TM

CP/M-86 Operating System   Model No: APC-S01

1.0   Introduction:

      CP/M-86 is a single-user/single-task Disk Operating System
      (DOS) for the APC computer. The current release of the
      operating system consists of two integrated parts; CP/M-86
      1.1 and CBIOS 1.107. Together these two parts form the
      operating system referred to as CP/M-86 1.1 (1.107:015;B).

2.0   Contents of the Release:

      2.1   Distribution Media

            PART NO.   DESCRIPTION

            819-076001-0100 Rev 07   CP/M-86 Diskette
            819-076002-0100 Rev 02   CP/M-86 Program Development
                                            Aids Diskette

      2.2   Documentation

            PART NO.   DESCRIPTION

            819-000100-4001   CP/M-86 User's Guide
            819-000102-2001   CP/M-86 System Guide

            819-095000-236 Rev 07   Release Bulletin

3.0   Hardware/Software Requirements:

      3.1   Minimum Hardware Requirements

            APC-H01 - Monochrome APC with 1 Floppy Disk Drive (See
                      Section 6.5 in this release bulletin)

      3.2   Minimum Software Requirements

            None

4.0   Installation Procedure:

      1) Refer to the CP/M-86 User's Guide Chapter 1 for details
          on installation.

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2) Use TYPE to view the READ.ME file included with the CP/M-86 System Diskette. This text file contains additional information that is not incorporated into the release bulletin.

5.0 **Enhancements**:

These enhancements were originally implemented in CP/M-86 (1.107:105;A) and still apply to this release.

1) Screen dump capabilities for graphics, alternate character and normal character screen images are supported. See the attached description "operation of CRTDUMP" for further details.

2) The ALT key now selects the alternate character set. With ALT latched in the down position, all characters displayed will be from the currently loaded alternate character set. Unlatching the ALT key will resume display of characters from the ROM (standard ASCII) character generator. BIOS & BDOS error messages will be displayed in the normal character mode regardless of the ALT key's state.

3) Universal country code capability has been added to the BIOS and is controlled by the COUNTRY utility. Refer to the attached sheets for further information regarding the use of the COUNTRY utility.

4) Additional functionality relative to defining CRT type and printer selection has been added to the CONFIG utility. Refer to the attached sheets for more details.

5) Additional BIOS support is provided for the optional expansion Serial Interface Controller (APC H-14). The SETCOM [O] option now allows the user to configure the expansion interface for baud rate, number of stop bits, and parity generation requirements. Additional extended BIOS functions (INT 220 function #15 and it's eight subfunctions) are used to access the expansion interface hardware. See the attached section Extended BIOS function #15: Optional RS-232 Functions.

6) Additional escape sequence functions have been added with this release. Please see the attached section Escape Sequence Enhancements for details.

7) The Direct CRT/IO method (CRTDMA) has been modified to access the 7220 GDC directly instead of through Hardware DMA. This produces a more effective output with greater speed and eliminates conflicts with interrupts.

8) The READER routine (BDOS function 3) now times out after approximately 450 milliseconds if the DR (Data Set Ready) signal from the modem is not active. In previous releases, the routine would loop forever if DR was inactive. The new timeout on DR allows the user program to check for keyboard input so that the operator can break the operation if DR is inactive.

9) The KEY utility will allow control characters (e.g. CTRL+X, CTRL+R, etc.) to be input from the keyboard.

6.0 Cautions:

1) Be sure to refer to the System Reference Guide (pages 2-44 and 3-49 thru 3-54) when setting jumpers for communications and printers.

2) I/O byte functionality has no effect in CBIOS 1.107:015;B except for LST: assignment to LPT: or UL1:.

3) Use TIMEROFF and TIMERON utilities when running any communications software that supports interrupts and uses either the standard or optional (H-14) serial communications ports of the APC.

4) Local stacks in user programs are recommended when BDOS calls are made since BDOS may change information on the system stack.

5) Keyboard repeat does not work when the Timer is off.

6) The status of the GRAPH1, GRAPH2, CAPS and ALT keys are returned in the AH register for Direct CBIOS calls only. BDOS does not return their status to a calling routine. The user must write code that uses direct calls to the BIOS if the status of these keys is required.

7) Serial Interface Printers:
   a. SETCOM allows the user to specify the parameters (baud rate, parity and number of data bits) for the standard APC serial RS232C port. These parameters must match those of the serial interface printer attached to the serial RS232C port.

   b. After using the STAT or CONFIG utility to redirect the printer output to the serial RS232C port execute the SETCOM utility to set the matching parameters for the serial port before attempting printer-bound output.

8) Never press FNC/CTRL/BREAK-STOP while disk writes are in progress as it may cause loss of data.

9) TM-4 on the G9PFBU board (for printer control) must be jumpered in order to insure that a PC-8023 does not lose characters during printing. This setting for TM-4 is correct for all parallel interface printers specified for the APC.

10) PIP will not back-up a file to a floppy diskette from a hard disk when the file size is greater than the maximum available space on the destination floppy diskette. HDBACKUP must be performed and the entire hard disk partition containing the file must be backed-up to several floppy diskettes. HDBACKUP will restore the entire hard disk partition without regard to file name references.

11) HDBACKUP performs physical I/O to the floppy and hard disks without recognizing the standard CP/M-86 directory format or data storage conventions. Files backed-up by HDBACKUP are not accessible by the normal file I/O operations performed by CP/M-86 1.1.

12) CP/M-86 utilities provided with previously released versions of CP/M-86 1.1 for the APC should not be used on the current release of CP/M-86 1.1 (1.107:015;B). Use only those utilities that are provided with a particular release of CP/M-86 1.1 for that release.

13) If CRTDUMP is to be utilized:

   a. Only load CRTDUMP once since loading CRTDUMP absorbs memory for each subsequent load that cannot be regained unless the system is rebooted.
   b. Load CRTDUMP first; before for example GRAPHICS, since holes in the memory allocation can result.
   c. Only the model 8023 printer is supported for graphic alternate character and normal character dumps.
   d. The models 3530, 5530 and 7730 Spinwriter printers are supported for normal character screen dumps only. Graphics and alternate character dumps to these printers will not produce output for graphics and substitute spaces for any alternate characters.

14) Using copydisk on a single drive APC system for verification operations does not work.

15) When booting the CP/M-86 operating system it is necessary to use a write enabled diskette since the autostart process writes a temporary file to drive A:.

16) Do not use LDCOPY for transferring the loader to the hard disk. It is unnecessary to perform this operation and directory entries may be destroyed if the operation is performed.

17) A default-alternate-character set should be loaded by using the CHR utility in order to insure the proper operation of the ALT key function. It is recommended that AUXCG.CHR be used.

18) When using the CHR utility to modify a loadable auxiliary character file be sure not to disturb the first two columns (codes 00-1F(hex)) in the file since these character codes are used in the universal country definitions.

19) Alternate character output on the 8023 printer is accomplished by printing every other dot line for the character. Some alternate characters may appear broken or distorted due to the mechanical limitations of the 8023 printer.

20) Line editing functions within the KEY utility have been eliminated since control characters are now allowed. To edit the input line it must be retyped from the beginning.

21) When screen dump is in effect interrupts are disabled. Any processing that uses interrupts will not function during the screen dump time interval.

22) If COPYDISK is executed when CRTDUMP or Graphics has been loaded, a memory not available error results. To recover from this error the system must be rebooted and CRTDUMP or Graphics must not be loaded.

23) Using CP/M-86 function call 11 (console status) followed by CP/M-86 function call 6 (direct console input) will cause the first character that is typed to be missed. Subsequent console status calls will indicate that a character exists (the first character) until a console read (function 1) is performed which will return the first character that was lost. To eliminate this situation, direct I/O calls (function 6) or standard I/O calls (functions 1, 2, and 11) should be used in exclusive groups.

24) Graphics when loaded does not check for the existence of graphics hardware. Graphics will load successfully but

fail when the application is executed if graphics hardware is not installed.

7.0   Problems Fixed:

1)   Null characters are no longer displayed on the CRT as spaces, instead, no output results from sending a null to the console (CRT). Nulls are still recognized within ESC sequences.

2)   The cursor positioning ESC sequence ESC [#;#h has been corrected to become ESC[#;#f.

3)   CONFIG, option 2 (for selecting a serial interface printer), followed by option 6 (to save a configured CP/M-86) has been fixed so that a reboot operation will function.

ADDENDUM

Escape Sequence Enhancements

The following escape sequences have become available starting
with CP/M-86 (1.107:015;A). They are an addition to the set
implemented by previous releases; all of the previous sequences
that are documented in the CP/M-86 System Reference Guide
remain valid.

   1) Alternate Character Set Display.

      ESC (0

      This sequence selects the currently loaded alternate
      character set (RAM character generator) for display of
      all subsequent characters with codes in the range 20
      (hex) to FF (hex).

      ESC (B

      This sequence selects the standard ASCII (ROM character
      generator) character set for display of all subsequent
      characters.

      ESC {80h} 0

      Initiates screen character dump to printer. "{80h}" is
      the single character with code 80 (hex). The CRTDUMP
      resident extension must be loaded. See the attached
      Operation of CRTDUMP section for details.

      ESC {80h} 1

      Initiates screen graphics dump to printer. "{80h}" is
      the single character with code 80 (hex). The CRTDUMP
      resident extension must be loaded. See the attached
      Operation of CRTDUMP section for details.

      ESC {80h} 2

      Initiates graphics memory dump to printer. "{80H}" is
      the single character with code 80 (hex). The CRTDUMP
      resident extension must be loaded. See the attached
      Operation of CRTDUMP section for details.

      ESC {01h} {attribute}

      Set screen attribute(s). This sequence allows direct
      specification of screen attributes, with a binary code.
      "{01h}" is the single character code 01 (hex);
      {attribute} is a single character code with bits set to
      select the desired attribute(s). The bit assignments

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are as follows:

```
bit 7 (msb) green on
    6       blue on
    5       red on (highlights)
    4       reverse video on
    3       blink on
    2       vertical line
    1       over line
    0       under line
```

Notes:

Various combinations of the color bits (5-7 select different colors, as follows:

bit 7 6 5	color display	monochrome display
0 0 0	black (no color)	black (invisible)
0 0 1	red	bright
0 1 0	blue	black
0 1 1	purple	bright
1 0 0	green	normal
1 0 1	yellow	bright
1 1 0	light blue	normal
1 1 1	white	bright

Extended BIOS function #15: Optional RS-232 Functions.

Extended BIOS function #15 allows access to the optional
expansion serial interface hardware (APC-H14). The function is
comprised of eight subfunctions. When calling a subfunction,
register CL must contain 15 (decimal), and register CH specifies
the subfunction to be executed. Additional parameters should be
supplied as described for each subfunction detailed below. Once
the required parameters have been set, the function is called by
using the INT 220 (extended BIOS function call) software
interrupt.

Subfunction #0: Set Baud Rate and Mode

This subfunction is used to initialize the expansion interface,
by specifying baud rate, number of stop bits, parity, and
character length.

Input

CL: 15 (decimal)
CH: 0
DL: 8251 mode (see below)
DH: baud rate (see below)

Output

8251 Mode

```
bit (msb) 7 6 5 4 3 2 1 0
          0 0 x x x x 1 0   invalid
          0 1 x x x x 1 0   1 stop bit
          1 0 x x x x 1 0   1 1/2 stop bits
          1 1 x x x x 1 0   2 stop bits
          x x 0 x x x 1 0   odd parity
          x x 1 x x x 1 0   even parity
          x x x 0 x x 1 0   parity disabled
          x x x 1 x x 1 0   parity enabled
          x x x x 0 0 1 0   5 data bits
          x x x x 0 1 1 0   6 data bits
          x x x x 1 0 1 0   7 data bits
          x x x x 1 1 1 0   8 data bits
```

example:

0BE (hex) = 2 stop bits, even parity, 8 data bits

Baud Rate

0:	150 bps
1:	200
2:	300
3:	600
4:	1200
5:	2400
6:	4800
7:	9600
8:	19200
9-15:	invalid

Subfunction #1: 8250 Command

This subfunction is used to command the expansion interface to go to a specific state of operation. For this subfunction to operate correctly, subfunction 0 (Set Baud Rate and Mode) must have been previously executed to initialize the interface.

Input

CL:	15 (decimal)
CH:	1
DL:	command specifier (see below)

Output
none

Command Specifier

```
bit (msb) 7 6 5 4 3 2 1 0
          0 0 x x x x x x   hunt mode off
          1 0 x x x x x x   hunt mode on (see note 1 below)
          x 1 x x x x x x   internal reset (see note 2 below)
          x 0 0 x x x x x   RS (request to send) off
          x 0 1 x x x x x   RS (request to send) on
          x 0 x 1 x x x x   error reset (see note 3 below)
          x 0 x x 1 x x x   send break (see note 4 below)
          x 0 x x 0 x x x   no break (see note 4 below)
          x 0 x x x 0 x x   receiver disable
          x 0 x x x 1 x x   receiver enable
          x 0 x x x x 0 x   DTR (data terminal ready) off
          x 0 x x x x 1 x   DTR (data terminal ready) on
          x 0 x x x x x 0   transmitter disable
          x 0 x x x x x 1   transmitter enable
```

example:

27 (hex) = RS on, receiver enabled, DTR on, transmitter enabled.

Notes:

1) Hunt mode is used only during synchronous operation; meaningless for asynchronous operation

2) When using the INT 220 function #15 and subfunctions, the internal reset bit should always be 0; it is always possible to select a different mode via subfunction #0.

3) Error reset, when set, resets the 8251 internal error flags (see subfunction #2).

4) Turning break on causes the transmit data output (TXD) to be held low, signaling a break to the receiving device. It must be reset before normal transmitter operations can resume.

Subfunction #2: Read Interface (8251) Status

This subfunction is used to examine the status of the expansion interface.

Input

CL: 15 (decimal)
CH: 2

Output

AL: interface status

Interface Status

```
bit (msb) 7 6 5 4 3 2 1 0
          0 x x x x x x x   DSR (data set ready) is off
          1 x x x x x x x   DSR (data set ready) is on
          x 0 x x x x x x   no break detected
          x 1 x x x x x x   received break detected
          x x 0 x x x x x   no framing error (see note 1)
          x x 1 x x x x x   framing error (see note 1)
          x x x 0 x x x x   no overrun error (see note 2)
          x x x 1 x x x x   overrun error (see note 2)
          x x x x 0 x x x   no parity error
          x x x x 1 x x x   parity error
          x x x x x 0 x x   transmitter not empty
          x x x x x 1 x x   transmitter empty
          x x x x x x 0 x   receiver not ready
          x x x x x x 1 x   receiver ready
          x x x x x x x 0   transmitter not ready
          x x x x x x x 1   transmitter ready
```

Notes

1) A framing error occurs when no valid stop bit detected on a received character.

2) A overrun error occurs when a valid character is received before the MPU read the previous valid character; the old character is lost.

Subfunction #3: Read Interface Character

This subfunction returns the character in the receiver buffer register.

Input

CL: 15 (decimal)
CH: 3

Output

AL: received character

Note:

This subfunction clears the receiver ready status bit, but does not clear the receiver buffer. The receiver buffer is overwritten by the next valid received character, and the receiver ready status bit is set to 1.

Subfunction #4: Write Interface Character

This subfunction writes the character in register DL to the interface.

Input

CL: 15 (decimal)
CH: 4
DL: character to be transmitted

Output

Subfunction #5: Modem Signal Read

This subfunction reads the modem handshake signals.

Input

```
CL:       15 (decimal)
CH:        5

Output

ALL:      modem signals
```

Modem Signals

```
bit (msb) 7 6 5 4 3 2 1 0
          x x x x x 0 x x    CTS (clear to send) off
          x x x x x 1 x x    CTS (clear to send) on
          x x x x x x 0 x    RI (ring indicator) off
          x x x x x x 1 x    RI (ring indicator) on
          x x x x x x x 0    CD (carrier detect) off
          x x x x x x x 1    CD (carrier detect) on
```

Subfunction #6: Modem Signal Write

This subfunction reads the modem handshake signals.

Input

```
CL:       15 (decimal)
CH:        6
DL:       modem signal data
```

Output

Modem Signal Data

Only bit 0 (lsb) of the data byte is meaningful. The
transmit data (TXD) signal is set on or off by this bit.
This subfunction is not normally used; it would only be used
when software control of the transmit data is required, such
as when a "software UART" is implemented.

Subfunction #7: Read Interface Parameters

This subfunctions allows a program to determine the current
setting of several interface parameters.

Input

```
CL:       15 (decimal)
CH:        7
```

Output

```
AL:        current interface command
AH:        current modem write signal
DL:        current interface mode
DH:        current baud rate
```

Current interface command is the most recent command set to the interface via subfunction #1.

Current modem write signal is the most recent write signal data sent to the interface via subfunction #6.

Current interface mode is the most recent operating mode selected at the interface via subfunction #0.

Current baud rate is the most recent baud rate selected at the interface via subfunction #0.

Operation of COUNTRY

Purpose

COUNTRY is a utility that allows the user to change the codes that the CP/M-86 BIOS interprets and generates from the keyboard. COUNTRY can be menu operated or used as a single command. Once a valid country has been selected, the BIOS will reflect the changes until a new country is defined. If the system is rebooted, the country definition is lost and defaults to U.S.A. until COUNTRY.DEF is executed or a new country is selected from the menu or command line. For this reason, the command COUNTRY DEF is placed in the AUTSTRT.SUB file and will initiate the selected country each time the system is rebooted.

Operation

Menu method

Menu selections are displayed in Figure 1. as they appear in the COUNTRY menu. Note that AUSTRAL stands for Australia. This menu is displayed when the COUNTRY utility is executed without a valid parameter. Only a valid number and a successful loading of the country definition will return the user to the A> prompt. Type CTRL+C or the number of the currently selected (highlighted) country to abort the COUNTRY command.

Figure 1.

COUNTRY VER 1.12

　　　* * * COUNTRY SELECT * * *

1.　AUSTRAL
2.　FRANCE
3.　GERMANY
4.　NORWAY
5.　SPAIN
6.　SWEDEN
7.　U.K.
8.　U.S.A.

KEY IN NUMBER OF COUNTRY (1-8):_

Command Line Entry

The COUNTRY utility can be executed as a command by typing COUNTRY followed by a single option:

    COUNTRY [country name] <ret>

Valid selections are the country names that appear in the menu. Note that they should be typed as they appear in the menu, including periods. It does not matter if the name is in upper or lower case. An invalid name (if you typed COUNTRY USA, for example) will display the menu (see Figure 1.) and then the proper country can be selected by number.

Notes on Printers when COUNTRY is used

The auxiliary characters make up the special character set that is used for the individual country definitions. The auxiliary characters are composed of 16 dots by 8 dots in a matrix. For thimble-type printers, such as the SPINWRITER series, 3530 and 7730, the special codes in the auxiliary character set have no meaning and are replaced by a space. The 8023 Dot matrix printer is capable of interpreting the auxiliary character codes and will print a dot representation of the auxiliary character.

Enhancements to SETCOM

The SETCOM utility now supports an optional RS232C interface. This interface can be programmed from the console using the SETCOM utility. Type "SETCOM [O]" to modify speed, word length, parity, and the number of stop bits for the RS232C optional interface.

Note that if the optional RS232C interface board is not in place, the utility will display an error message:

*** NO OPTION RS232C PKG ***

Also note that SETCOM for the optional interface cannot be used in a command form. Values must be entered from the menu as it appears in Figure 1. Attempts to enter incorrect values at the menu will result in an error:

*** PARAMETER ERROR ***

Figure 1.

SETCOM PROGRAM V2.1

    SETCOM [SPEED, LENGTH, PARITY, STOP BIT]

```
**************************************************
*    OPTION  RS232C INTERFACE INITIALIZE MODE    *
**************************************************
```

    SPEED   : 150 200 **300** 600 1200 2400 4800 9600 19200

    LENGTH : 5 6 7 8

    PARITY :**E** O N

    STOP BIT:1 2

_   <----- (cursor position for entry)

Defaults are displayed in boldface.

Caution

The menu will not reflect changes that were previously made and will always display the default values, SPEED=300, LENGTH=7, PARITY=E, STOP BIT=1.

Enhancements/changes to CONFIG

The appearance of the CONFIG menu has changed. Figure 1. shows the menu for the configuration utility. Option 4 has been added, and option 2, List Device configuration has added functionality. Option 4 specifies a Console configuration. When this option is selected, the menu shown in Figure 2 is displayed.

Option 4 sets a byte in CMOS that indicates whether the APC has a color or monochrome monitor. This byte is useful for applications that check to see what type of APC is available.

Option 2 now prompts the user before entering its normal menu. After selecting option 2 from the main menu the user will be prompted with the following message:

```
* Printer type selection *
Currently "xxxxxxx" mode!
Change mode (Default,8023,PINWRITER) D or 8 or P: _
```

xxxxxxx represents one of the three names (Default, 8023, or PINWRITER) that is the currently selected mode (in CPM.SYS). Selection of D, 8, or P upper or lower case characters will put the user at the List device Configuration menu as it appears in old versions. Note that only the 8023 is a supported printer type. Default is to be used with CRTDUMP and represents a standard carriage return line-feed printer. In the default configuration, character attributes underline, overline, and vertical bar will not print.

Figure 1

```
***********CP/M-86 CONFIGURATION PROGRAM Ver 1.3****************
*                                                              *
*                      FOR APC                                 *
***************************************************************

                      CONFIGURATION MENU

1.  FLOPPY DISK READ AFTER WRITE CONFIGURATION
2.  LIST DEVICE CONFIGURATION
3.  AVAILABLE DISK DRIVE SELECTION
4.  CONSOLE CONFIGURATION
5.  UPDATE MEMORY RESIDENT CP/M-86 1.1
6.  FINISH AND UPDATE DISK RESIDENT CP/M-86 1.1

* TYPE THE CORRESPONDING NUMBER (1-6):_
```


Figure 2


```
          * Console Display Section

          1.   Character display (mono)
          2.   Character display (color)
          3.   Graphic display (mono)
          4.   Graphic display (color)
               Output console type : _
```

Operation of CRTDUMP

Purpose

CRTDUMP is a utility that allows the user to copy data on the screen to a printer. The data copied can be text or graphics, and the graphic copy can be either what is on the screen or a dot representation of the graphic memory. CRTDUMP, when loaded, becomes a resident utility, and can be executed at any time, even from a user program.

Loading of CRTDUMP

From the CP/M prompt, the user issues the command

    d>CRTDUMP

to load the utility. The program responds with

    CRTDUMP now loaded.

At this point, the program becomes part of the system itself, and remains there until the system is rebooted. At load time, CRTDUMP will determine the type of screen [graphic or not, mono or color], and the printer type [8023, PINWRITER, or DEFAULT]. To change the CRT type and printer type parameters, the CONFIG utility should be used.

On the 8023 printer, auxiliary characters are printed as they appear on the screen. In the case of the 8023, every other line of an auxiliary character is printed. Spinwriter printers will simply replace the alternate characters with spaces and print nothing for graphics.

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Execution

The CRTDUMP extension can be invoked from the keyboard, or through the use of system calls, or CRT escape sequences: Refer to the table below for a description of each access method.

	KEYBOARD	INT 221	CRT ESCAPE CODE
CHARACTER DUMP:	CTRL + PRINT	CL = 0	ESC 80H 0
CRT GRAPHIC DUMP:	FNC + PRINT	CL = 1	ESC 80H 1
GRAPHIC MEMORY DUMP:	FNC+CTRL+PRINT	CL = 2	ESC 80H 2