WORDPAK DRIVER PROGRAM

COLOR COMPUTER OS-9 VERSION 3.0

INSTALLATION AND OPERATING INSTRUCTIONS

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WARRANTY NOTICE

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1.0 INTRODUCTION

Depending on your order, the disk accompanying this manual contains either the WordPak or WordPakII device drivers. Also included on the disk you received are procedure files which will perform the installation of the driver modules automatically.

If you are using the WordPakII, note that throughout this manual, except where noted, all references to WordPak also apply to the WordPakII.

1.1 FEATURES OF WORDPAK 3.0

WordPak 3.0 includes many enhancements over the original WordPak driver for OS-9. These new features include:

1. Faster screen throughput
   The video display routines have been completely revised to make use of the advanced features of the 6845E CRT controller. This results in a display update rate that is approximately 33% faster than previous versions.

2. Dual Operating Modes
   WordPak 3.0 is completely compatible with previous versions in its standard operating mode. An additional operating mode, called the RS compatible mode is included. This enables the WordPak to use the same display control codes as the standard OS-9 text display. In this mode, compatibility with FHL O-PAK is also available.

3. Auto key repeat
   After an initial delay of one-half second, any key held down will repeat at a rate of twelve characters per second.

4. Joystick conversion
   "Get Status" commands added to WordPak 3.0 will allow you to determine joystick values and fire button status.

2.0 INSTALLATION OF THE WORDPAK DRIVERS

Installation of the WordPak drivers under the OS-9 operating system is a relatively straightforward procedure. There are no "patches" to be performed. The OS-9 WordPak driver program is in itself a complete replacement for the CCIO terminal device driver module provided with Color Computer OS-9.

The disk you received contains a number of files. There is a directory named MODULES under which you will find two programs, WordPak and TERM. WordPak is the device driver module for the WordPak display hardware, and contains all the routines needed to control the display of characters on your monitor. In addition, scanning of the Color Computer keyboard is performed by this module. Key assignments remain the same as before.

TERM is the Device Descriptor module for WordPak. It replaces the CCIO terminal descriptor module also named TERM which is not compatible with the WordPak device driver module.

The disk also contains two procedure files, INSTALL.1 and INSTALL.2. These procedures will be used to make a new system disk containing the WordPak driver modules as part of a new OS9Boot file. INSTALL.1 is intended to be used with a single disk drive, while INSTALL.2 should be used where multiple disk drives are available.

The last file on the disk is named BOOTLIST. This file is simply a list of modules used by the OS9Gen program to create a new OS9Boot file which includes the WordPak drivers.

The first portion of the installation procedure details the steps required to make a backup copy of the program diskette. This is necessary since the installation procedure requires that write operations be performed on the disk containing the WordPak driver modules. For this reason, it is imperative that backup copies be made prior to performing the final phase of the installation procedure.

Before proceeding with the OS-9 installation, be sure that your WordPak is properly connected to the computer and monitor. Refer to the WordPak User's Manual for instructions regarding use of the WordPak.

2.1 INSTALLATION PROCEDURE (TWO DRIVE SYSTEM)

Installation of the WordPak device driver module is a relatively simple process when two disk drives are available. The program disk you received contains a procedure file named INSTALL.2 which will perform the installation for you automatically.

1. First, boot-up OS-9 as usual and enter the date and time.

2. Format a diskette in drive #1 with the OS-9 Format command:

   OS9:FORMAT /D1

3. Load the Backup command into memory by entering the following:

   OS9:LOAD BACKUP

4. Remove your OS-9 system disk from drive #0.

5. Place the WordPak installation disk in drive #0 and enter:

   OS9:BACKUP /D0 /D1 #40K

6. The Backup program will prompt you for verification. Be certain that everything is correct before proceeding.

7. After the backup is completed, remove the WordPak installation disk from drive #0 and put it away for safe keeping. Leave the backup copy that you just created in drive #1.

8. Replace your OS-9 system disk in drive #0.

9. Invoke the MDIR command in order to verify that each of the following modules is resident in memory:

```
OS9:MDIR

CCDisk      IOMan       SysGo       PipeMan
D0          RBF         Clock       Piper
D1          SCF         RS232       Pipe
D2          Shell       PRINTER     P
D3          T1
```

NOTE:
This step is not required unless you have booted OS9 from a modified OS9Boot file in which you may have excluded some unnecessary modules such as D2 or D3. It is possible that you may have done this to prevent inadvertent access to nonexistent drives. If this is the case, you should restart the system from an unmodified OS9Boot program as supplied by Tandy. Later on, you can create a custom version of OS9Boot with the OS9Gen command.

10. Enter the following command to begin the installation:

    ```
    OS9:/D1/INSTALL.2
    ```

11. After several minutes, you will have a complete system disk in drive #1 with the WordPak driver modules properly installed as part of a new OS9Boot file. Also, all directories and files with the exception of the old OS9Boot file will have been copied from your OS-9 system disk in drive #0 onto the new WordPak system disk.

12. Remove your original OS-9 system disk from drive #0.

13. Remove the new system disk that you just created from drive #1 and place it in drive #0.

14. Press the Reset button on the back of the computer. OS-9 should begin to reboot. If this fails, remove the disk from the drive and turn off the computer. Be sure that the WordPak is properly connected to the computer and to your video monitor. After having determined this, restore power and boot OS-9 with the new system disk in drive #0.

15. If you performed the installation correctly, you will see the OS-9 prompt appear on your monitor.

2.2 SINGLE DRIVE INSTALLATION PROCEDURE

Installation of the WordPak driver module is somewhat tedious with a single disk drive. However, if you follow this procedure carefully, you should have little or no trouble installing WordPak.

To create a bootable WordPak disk, follow these instructions in the order indicated.

1. Boot-up OS-9 as usual and enter the date and time.

2. Load the Backup and Format commands into memory as follows:

    ```
    OS9:LOAD BACKUP FORMAT
    ```

3. After both commands have loaded, remove the OS-9 system disk.

4. Place a blank disk into the drive and enter:

   OS9:FORMAT /D0

   Answer the prompts issued by the Format program to begin formatting the disk. When the formatting is complete, remove the disk from the drive.

5. Place the WordPak installation disk you received into the drive and begin the single drive copy by entering the command:

   OS9:BACKUP /D0 #36K

6. After the backup procedure is completed, remove the copy of the WordPak installation disk you just created from the drive. Store the original disk in a safe place for future use. Before going any further, you will need at least one backup of your OS-9 system disk. If you do not have one at this time, you should prepare one or two using the procedure outlined above.

7. Insert a backup copy of your OS-9 system disk in the drive and enter the MDIR command to be sure that each of the following modules is resident in memory:

   OS9:MDIR

CCDisk	IOMan	SysGo	PipeMan
D0	RBF	Clock	Piper
D1	SCF	RS232	Pipe
D2	Shell	PRINTER	P
D3	T1		

   NOTE:
   This step is not required unless you have booted OS-9 from a modified OS9Boot file in which you may have excluded some unnecessary modules such as D2 or D3. It is possible that you may have done this to prevent inadvertent access to nonexistent drives. If this is the case, you should restart the system from an unmodified OS9Boot program as supplied by RS. Later on, you can create a custom version of OS9Boot with the OS9Gen command.

8. Next, enter each of the following commands in succession:

   OS9:UNLINK BACKUP;LOAD OS9GEN SAVE RENAME TMODE

9. Now, remove your OS-9 system disk from the drive.

10. Put a copy of the installation disk into the drive.

11. Run the single drive procedure file by entering the command:

    OS9:/D0/INSTALL.1

The procedure will begin by saving all required memory modules to a directory named MODULES. This directory already contains the device driver module WordPak and device descriptor module TERM. Next, the OS9Gen program will be invoked in order to create a new OS9Boot on the disk. The input to the OS9Gen program will be redirected to a file on the disk named Bootlist. This file is simply a list of the memory modules needed to build a new OS9Boot file.

12. After the procedure is complete, press the reset button on the back of the computer to reboot the computer from the new system disk. The OS-9 startup header will then appear on your monitor. Note that if you do not have a WordPakII, you must connect the monitor to the video output of the WordPak in order to view the display.

13. Remove the disk from the drive, and replace it with a backup copy of your OS-9 system disk.

14. Execute the following OS-9 commands:

    OS9:chx /d0/cmds;setime </term

15. After entering the date and time, delete the old OS9Boot from the disk as follows:

    OS9:del /d0/os9boot

16. Now, a new OS9Boot which contains the WordPak driver can be created. To do this, enter the following:

    OS9:cobbler /d0

    After cobbler has completed, it will inform you that files were present on track 34. Ignore this message.

17. You now have a complete system disk with WordPak installed. Make several backups for future use.

3.0 DISPLAY FEATURES

One of the features of WordPak 3.0 is its ability to operate in either of two modes. The display control codes in the Standard Mode are completely compatible with earlier releases of the WordPak device driver. This means that all software configured to work with WordPak 1.0 and later versions should run properly in the Standard Mode.

The RS Mode allows the WordPak to process display control codes in the same manner as the standard Color Computer OS-9 display. In addition, most of the display control codes used by FHL O-Pak have been implemented.

Note that most software designed for use with the WordPak operates in the RS compatible mode. This includes all OS-9 programs sold by Radio Shack as well as those programs designed specifically for FHL O-Pak. However, you may find that some early versions of popular Color Computer OS-9 programs use the Standard Mode display codes. If you find that a particular program does not work properly with the WordPak, try changing the display mode.

3.1 CHANGING THE DISPLAY MODE

As supplied, the WordPak operates in the RS Compatible mode. Changing from one operating mode to the other is accomplished by the TMODE command. To set the display to the Standard Mode, enter the following:

```
OS9:TMODE TYPE=1
```

To return the display to the RS Mode, type:

```
OS9:TMODE TYPE=80
```

You may include either of these commands in your STARTUP file to set the default operating mode. Alternatively, you may use the XMODE command to permanently set the default mode. For example, if you wish to default WordPak to the Standard Mode, follow these steps:

1. Create a new WordPak system disk using the supplied installation procedures.

2. Reboot OS-9 from the new system disk you created.

3. Use the XMODE command to permanently set the device descriptor TERM to the Standard Mode:

   ```
   OS9:XMODE /TERM TYPE=1
   ```

4. Format a new disk in drive #1 using the OS-9 FORMAT command.

5. Create a new OS9Boot on the blank disk with the COBBLER command as follows:

   ```
   OS9:COBBLER /D1
   ```

6. Copy the contents of your system disk in drive #0 to the new disk in drive #1 with the DSAVE command.

   ```
   OS9:DSAVE -S30 /D0 /D1 ! SHELL
   ```

3.2 DISPLAY CONTROL CODE DESCRIPTION

The display control codes included in WordPak 3.0 are described in the following pages. These control codes are extremely useful for display formatting within applications programs. Note that the control codes for the Standard Mode and RS Mode are different, and that the functions of some of these codes varies with the display mode.

HOME CURSOR

```
RS Mode:       display 1
Standard Mode: display F
```

Causes the cursor to move from its current position to the upper left-hand corner of the display. All subsequent characters will be displayed from this position onwards. Previously displayed characters will be overwritten as new characters are displayed in their place.

CURSOR X-Y ADDRESSING

RS Mode: display 2 x y
Standard Mode: display 14 y x

Initiates cursor X-Y addressing sequence. In the Standard Mode, the sequence is row (y) then column (x). In the RS Mode, the column (x) precedes the row (y) coordinate. A row and column bias of 32 ($20) is required in both modes. Invalid x or y values will cause the cursor to default to the maximum column or row coordinates.

ERASE LINE

RS Mode: display 3
Standard Mode: display 19

Erases the entire line the cursor is on. The cursor is not moved, and new characters will be displayed from the cursor position onwards.

ERASE TO END OF LINE

RS Mode: display 4 or display 1B 41
Standard Mode: display 5

Erases the line from the current cursor position to the end of the line. The cursor is not moved and subsequently displayed characters will be shown from the original cursor position onwards.

CURSOR RIGHT

RS Mode: display 6
Standard Mode: display 9

Moves the cursor one position to the right. If the cursor is at the end of a line, it will move to the the next line. If the cursor is at the lower right hand corner of the screen, no action will occur.

CURSOR LEFT

RS Mode: display 8
Standard Mode: display 8

Moves the cursor non-destructively one place to the left. If the cursor is at the beginning of a line, it will move to the right-most position of the previous line. If at the home position, the cursor will not move.

CURSOR UP

RS Mode: display 9
Standard Mode: display B

Moves the cursor up one line to the same horizontal position in that line. If the cursor is on the top line of the screen, no action occurs.

CURSOR DOWN

RS Mode: display A
Standard Mode: display A

Moves the cursor down one line from its current location to the same horizontal position in the line below it. If the cursor is on the bottom line, the screen will scroll up.

ERASE TO END OF SCREEN

RS Mode: display B or display 1B 42
Standard Mode: display 13

Erases the screen from the current cursor position to the end of the screen. The cursor will not be moved, and subsequently displayed characters will be shown from the original cursor position onwards.

HOME CURSOR AND ERASE SCREEN

RS Mode: display C
Standard Mode: display 2

Moves the cursor to the upper left-hand corner of the screen and erases the entire screen. Subsequently displayed characters will begin from the home position on the screen.

CARRIAGE RETURN

RS Mode: display D
Standard Mode: display D

Moves the cursor to the beginning of the current line.

INSERT LINE

RS Mode: display 1B 45
Standard Mode: N/A

Shifts the entire display from the line containing the cursor to the end of the screen down by one line and inserts a blank line at the cursor position.

DELETE LINE

RS Mode: display 1B 46
Standard Mode: N/A

Deletes the current line containing the cursor and copies all lines below the cursor up by one line. A blank line is inserted at the bottom of the display.

SHIFT RIGHT

RS Mode: display 1B 47
Standard Mode: N/A

Shifts the entire line containing the cursor eight places to the right and fills the eight left most spaces with blanks.

SHIFT LEFT

RS Mode: display 1B 48
Standard Mode: N/A

Shifts the entire line containing the cursor eight places to the left and fills the eight right most spaces on the line with blanks.

NORMAL VIDEO

RS Mode: display 1B 53 20
Standard Mode: display 6

In the RS Mode, the sequence "1B 53 20" will cause all subsequently displayed characters to appear in normal video. In the Standard Mode, the function is the same as the inverse video command described below.

INVERSE VIDEO

RS Mode: display 1B 53 21
Standard Mode: display 6

In the RS Mode, this sequence will cause all subsequently displayed characters to appear in inverse video. In the Standard Mode, the same command is used to toggle inverse video on and off. That is, upon receipt of the command, if normal video is enabled, subsequently displayed characters will appear in inverse video. If inverse video is enabled, subsequently displayed characters will appear in normal video.

BLOCK CURSOR

RS Mode: display 1B 56
Standard Mode: N/A

Sets the cursor type to a block cursor.

UNDERLINE CURSOR

RS Mode: display 1B 76
Standard Mode: N/A

Sets the cursor to a underline cursor.

CURSOR RATE

RS Mode: display 1B 57 "r"
Standard Mode: N/A

This command allows the cursor blink rate to be varied as a function of the following values of "r":

20 - steady cursor
21 - slow blinking cursor
22 - fast blinking cursor
23 - invisible cursor

CHANGE CURSOR TYPE

RS Mode: N/A
Standard Mode: display 1B 2E "n"

Changes the cursor type to one of the following for the values of "n" listed below:

30 - invisible cursor
31 - blinking block cursor
32 - steady block cursor
33 - blinking underline cursor
34 - steady underline cursor

3.3 ADDITIONAL DISPLAY FEATURES OF WORDPAK II

SCROLL RATE

Standard Mode: N/A
RS Mode: display 1B 58 "r"

The scroll rate of the WordPakII display may be varied from a very slow smooth scroll to a fast hard scroll. The scroll rate "r" requires an offset of 32 ($20), and may be varied from 1 ($21 with offset) to 16 ($30 with offset). The default scroll value is set to 16 for hard scrolling. For smooth scrolling, type:

OS9:display 1B 58 2E

For best results, the soft scroll rate should be set to near maximum. Lower values will result in extremely slow scrolling which is not very practical. Note that while smooth scrolling may be used in either the RS or Standard Mode, the scroll rate may be changed only when in the RS Mode.

You may use the Debug program to set the default value for the scroll rate. The default scroll rate is located at offset $3E and should be set to a value from $1 to $10. An offset of $20 is not required.

3.4 GET STATUS CODES

WordPak 3.0 implements several "Get Status" commands not included in previous versions of the driver. These commands are useful for determining joystick position and various display parameters and may be accessed by assembly language programs. Joystick values may be obtained with Basic09 through the graphics interface module GFX. Consult the OS-9 and Basic09 manuals for further information about the use of "Get Status" commands.

The "Get Status" commands implemented in WordPak 3.0 maintain functional compatibility with CCIO and FHL O-Pak wherever possible. It is important to note that the WordPak hardware produces a video display in an entirely different manner than the software generated displays of CCIO and O-Pak. For this reason, only those CCIO and O-Pak "Get Status" commands which have application to the WordPak display have been included.

The proper assembly language calling format for "Get Status" commands is as follows:

```
lda     #1          path number for WordPak
ldb     #GScode     appropriate "Get Status" code
os9     I$GSTT      call OS-9 Get status routine
```

The "Get Status" commands implemented in WordPak 3.0 may be invoked by the codes listed below. All values shown are in decimal except where indicated otherwise.

CCIO compatible Get Status commands:

Code 19 Passed: (X) = 0 for right joystick: 1 for left joystick
Returned: (X) = x value (0-63) of selected joystick
(Y) = y value (0-63) of selected joystick
(A) = 0 if fire button off: $FF if button on

Code 38 Passed: nothing
Returned: (X) = number of columns on the screen (always 80)
(Y) = number of rows on the screen (always 24)

FHL O-Pak compatible Get Status commands:

Code 131 Passed: nothing
Returned: (A) = Maximum displayable ASCII character (=$7F)

Code 132 Passed: nothing
Returned: (A) = Number of columns on the screen (always 80)
(B) = Number of rows on the screen (always 24)

Code 134 Passed: nothing
Returned: (B) = 1 if block cursor, 0 if underline cursor
(A) = Cursor blink rate (0 - 3)

where: 0 = Steady cursor
1 = Slow Blinking cursor
2 = Fast blinking cursor
3 = Invisible cursor

Code 135 Passed: nothing
Returned: (A) = 0 - display always in non-overstrike mode.

3.5 WORDPAK II GET STATUS CODES

These Get Status codes for WordPakII are in addition to those implemented for the WordPak.

Code 136 Passed: nothing
Returned: (A) = Scroll rate (1 - 16).

4.0 CUSTOMIZATION

The supplied programs have been designed to correctly interface the WordPak to a wide variety of video monitors. Your own particular video monitor may require different programming of the CRTC for best results. The data programmed into the 6845 CRTC is located in a table near the beginning of the program module. The offset from the module beginning to the start of the table is $28 for WordPak, $2A for WordPakII. The format of the CRTC table is identical to that described in the WordPak User's Manual. Use the DEBUG program to modify the table entries to suit your particular monitor.

SUMMARY OF WORDPAK DISPLAY CODES

RS Mode Hex	Dec	Standard Mode Hex	Dec	Screen Function	
$01	01	$0F	15	Home cursor	
$02 x,y	02 x,y			Position cursor (x=column+$20;y=row+$20)	
		$14 y,x	20 y,x	Position cursor (y=row+$20;x=column+$20)	
$03	03	$19	25	Erase line	
$04	04	$05	05	Erase to end of line	
$06	06	$09	09	Cursor right	
$08	08	$08	08	Cursor left	
$09	09	$0B	11	Cursor up	
$0A	10	$0A	10	Cursor down	
$0B	11	$13	19	Erase to end of screen	
$0C	12	$02	02	Home cursor and clear screen	
$0D	13	$0D	13	Carriage return	
$1B $41	27 65			Erase to end of line	(*)
$1B $42	27 66			Erase to end of screen	(*)
$1B $45	27 69			Insert line	
$1B $46	27 70			Delete line	
$1B $47	27 71			Shift right	
$1B $48	27 72			Shift left	
$1B $53 $21	27 83 33	$06	06	Set inverse video	
$1B $53 $20	27 83 32	$06	06	Set normal video	
$1B $56	27 86			Block cursor	
		$1B $2E $30	27 46 48	Invisible cursor	
		$1B $2E $31	27 46 49	Blinking block cursor	
		$1B $2E $32	27 46 50	Steady block cursor	
$1B $57 r	27 87 r			Set cursor (r)ate	
$1B $58 r	27 88 r			Set scroll (r)ate - WordpakII	
$1B $76	27 118			Underline cursor	
		$1B $2E $33	27 46 51	Blinking underline cursor	
		$1B $2E $34	27 46 52	Steady underline cursor	

(*) - Indicates extra display code required for O-Pak compatibility.