PC10 Diagnostics

User Handbook

Commodore Business Machines, Inc.
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PC10 Diagnostics

User Handbook

I. Introduction

Overview

The information in this Handbook is both introductory and for reference. A considerable amount of attention has been given to providing information and instructions on the system's display to aid you in using PC10 Diagnostics and to minimize the need for extensive documentation.

The **PC10 Diagnostics**, Professional Level Personal Computer Diagnostic System, consists of the **SYSTEM** Diskette (copy protected), two specially formatted **TEST** Diskettes, a Parallel Port **TEST** Plug, a Serial Port **TEST** Plug, this User Handbook, and a rugged carying case. The PC10 Diagnostics **SYSTEM** Diskette is 'self loading' and does not require an operating system (PC-DOS) to load or operate. The two **TEST** Diskettes are for use when testing the diskette drive(s), and the two **TEST** Plugs are provided for use when performing a complete test of the parallel and serial interfaces.

The 'Preparation For Use' section describes how to load PC10 Diagnostics and navigate through the its menu structure to test and diagnose a system. The 'Operation' section gives an explanation of the various functional menus and their use. If a failure is detected by PC10 Diagnostics the 'Failure Identification' section contains reference charts to aid you in translating the error code and identifying the failing system component.

Summary of Features

PC10 Diagnostics is intended to assist you in certifying the operation of the system and testing to locate and diagnose hardware failures. In addition, to its certification and diagnostic features, PC10 Diagnostics includes features to assist you in determining the system's configuration.

Primary uses of the product are in initial system setup and burn-in, testing and diagnosis of a malfunctioning system, and re-certification after repair. PC10 Diagnostics enables you to very quickly test a system's hardware devices and components to determine the nature of a reported problem without having to take the system apart. When a hardware failure is detected, PC10 Diagnostics allows you to identify the failing device and in many cases localize the failure to the component or address level.

II. Preparation For Use

Within this section are the instructions you need to start using PC10 Diagnostics. This section describes how to 'load' PC10 Diagnostics and how to operate the product to achieve the desired test and diagnostic results. By following the procedures outlined, under 'Loading PC10 Diagnostics' and 'Running PC10 Diagnostics you will be able to perform any number of tests to verify the operation of the system and specific devices.

Loading PC10 Diagnostics

1. Insert the PC10 Diagnostics **SYSTEM** Diskette into drive A.

2. Power ON the system and all externally attached devices or reset the system to load PC10 Diagnostics by holding the 'Ctrl' and 'Alt' keys, then pressing the 'Del' key. Depending on the system's configuration, PC10 Diagnostics may require up to 60 seconds to load.

   During the loading phase, general tests are made to insure that the system's hardware (especially memory) is functioning sufficiently to allow PC10 Diagnostics to be loaded and operate.

If the initial memory area (16K to 70K) contains a failing module, PC10 Diagnostics displays the message 'Memory Error - Location XXXX:0, Searching For Good Memory.....' and continues to look for good contiguous memory in which to load.

The program is then loaded from the top side of the SYSTEM Diskette. If the diskette drive's upper read/write head is not operating correctly, the error message 'Read Failure - Head 0 (Top Side), Attempting To Read From Head 1 (Bottom Side)' will appear. If it again fails the error message 'Failure To Read From Head 1 (Bottom Side), Terminating Loading Operation' will appear.

Did the Main Menu appear on your screen, after the title screen?

YES - Proceed to the section 'Running PC10 Diagnostics'.

NO - Remove the diskette and verify that it:
a) was the PC10 Diagnostics SYSTEM Diskette.
b) was inserted correctly into drive A.
c) was the power switch set to ON or was the alternate loading method used after inserting the SYSTEM diskette.

Correct any mistakes and retry again. If the PC10 Diagnostics SYSTEM Diskette was inserted correctly, the system may be preventing further operation due to a hardware failure - refer to the system manufacturer's information about program loading.

Running PC10 Diagnostics

PC10 Diagnostics uses a menu structure to display a series of functional menus, and within each menu, options for you to select the desired test or function.

The menu structure is very simple and easy to use in that the function keys are used to move between menus, and the alphanumeric keys are used to select particular tests or functions within a menu. Each display contains instructions and statements to prompt you in the selection of options available and to query you for any information required.

When entering PC1Ø Diagnostics, the Main Menu is displayed and you are given the choice to perform a System Certification or to select from a number of other functional menus (described in the 'Operations' section). From the System Certification mode you can return to the Main Menu, and then proceed to the Diagnostic Menu for further testing if an error is detected.

It is recommended that you select the System Certification (F3) on the Main Menu to begin testing a system and then return to the Main Menu and proceed to the Diagnostic Menu (F5) if an error is found.

As part of certain tests contained in the Certification Menu (F3) and the Diagnostic Menu (F5), you will be required to insert the **TEST** Diskette(s) into the diskette drive(s), and connect the Parallel and Serial **TEST** Plugs to their respective interfaces.

III. Operation

Summary of Menus

PC1Ø Diagnostics contains a Main Menu and four adjoining menus: the Configuration Menu (F2), Certification Menu (F3), Diagnostic Menu (F5), and Help Menu (F1Ø). The actual testing and operating of other support functions are activated by selecting from the options listed within each menu.

The Main Menu displays the four other menus and provides an option to certify the operation of the system by selecting System

Certification. You can move between menus to select other options by accessing the Main Menu and then selecting the menu desired.

The **Configuration Menu** enables you to conveniently determine the system's hardware configuration, display the DIP switch settings and verify the amount of memory physically installed.

The DIP switch settings for different configurations may also be saved to the **SYSTEM** Diskette and later recalled for resetting the switches.

The **Certification Menu** provides two system level tests to certify the system's hardware operation - a Fast System Test and Extended System Test. A Fast System Test is useful to quickly certify the system and verify that a reported problem is actually hardware related, as opposed to software or user related. The Extended System Test performs a continous test loop which is useful to detect intermittent failures during setup, or in extensive certification of new systems.

Depending on the amount of memory installed the Fast System Test takes 30 to 90 seconds to complete. The Extended System Test will continue and indicate the number of test passes until interrupted.

The **Diagnostic Menu** includes a series of tests organized by six system component level menus. These tests will help you in identifying and locating failures detected during the Certification tests. The six system component level menus are the keyboard (F2), display (F3), parallel interface (F4), diskette and fixed disk drives (F5), serial interface (F6) and memory (F7). The tests offered in each menu perform more extensive testing of the system component in question to verify its operation and report the error condition and location/address.

The Help Menu provides on-screen information and instructions to assist you in navigating through the menu structure, selecting options and running PC10 Diagnostics.

IV. Failure Identification

Interpreting Error Codes

This section explains how to interpret any error codes reported by the Certification and Diagnostic tests. The following is an explanation of the error code scheme used to identify failures detected by PC10 Diagnostics. In the 'Error Code Description' section you are provided a set of charts and descriptions of error codes for each type of device area that an error code is reported.

The error codes consist of a four or five characters and begin with an alphabetical character followed by three or four alphanumeric characters. The first alphabetical character identifies the device area. The remaining four alphanumeric characters identify the particular device and the location or type of failure at the component level. These characters are interrupted in the 'Error Code Description' section.

The first character represents the following device areas:

D - diskette drive
F - fixed disk drive
M - memory
P - parallel interface (printer)
S - serial interface (communication)

Error Code Descriptions

D - Diskette Drive

The error code format for the diskette drive is; 'Ddxx', where:

D - indicates the diskette drive

d - indicates the drive, with a value of:

- Ø - indicates drive A
- 1 - indicates drive B
- 2 - indicates drive C
- 3 - indicates drive D

xx - indicates the error detected, with values of:

- Ø1 - controller status error
- Ø2 - drive start failure
- Ø3 - controller failure
- Ø4 - controller ready failure
- Ø5 - controller direction error
- Ø6 - recalibrate error
- Ø7 - reset error
- Ø8 - read error
- Ø9 - start error
- ØA - write error
- ØB - data error
- ØC - SYSTEM Diskette in drive
- ØD - incorrect TEST Diskette in drive
- ØE - diskette is write protected

The example error code of D1Ø9 indicates a diskette drive 'start error' on Drive B.

F - Fixed Disk Drive

The error code format for the fixed disk drive is; 'Fdxx', where:

F - indicates the fixed disk drive

d - indicates the drive, with a value of:

- 0 - indicates drive 0
- 1 - indicates drive 1

xx - indicates the error detected, with values of:

- 01 - bad command
- 02 - address mark not found
- 04 - requested sector not found
- 05 - reset failed
- 07 - drive parameter activity failed
- 09 - DMA boundary error
- 0B - bad track flag detected
- 10 - read error, bad ECC
- 11 - error corrected by ECC
- 20 - controller failure
- 40 - seek operation failure
- 80 - attachment (board) failed to respond, time out error
- BB - undefined error occurred
- FF - sense operation failed

The example error code of F040 indiactes a 'seek operation failure' on Drive 0.

M - Memory

The error code format for memory is: 'MtblPxx', where:

M - indicates memory

t - indicates the test that detected the failure, with a value of:

Ø - ALL ZEROS test	3 - ADDRESS test
1 - ALL ONES test	4 - MARCHING ONES test
2 - CHECKERBOARD test	5 - BANK test

b - indicates the memory bank (Ø through 9) containing the failure.

l - indicates the position of an error as it relates to a 16K block of memory, with a value of:

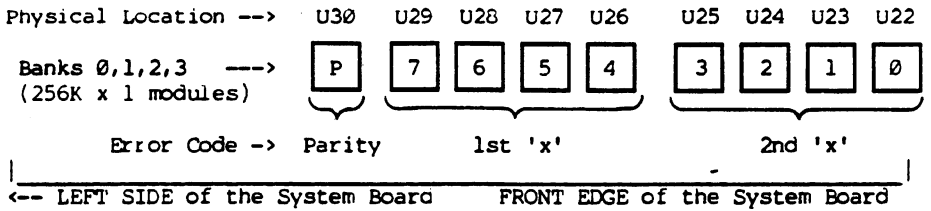
A - ØØK through 16K	C - 32K through 48K
B - 16K through 32K	D - 48K through 64K

This parameter provides additional location information as an aid in troubleshooting.

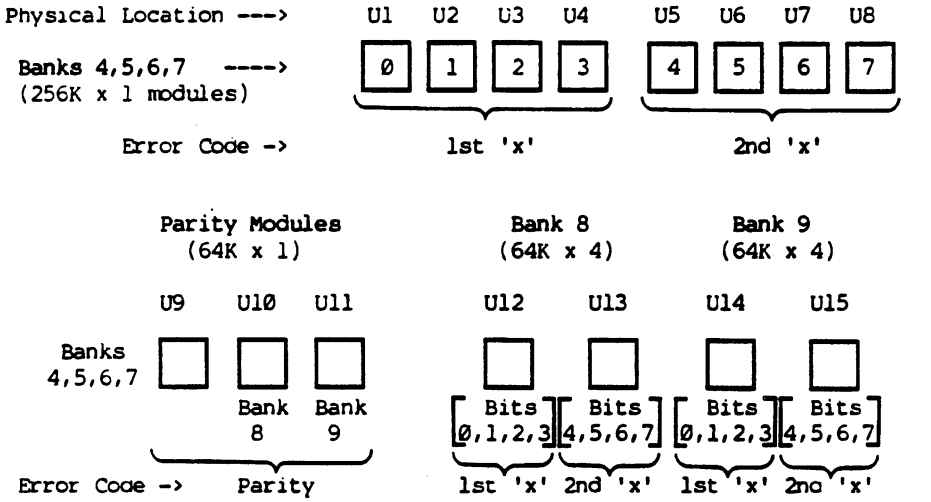
P - the upper case 'P' appears only when the parity bit for that byte is failing. If this code's space is blank, the parity module passed.

xx - indicates the physical location of the memory module(s) on the System and Memory boards, with an 'o' indicating 'passing', and an 'F' indicating 'failing', as indicated in the Memory Module Status Chart on Page 11 below.

System Board Memory Module Layout (memory modules indicated in boxes):



Memory Board Memory Module Layout (memory modules indicated in boxes):



Memory Module Status Chart

Value 1st 'x'	Memory Module Location Bank(s)	Location			
	0,1,2,3 4,5,6,7	U22 U1	U23 U2	U24 U3	U25 U4
	8	U12	U12	U12	U12
	9	U14	U14	U14	U14
0 =		o	o	o	o
1 =		o	o	o	F
2 =		o	o	F	o
3 =		o	o	F	F
4 =		o	F	o	o
5 =		o	F	o	F
6 =		o	F	F	o
7 =		o	F	F	F
8 =		F	o	o	o
9 =		F	o	o	F
A =		F	o	F	o
B =		F	o	F	F
C =		F	F	o	o
D =		F	F	o	F
E =		F	F	F	o
F =		F	F	F	F

Value 2nd 'x'	Memory Module Location Bank(s)	Location			
	0,1,2,3 4,5,6,7	U26 U5	U27 U6	U28 U7	U29 U8
	8	U13	U13	U13	U13
	9	U15	U15	U15	U15
0 =		o	o	o	o
1 =		o	o	o	F
2 =		o	o	F	o
3 =		o	o	F	F
4 =		o	F	o	o
5 =		o	F	o	F
6 =		o	F	F	o
7 =		o	F	F	F
8 =		F	o	o	o
9 =		F	o	o	F
A =		F	o	F	o
B =		F	o	F	F
C =		F	F	o	o
D =		F	F	o	F
E =		F	F	F	o
F =		F	F	F	F

o = passing (ok) F = failing

An 'xx' error code of 02 would have the value of oooo ooFo and would indicate that module U28 was failing in Banks 0,1,2,3; module U7 was failing in Banks 4,5,6,7; module U13 was failing in Bank 8; or module U15 was failing in bank 9, depending on the value of the Bank Indicator in the Error Code.

For example, the error code 'M15A 90' indicates:

```
M  =  (M) - Memory
1  =  (t) - the ALL ONES test
5  =  (b) - Bank 5
A  =  (1) - the first 16K of the 64K testing block
   =  (p) - the blank space indicates Parity passed
9  =  (x) - modules U1 and U4 are failing
Ø  =  (x) - all modules U5 through U8 passed
```

The System Board has one row of 256K x 1 memory modules (locations U22 through U3Ø, including parity) at the front of the System Board (under the bracket for the fixed disk drive), parallel to the front side of the System Unit as the first 256K of memory (Banks Ø,1,2,3). The Memory Board stands on the System Board near the center and perpendicular to the front of the System Unit. The PC1Ø-1 model has 512K total memory, with locations U1 through U8 populated with 256K x 1 modules, and a 64k x 1 module in location U9 for parity (Banks 4,5,6,7). The PC1Ø-2 model has 64ØK total memory, with the addition of locations U12 through U15 (Banks 8 and 9) populated with 64K x 4 modules, and with 64K x 1 modules in locations U1Ø and U11 for parity.

If an error is detected during the Fast and Extended tests in Certification and Diagnostic Menu - Memory Tests (options A and B), the entire error code is displayed. If an error is detected during the Diagnostic Menu - Memory Tests (options C through G), since only the individual test selected is being performed, and the memory Banks are indicated for each 64K 'testing block' being tested, only the '1Pxx' portion of the error code is displayed.

The memory tests Ø (ALL ZEROS), 1 (ALL ONES), and 2 (CHECKERBOARD), all produce a data pattern that naturally has an 'even' parity; thus, if the parity module is failing in a 'high' state or is not present, it would not be detected by these tests. If a parity module is suspect, use test 3 (ADDRESS) to verify.

P - Parallel Interface (Printer)

The error code format for the parallel interface is: 'Pptxx', where:

P - indicates the parallel interface

p - indicates the interface that failed, with a value of:

- 1 - indicates interface 1 (LPT1)
- 2 - indicates interface 2 (LPT2)
- 3 - indicates interface 3 (LPT3)

t - indicates the test that failed, with a value of:

- Ø - data test
- 1 - control test
- 2 - interface status test

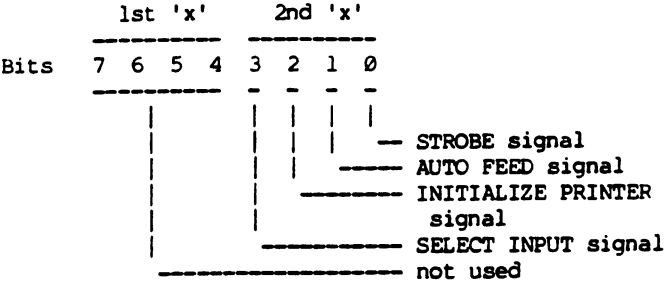
xx - indicates the bit(s) that failed, the value expressed as 'o' for passed and 'F' for failed, as indicated in the DATA/CONTROL/STATUS Bit Status Chart on Page 18.

The error codes for each of the tests are:

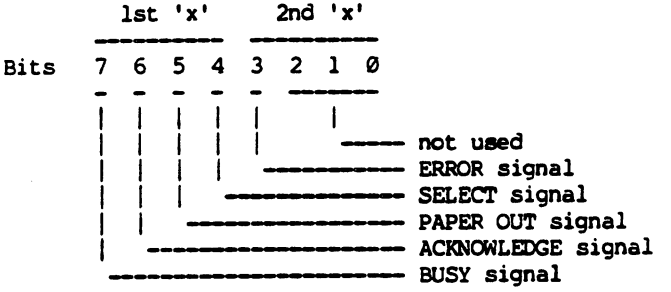
Data test - each bit in the error code represents a data bit in the internal circuitry. An error code Ø1 indicates that bit position Ø failed the test, and an error code of FF indicates that ALL bits failed the test.

	1st 'x'				2nd 'x'			
Bits	7	6	5	4	3	2	1	Ø

Control test - each bit in the error code represents a control bit in the internal circuitry. The most significant four bits are not used in the error code thus, the range of valid codes is from Ø1 through ØF.



Interface status test - each bit in the error code represents a status bit in the external interface. The least significant lower three bits are not used in the error code thus, the range of valid codes is from Ø8 through F8.



This test requires that the Parallel Interface TEST Plug be connected to the interface being tested. If the TEST Plug is not installed, all status bits will indicate 'failed '(an error code of F8).

S - Serial Interface (Communication or RS-232)

The error code format for the serial interface is; 'Sptxx', where:

S - indicates the serial interface

p - indicates the interface that failed, with a value of:

1 - indicates interface 1 (COM1)
2 - indicates interface 2 (COM2)

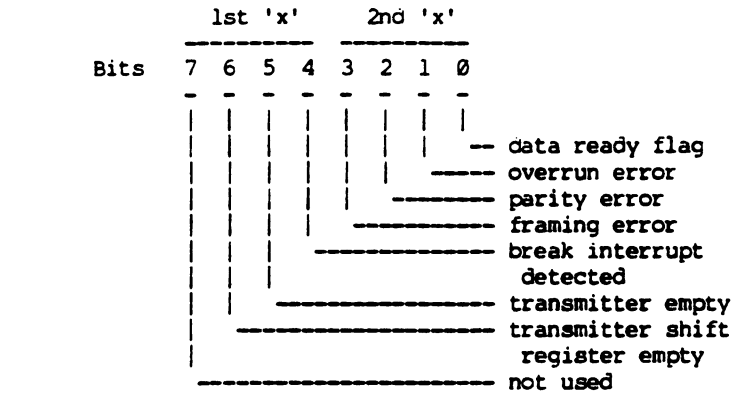
t - indicates the test that failed:

1 - transmitter test
2 - receiver test
3 - data test
4 - interface test

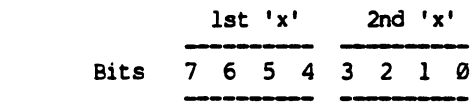
xx - indicates either a status or error code, depending on the test, with the value expressed as 'o' for passed and 'F' for failed, as indicated in the DATA/CONTROL/STATUS Bit Status Chart on Page 18.

The error codes for each of the tests are:

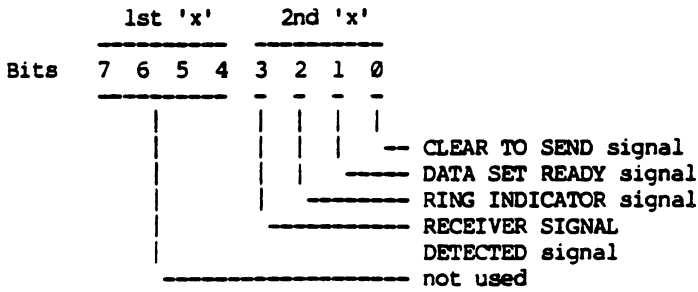
Transmitter and receiver test - the status of the UART circuitry with 'o' indicating an OFF or passed condition, and 'F' indicating an ON or failed condition .



Data test - the error code indicates the data bit(s) in the internal circuitry that failed. An error code Ø1 indicates that bit position Ø failed the test, and an error code of FF indicates that ALL bits failed the test.



Interface test - each bit in the error code represents a status bit in the external interface, by reading the modem status register, with '0' indicating an OFF or passed condition, and 'F' indicating an ON or failed condition .



This test requires that the Serial Interface TEST Plug be connected to the interface being tested. If the TEST Plug is not installed, all of the tests will fail.

Parallel and Serial Interface DATA/CONTROL/STATUS Bit Status Chart

1st 'x'		DATA/STATUS/CONTROL BIT 7	6	5	4
Ø	=	o	o	o	o
1	=	o	o	o	F
2	=	o	o	F	o
3	=	o	o	F	F
4	=	o	F	o	o
5	=	o	F	o	F
6	=	o	F	F	o
7	=	o	F	F	F
8	=	F	o	o	o
9	=	F	o	o	F
A	=	F	o	F	o
B	=	F	o	F	F
C	=	F	F	o	o
D	=	F	F	o	F
E	=	F	F	F	o
F	=	F	F	F	F

2nd 'x'		DATA/STATUS/CONTROL BIT 3	2	1	Ø
Ø	=	o	o	o	o
1	=	o	o	o	F
2	=	o	o	F	o
3	=	o	o	F	F
4	=	o	F	o	o
5	=	o	F	o	F
6	=	o	F	F	o
7	=	o	F	F	F
8	=	F	o	o	o
9	=	F	o	o	F
A	=	F	o	F	o
B	=	F	o	F	F
C	=	F	F	o	o
D	=	F	F	o	F
E	=	F	F	F	o
F	=	F	F	F	F

o = passing (ok), or OFF status F = failing, or ON status

An 'xx' error code of Ø2 would have the value of oooo ooFo and would indicate that bit 1 was failing. An 'xx' error code of 4A would be oFoo FoFo indicating bits 6, 3 and 1 were failing.

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