ctrl-C, you would create a bar code of Ctrl ON, C, and Ctrl OFF (control character FS, C and control character GS).

## **Windows Key**

The Windows key on a Windows keyboard is transmitted by scanning bar codes %UC for Windows On (pressing down) and %UD for Windows Off (releasing the key).

## **Macintosh Command and Option Keys on USB**

When you have a WDP Reader attached to a Macintosh Computer's USB port, to emulate the Command key, you use the Windows key On/Off bar codes (%UC - Command On and %UD - for Command Off) the Alt Key On/Off (%D for Option On and %E for Option Off).

If you have an older WDS Reader (before 6/99), you can also imitate the Command Key by keycodes in the Preamble/Postable. To transmit Command N would be: `E01F'N`E0F01F'

## **Transmitting any ASCII character using its 3-digit ASCII code**

You can also transmit any ASCII character from 000 to 255 by emulating the IBM technique of typing a character's ASCII number on the numeric pad while holding down the Alt key.

For example, to transmit ASCII 250, you would create a bar code of Alt On, Down Arrow (2 on the numeric pad), Numpad 5, Insert (0 on the numeric pad) and Alt OFF (control character RS, control character NAK, control character LF, control character DC2 and control character US).

## Accumulate Mode

Accumulate Mode is an option (which can be enabled or disabled using the Reader Setup Menu's Code 39 section) allowing the reader 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.

It works with Code 39 only, and can't be used with a check digit. When the reader reads a bar code with a leading space, 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. Then the entire buffer (including that last code) is transmitted as one long bar code. A bar code of a double minus (--) sign clears the buffer. Scanning a backspace code (\$H) backspaces in Full ASCII mode. A handy code for Enter (as seen on the "Barpad" below) is a Start/Stop only. (No data.)

This numeric "Barpad" illustrates Accumulate Mode. Scan 5, 3, 8, and Enter. The reader transmits a single message of 538.



0



1



2



3



4



5



6



7



8



9



Clear



Backspace



CR



Enter

# Troubleshooting

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**A reader installed in Wedge mode (external or internal) doesn't beep three times when you power up your system, or the keyboard locks up, or you get a "keyboard error" or "301" message.**

- Check the cable connections to make sure everything is plugged in securely. With a PC, make sure the keyboard cable is plugged into the keyboard port rather than the mouse port. If on a Mac ADB, be sure the tagged end of the Y cable goes to the ADB port.
- If, after checking the connections, you still have a problem, your computer and keyboard combination probably doesn't have enough left-over power to drive the bar code reader also. Disconnect the scanner from the WDP Reader and reboot your system. If the system boots correctly when the scanner is not attached, you solve the problem by ordering a 5-volt external power supply (feature code F10).
- If the system still doesn't boot correctly with the scanner disconnected, a Worth Data regulated power supply (don't use someone else's power supply or you will damage the reader)- will probably still correct the problem. If you are using a USB reader and there many devices, you may need either a power supply on the WDP, or you may need a powered USB hub device.

## **The reader won't beep when reading bar codes**

Recheck all the connections using the installation section as a guide. Try

- reading a known good bar code - the test label on page 18, following the steps for scanning in Appendix K. If you're trying to read Code 39 bar codes with leading spaces (such as the Barpad on page 27) and have enabled Accumulate Mode, those bar codes will not be transmitted to your computer until you read a bar code without a leading space. Try reading the Test Label on page 18 as an example of a known good label.

Reread the configuration section and make your bar code type is enabled.

- Switch a wand to the Magstripe Port and try again. If it works in the Magstripe port, the wand port is probably jumpered for laser.

If the read failure is on Interleaved 2 of 5 codes, make sure the data length is

- the same that you selected on the Reader Setup Menu. Be sure you don't have the check digit enabled for Code 39 or Interleaved 2 of 5 if you're trying to read data without check digits.



## Extra characters at the beginning or end of your bar code data

- Clear the Preamble and Postamble.
- Make sure you haven't enabled transmission of any start/stop characters, checksums, leading digits or terminator characters that you don't want transmitted. For UPC-E, select Compressed transmission if you don't want it padded with extra zeros.

## The reader transmits incorrect data to the screen

- Reread page 12 and make sure you chose the proper Computer Interface.
- If part of the data is correct and part missing, you need to tell the WDP Reader to transmit data at a different rate. First try Learned Timing on page 12, and if that doesn't work, resort to changing Data Transmission Timing on page 15.
- If the reader is transmitting punctuation characters (!@#\$%^&\*) when reading numeric bar codes, or transmitting letters in the wrong (upper/lower) case, you may have a Num Lock, Caps Lock, shift or timing problem. Check your keyboard to see if the Num Lock or Caps Lock keys have been activated. Finally, try "learned timing" (See Page 12) or changing your Data Transmission Timing (See page 15).
- If you're using Code 39, read page 16 to see if you've set Caps Lock properly for your application. If your Code 39 bar codes include punctuation characters %, \$, / or +, the reader is seeing them as part of Full-ASCII Code 39 sequences. Using the Reader Setup Menu, disable Full ASCII Code 39.

## Poor read rate

- Try reading the test label on page 18 (following the scanning instructions in Appendix K) as an example of a known good bar code. Examine your bar codes to make sure they have dark bars, clearly defined bars and white spaces, and a "quiet zone" of at least 1/4 inch to the left and right. If the bars are grey, or so dark that they "bleed" into the white spaces, the person or organization printing them will need to adjust the printer or get a new ribbon or toner cartridge for it.
- Carefully follow the scanning instructions Appendix K when reading any and all bar codes. As straightforward as scanning may seem, many people who call Worth Data with a complaint about poor read rate are simply not doing it correctly.
- If you're using an infrared bar code wand, be sure the bar codes you're trying to read were printed with infrared-quality ink. Make sure you're using the right type of wand (see page 19) for the type of bar codes you're trying to read.
- Pry the wand tip off; clean the inside with a soft, lint-free cloth. Carefully blow off any debris from the red plastic lens.

- Erratic or low read rates can also result with systems that supply unusually low current or voltage to the keyboard. To test for this, turn your system off, disconnect the keyboard from the "Y" cable, and turn it back on. Then try reading the same bar codes. The system will probably be in a keyboard error state and not display the bar code data on the screen, but all you're interested in is listening for the beeps that signify good reads. If the WDP Reader has a much higher read rate without the keyboard attached, you can probably solve the problem by using a Worth Data regulated 5-volt external power supply (F10).

### **Changing the volume of the WDP Reader's beeper:**

- First, you need to get to the WDP Reader's circuitboard. If you're using the Reader in External Wedge mode, you'll need to remove the case, using the illustration on the next page as a guide. If it's mounted internally, you'll need to remove the cover to your computer's slot cabinet. Locate the volume-control potentiometer using the illustration below. Insert a small screwdriver into the slot and gently turn it clockwise, to decrease the volume, or counterclockwise, to increase it. A tiny fraction of a turn makes a big difference in volume.

### **5-volt power adapters for external wedge installation:**

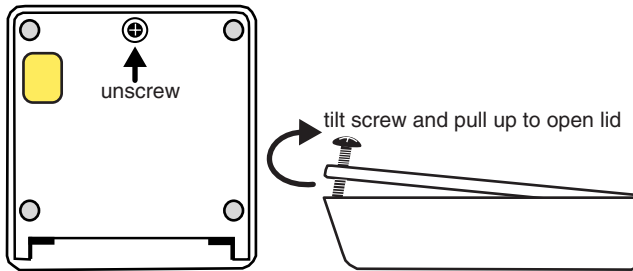
- The 5-volt adapter (F10 for 110V, F11 for 220V, F14 for UK 220V, and F13 for Australia 240V) is used to power the WDPs with separate decoder box configurations where the computer supplies unusually-low voltage or current to the keyboard. Do not plug in this adapter to a WDP Readers installed in bus mode. Connect the power adapter to the reader as shown below.
- Don't use anything but a Worthington Data Solution's power supply or you will probably damage the reader. The Worthington Data Solution's power supply is regulated and has a specific polarity. Almost all other power supplies are unregulated and will damage the WDP is used. Just because the connector fits, don't use it.

## Opening the WDP Case

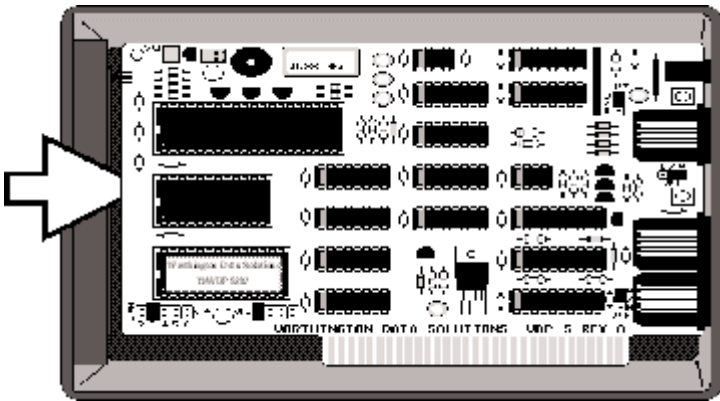
---

Use the illustrations below as a guide while removing the WDP Reader's circuitboard from its case.

Turn your WDP Reader upside-down, and unscrew its single phillips screw. Insert



a fingernail, credit card edge or small screwdriver blade into the gap between the base and side of the case, and gently use it as a lever to lift up the edge of the base.



Then grasp the edge of the base and open it outward like a door.

Grasp the circuitboard by the edge pointed to below, and gently pull up to lift it out of its case.

If you will be returning the reader to its case (as opposed to plugging it into an expansion slot), after beeper-volume adjustment or jumper change, do so by reversing the steps described and pictured on this page.

## **ISA Internal Board Installation**

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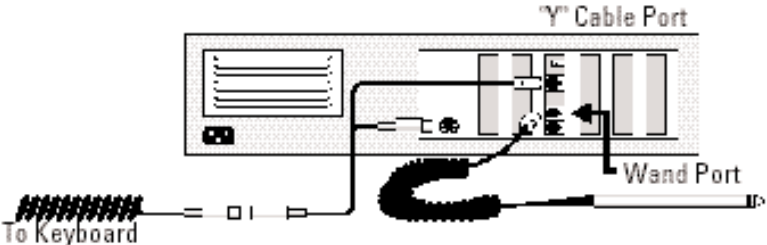
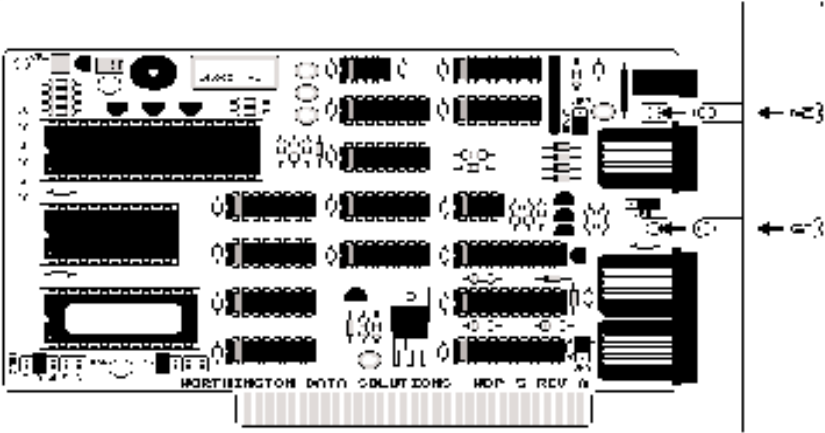
### **Slot Installation with Keyboard Cabling**

The WDP Reader can be kept out of the way by removing it from its case and mounting it in a PC's ISA slot. It can use the slot for physical mounting only, and doesn't communicate with the bus. Cables connect it between the computer and keyboard, and bar code data is received via the computer's keyboard port.

Carefully follow these steps to convert the WDP Reader to Internal Wedge mounting:

- 1 CAUTION:** Your computer's power must be off and its power cord unplugged before you install the WDP Reader. Attempting to install it with the power on may give you a severe shock or damage your computer.
- 2** Remove the reader's case according to the instructions in Appendix A.
- 3** Using the illustration on the following page for a guide, place the special order silver mounting bracket onto the end of the board, and use the included screws to securely attach it to the board.
- 4** Remove the cover to your computer's slot cabinet according to the procedures in the owner's manuals.
- 5** Insert the reader into any unused ISA slot. Be sure it is firmly seated in the slot. Anchor the board to the computer's case with a screw at the top of the metal bracket on the card.
- 6** Replace your computer's slot-cabinet cover according to the procedures in the owner's manuals.
- 7** Using the illustration on the following page for a guide, plug the wand, laser scanner, touch scanner or bar code slot scanner into the WDP Reader's Wand port. (If you have a MagStripe slot scanner, see page 21.)
- 8** Using the illustration on the following page for a guide, connect the "Y" cable's telephone-style jack to the WDP Reader's "Y" Cable port.
- 9** Unplug the keyboard cable from the back of the computer. Note its location so you don't accidentally plug into the mouse or cassette port when installing the "Y" cable.
- 10** Using the illustration on the following page for a guide, plug the end of the keyboard cable into the "Y" cable's round female DIN connector.
- 11** Using the illustration on the following page for a guide, plug the "Y" cable's male DIN connector into the back of the computer where the keyboard previously plugged into.

The connections for Internal Wedge installation on a PC should be as shown below.



If you have a laser scanner, CCD scanner or bar code slot scanner, it will plug into the wand port instead of the wand. (If you have a MagStripe slot scanner, see page 21 for its installation instructions.) Be sure to store the WDP Reader's case in a safe place: If you need the slot in the future, or upgrade to a system without PC-style expansion slots, you can easily replace the reader in its case for external mounting.

Now turn to page 7 to configure the WDP Reader.

## Slot Installation with Bus Communication

For computers running DOS, the internal WDP Reader can be mounted in any unused ISA slot and jumpered to communicate with the bus directly. Internal Bus installation is normally a factory-special order (WDP Model P31/32) which includes BusKey software but no reader case or Velcro for mounting the case. Because the WDP Reader is not physically connected to the keyboard, it requires the program BusKey to read bar code data from the bus and place it into the keyboard buffer.

See Appendix C for the jumper settings (JP4,JP5, and JP7) necessary to convert the WDP reader board to communicate directly with the bus.

The DOS program BusKey is used only when the WDP Reader is installed in Internal Bus mode. BusKey is a memory-resident program (TSR) that works in the background to read bar code data from the bus and place it into the keyboard buffer, making it look to your computer and software as if the data had been typed at the keyboard. Most people will want to put BusKey in their AUTOEXEC.BAT file for automatic loading at boot time.

### Installing BusKey

To copy BusKey onto your system, simply use the DOS COPY command. For instance, to copy BusKey onto hard disk C:, place the BusKey distribution diskette into drive A, log into the hard disk directory you want to install BusKey in, and at the C> prompt type:

```
Copy A:BusKey.Com /v
```

### BusKey Parameters

When you run BusKey, you need to give it parameters specifying the interrupt and port address you've set the WDP Reader to. If you're not sure of these, go to Appendix C and read about setting the interrupt number and port address. The syntax is:

```
BusKey P=ppp I=i
```

where ppp equals the port address in hex, and i equals the interrupt number. For example, if you've set the WDP Reader to port 240 and interrupt 5, you'd start BusKey like this:

```
BusKey P=240 I=5
```

If you run BusKey with no parameters, it will use the default settings of `port 220` and interrupt 3, the equivalent of `BusKey P=220 I=3` typed at the DOS prompt.

See Appendix C for the jumper settings (JP4,JP5, and JP7) necessary to convert the WDP reader board to communicate directly with the bus.

## Jumper Settings

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Your WDP Reader is shipped with its jumpers set to match the configuration (scanner type, interface method, etc.) you ordered. Why might you need/want to check or change jumper settings?

- If you change your scanner type, or install a second scanning device, you may need to change some jumper settings.
- If you're going to install the WDP Reader in Bus Interface mode, you may need to change the Interrupt Number and Port Address jumpers.
- If your WDP Reader or scanner doesn't power up correctly, you should make sure the WDP has the correct jumper settings for your configuration.

Open the WDP Reader's case using the instructions in Appendix A.

### **Interrupt Number jumper JP4, the Interrupt Number jumper:**

The WDP Reader in Bus Interface mode can use any one of interrupts 2 through 6. The default is interrupt 3. Go through the list below to determine which interrupts are not already in use in your system, and choose one of those. If all interrupts are already in use, you'll either have to free one up (by disabling COM2 or LPT2 on your computer, for example) or use the WDP Reader in wedge mode rather than bus mode.

If your system has any real-time clocks, network boards, bus mice, tape controllers or other add-on devices installed, they may be using some of these interrupts. If you have any of these in your system, compare their switch settings to your manuals to see what interrupts they're using.

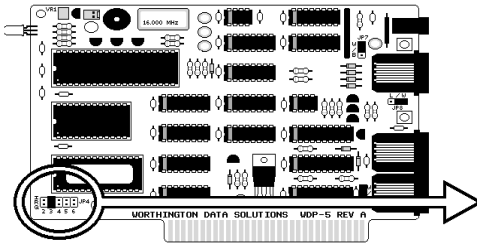
Interrupt 2: Don't use this interrupt if you have an AT, 386 or 486 system, an EGA, or an IBM network adapter.

Interrupt 3: This interrupt is usually used by COM2, the second serial port. If you don't have a COM2, or an internal modem or other device set to COM2, you should be able to use it.

Interrupt 4: This interrupt is usually used by COM1, the first serial port. If you don't have a COM1, or an internal modem or other device set to COM1, you should be able to use it.

Interrupt 5: This interrupt is used by the hard disk on a PC or XT system, and LPT2, the second parallel port, on an AT system. You can use it if you have a floppy-only PC or XT system, or an AT system with only one parallel port.

Interrupt 6: This interrupt is used by the floppy diskette drive controller.



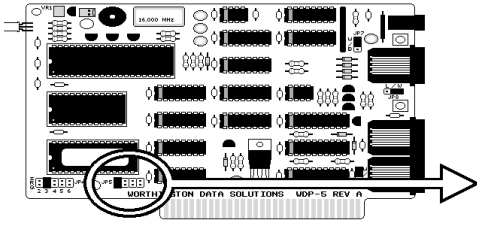
**JP4 - Interrupt**



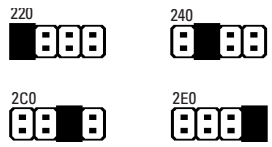
**JP5, the Port Address jumper:**

The WDP Reader in Bus Interface mode can use any of four different port addresses: hex 220, 240, 2C0 and 2E0. The default setting is 220, which most people will be able to use with no problem.

Occasionally a tape controller, bus mouse, network board, real-time clock or other add-on may be using address 220 (compare add-on board switch settings with the manuals) and you'll need to choose another.

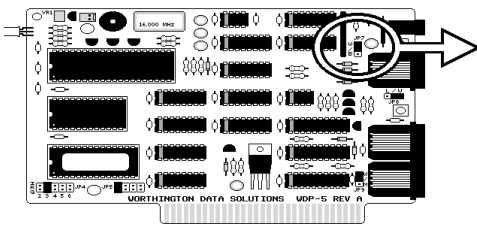


**JP5 - Port Address**

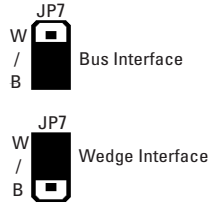


**JP7, the Interface Method jumper:**

JP7 is the jumper used to select wedge or bus installation. Use the Wedge Interface setting if you are installing the WDP Reader in external or internal wedge mode. Use the Bus Interface setting if you're installing it as an internal bus reader.



**JP7 - Interface**



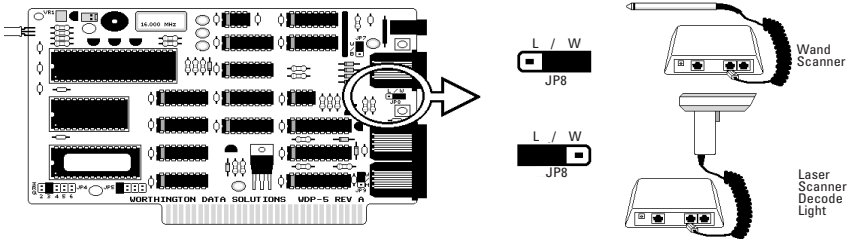


### JP8, the Laser (Decode Light)/Wand jumper:

**W** Use the W jumper setting if you have a wand, touch scanner or bar-code slot scanner connected to the Wand port, or if you'll be using a wand and laser scanner interchangeably with the Wand port. This is the default setting shipped on the WDP P11/12.

Using a laser scanner with the W setting causes the scanner's decode light to be on all the time. This means that your laser scanner won't give a visual indication (flashing decode light) of successfully-read bar codes, but as most people just listen for the WDP's beep anyway instead of staring at the scanner, this is unlikely to affect anyone.

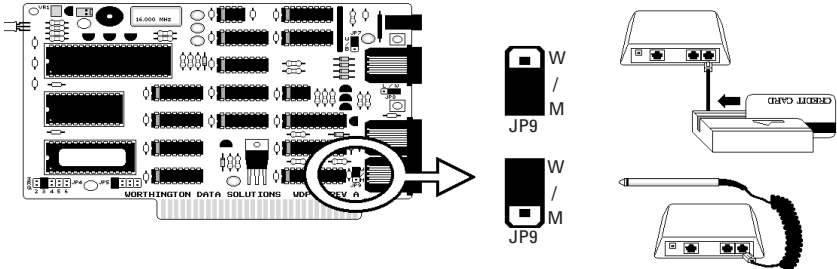
**L** Use the L jumper setting if you'll be using only a laser scanner with the Wand port. (As shipped, the decode light is always on. If you change the setting to L, a wand will no longer work but the laser scanner's decode light will flash as a bar code is successfully read.)



### JP9, the Wand/Magstripe jumper:

The WDP Reader has a port labeled "MagStripe", for adding a bar-code slot scanner, MagStripe reader or wand scanner as a second scanning device. However, the MagStripe port can not be used with laser scanners. If you want to have both a laser scanner and another scanner (such as a wand) hooked up at the same time, you must plug the laser scanner into the Wand post and the other scanner into the MagStripe port.

Set JP9 to M to use a 2 or 3 track Magstripe reader with the MagStripe port, or W to use a single track magstripe scanner, wand, touch scanner or slot-badge reader with the MagStripe port.



## Specifications for Code 39

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123ABC

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 -.

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 WDP 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**  
***The cost is \$36.***

### 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. The check character is derived by assigning a value to each character in the data to be bar coded from the table as follows:

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		

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:

$$\begin{array}{cccccc}
 \mathbf{1} & + & \mathbf{2} & + & \mathbf{3} & + & \mathbf{33} & + & \mathbf{34} & + & \mathbf{35} & = & \mathbf{108} \\
 1 & & 2 & & 3 & & X & & Y & & Z & & 
 \end{array}$$

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

$$\mathbf{108/43 = 2 \text{ with a Remainder of } 22}$$

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	C39	ASCII	C39	ASCII	C39	ASCII	C39
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	-	/M	M	M	m	+M
SO	\$N	.	/N	N	N	n	+N
SI	\$O	/	/O	O	O	o	+O
DLE	\$P	0	0	P	P	p	+P
DC1	\$Q	1	1	Q	Q	q	+Q
DC2	\$R	2	2	R	R	r	+R
DC3	\$S	3	3	S	S	s	+S
DC4	\$T	4	4	T	T	t	+T
NAK	\$U	5	5	U	U	u	+U
SYN	\$V	6	6	V	V	v	+V
ETB	\$W	7	7	W	W	w	+W
CAN	\$X	8	8	X	X	x	+X
EM	\$Y	9	9	Y	Y	y	+Y
SUB	\$Z	:	/Z	Z	Z	z	+Z
ESC	%A	;	%F	[	%K	}	%P
FS	%B	<	%G	\	%L		\$M
GS	%C	=	%H	]	%M	{	%R
RS	%D	>	%I	^	%N	~	%S
US	%E	?	%J	_	%O	DEL	%T,%X

See page 28 for instructions on encoding Function, Control, Alt and Shift keys with Full-ASCII Code 39 bar code characters.

## Appendix E

# Codabar

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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 WDP 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 WDP reader and data coming from the keyboard. If neither of these situations apply, you'll probably want to disable it.

# Code 128 Specifications

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AB123456

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.

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, all variable length fields are terminated by a Function Code 1 character unless they are the last field in the bar code.

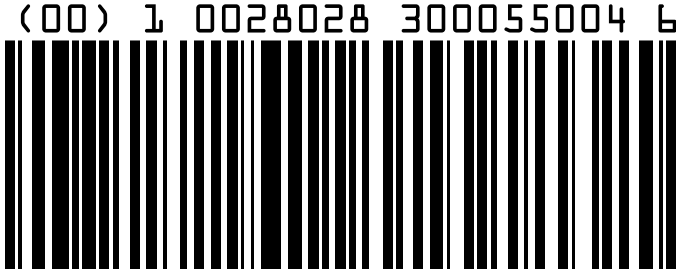
The WDP outputs the following for the special function codes and start sequences:

]C1 Start C/Function Code 1

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

If MOD 10 UCC 128 is enabled, the WDP expects only 20 digit, numeric-only 128 codes starting with a Function 1 character and terminating with a MOD 10 Check Digit. This is to comply with the Uniform Code Council's Serial Shipping Container Code specification. The Mod 10 Check digit is calculated the same as the Interleaved 2 of 5 example in Appendix D. It is the MOD 10 check digit that distinguishes the Serial Shipping Container Code from other UCC /EAN 128 bar codes.

MOD 10 UCC 128 is enabled by scanning the appropriate bar codes on the TriCoder Setup Menu or by keypad in the PROGRAMMING MODE "Change Setup" option. If MOD 10 UCC 128 is enabled, you will NOT be able to read a standard Code 128 bar code that does not have the Function 1 character and the Mod 10 check character.



*UCC/EAN Code 128 Serial Shipping Container Code*

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 Product Code Council, Inc.  
8163 Old Yankee Road, Suite J  
Dayton, Ohio 45458  
(513) 435-3870**

Many of the specifications are available online at:

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

## Interleaved 2 of 5 Code

---



123456

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.

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 TriCoder to look for one length of I 2 of 5 code only. By default, the TriCoder is set to look for a 6 digit I 2 of 5 code but you can set the length to something different using the TriCoder 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 TriCoder 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.

**7 - even**  
**8 - odd**  
**9 - even**  
**1 - odd**

3. Take the sum of the odd digits:

$$8 + 1 = 9$$

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:

$$19873$$

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

$$019873$$

# UPC Specifications

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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 Product Code Council, Inc.**  
**8163 Old Yankee Road, Suite J**  
**Dayton, Ohio 45458**  
**(513) 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 Number System Character, (the first number of the 11 digits to be entered) should conform to these UPC assignments:

- 0,6,7** Regular UPC 12 digit codes with numbers assigned by 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.

## UPC 2 and 5-character supplemental codes



The UPC standards include the addition of a 2 or 5-character supplemental code used with magazines and paperback books. To read the supplements, you must first enable them using the TriCoder Setup Menu.

**NOTE:** Enabling the supplements disallows the reading of UPC codes from right to left to assure that the supplement does not get missed.

## 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 TriCoder 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 \$26.00*

## 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:

<b>8</b>	<b>3</b>	<b>9</b>	<b>9</b>	<b>8</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>3</b>	<b>8</b>	<b>1</b>
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.

$$\text{Next higher multiple of 10 over 125} = 130$$

$$130 - 125 = 5$$

**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	abcde0	00000	3	ab00000cde
1	abcde1	10000	3	ab10000cde
2	abcde2	20000	3	ab20000cde
3	abcde3	00000	4	abc00000de
4	abcde4	00000	5	abcd00000e
5	abcde5	0000	6	abcde00005
6	abcde6	0000	6	abcde00006
7	abcde7	0000	6	abcde00007
8	abcde8	0000	6	abcde00008
9	abcde9	0000	6	abcde00009

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

**1234500006**

2. Add the Number System Character of 0 to the sample data:

**01234500006**

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:

**5**

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

**01234565**

# MSI/Plessey Specifications

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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:

**82345**

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

**835**

2. Multiply the new number by 2

$$(835) \times 2 = 1670$$

3. Add the digits of product

$$1 + 6 + 7 + 0 = 14$$

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

$$2 + 4 + 14 = 20$$

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

$$20 - 20 = 0$$

6. New Check Digit

**0**

7. Data with check digit is:

**823450**

## 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

$$195/11 = 17 \text{ remainder } 8$$

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**

# Code 93 Specifications

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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  $\textcircled{\$}$   $\textcircled{\%}$   $\textcircled{/}$  and  $\textcircled{+}$  . Full ASCII 93 is created by pairing these control characters with normal data characters. 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  $\textcircled{\$} M$  to produce the Carriage Return.

Code 93's two built-in check digits greatly minimize the possibility of reader substitution errors. These check digits are never transmitted by the bar code reader. 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 K*

# ASCII Code Equivalent Table

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

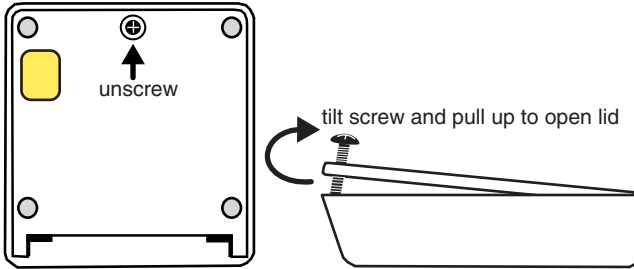
Char	hex	ASCII	Char	hex	ASCII	Char	hex	ASCII	Char	hex	ASCII
NUL	00	000	SP	20	032	@	40	064	'	60	096
SOH	01	001	!	21	033	A	41	065	a	61	097
STX	02	002	"	22	034	B	42	066	b	62	098
ETX	03	003	#	23	035	C	43	067	c	63	099
EOT	04	004	\$	24	036	D	44	068	d	64	100
ENQ	05	005	%	25	037	E	45	069	e	65	101
ACK	06	006	&	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

# Firmware Upgrades

*This section applies only to the WDP P11/12 and the WDP P01, the separate external box decoder models. It does not apply to the Integrated WDP Models.*

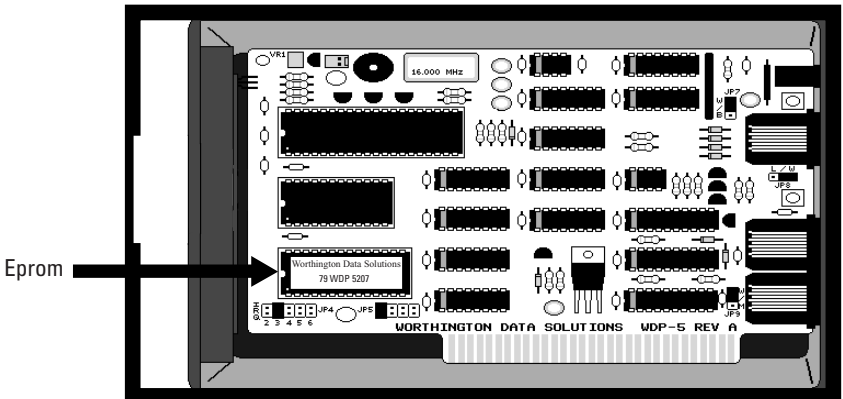
Occasionally it will be necessary to get firmware fixes for problems discovered with the external WDP Reader, especially in the early stages of each advance in development. This is accomplished replacing the EPROM, a chip which is to replace the similar chip on the board of the WDP's decoder box. The EPROM chip on the board is labeled with a white paper label to indicate the firmware version and to communicate the "Copyright Notice".

To replace the EPROM, remove the cover to the WDP decoder box according to instructions in Appendix A (see the diagram below).



If you have a Integrated models of the WDP, you will have to send the unit back for a firmware change at the factory.

Remove the EPROM by gently prying with a small flat head screw driver -- alternate ends to keep from bending the metal legs.



Before inserting the new EPROM, notice that the EPROM has a small groove in one end; the end with the groove in it must match the groove in the socket which it is to be inserted into. Don't insert the chip backwards -- line up the groove in the chip to be on the same side as the socket's groove.

You may need to slightly bend into the center the legs of the EPROM so that they can be inserted into the socket. Place the chip into the socket and begin to lightly push the chip into the socket. Unless you check, you may bend one of the leads not in a hole underneath the chip -- making your Reader disfunctional. Once you are sure all legs are positioned into the holes correctly, you can push hard until the chip is firmly positioned into the socket.

After turning the re-powering the WDP by plugging back in the "Y-Cable", you should hear 3 beeps. This indicates that the EPROM has been successfully installed. If it doesn't beep three times, immediately unplug the "Y-Cable" and remove the EPROM and check for bent legs. Also be certain you have not placed it in upside down, (not matching the notches). If you have placed it upside down and were a little slow in removing power, you probably have burnt out the EPROM and will have to replace it before proceeding.