

**COMMODORE DISKETTE  
DIAGNOSTIC MANUAL  
VERSION 2.0**

**PN 314051-01**

 **commodore**  
COMPUTERS

**COMMODORE DISKETTE  
DIAGNOSTIC MANUAL  
VERSION 2.0**

**PN 314051-01**

**Commodore Business Machines, Inc.**

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## VERSION 2.0 TEST DISKETTE INTRODUCTION

This manual was developed to aid you in the use of the Diagnostics available for Repair Troubleshooting of the CBM Consumer Products.

The manual is separated into four (4) sections.

SECTION 1: This section contains DIAGNOSTIC AND TEST PROGRAMS to assist in troubleshooting of the CBM 1540 and 1541 Single Disk Drives.

SECTION 2: This section contains some user friendly DISK UTILITY PROGRAMS which should help you with day to day operations.

SECTION 3: This section contains DIAGNOSTIC AND TEST PROGRAMS to assist in troubleshooting the C-64, SX-64 and the VIC-20 Computers.

SECTION 4: This section contains some of the most used BASIC COMMANDS of the C-64 and VIC-20 Computers.

The below listing is the directory of the Version 2.0 Test Diskette and a brief explanation of each program. More detailed information is contained inside this manual.

### Disk Name — Diagnostic V 2.0

PGM 1	— "Performance Test"	** Performance Test For The 1540/1541.
PGM 2	— "Performance Burn"	** Performance Burn-in For The 1540/1541.
PGM 3	— "System Test"	** System Test For The 1540/1541.
PGM 4	— "10 Pass Sfterr"	** Preliminary Soft Error Test For 1540/1541.
PGM 5	— "100 Pass Sfterr"	** Final Soft Error Test For The 1540/1541.
PGM 6	— "Final Test"	** Final Test For The 1540/1541.
PGM 7	— "Disk Alignment"	** Alignment Program for the 1540/1541.
PGM 8	— "Disk Formatter"	** Disk Format Utility Program for the 1540/1541.
PGM 9	— "File Scratcher"	** File Scratch Utility for the 1540/1541.
PGM 10	— "Disk Backup"	** Single Drive Backup Program for the 1540/1541.
PGM 11	— "Change Device #"	** Disk Address Change for the 1540/1541.
PGM 12	— "Disk Copy/All"	** Disk Utility to copy files from Drive to Drive.
PGM 13	— "C-64 Burn-in"	** Bootup Program to Load C-64 Diagnostic Data.
PGM 14	— "Burn-in"	** C-64 Diagnostic Data.
PGM 15	— "Enhancer"	** Version Kernal 2 Rom Upgrade Program.
PGM 16	— "Arrow Game"	** Demo Program to Display Enhancer Results.
PGM 17	— "VIC-20 Burn-in"	** Bootup Program to Load VIC-20 Diagnostic Data.
PGM 18	— "Burn-in"	** VIC-20 Diagnostic Data.

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**SECTION ONE**  
**DISK DIAGNOSTIC  
AND TEST PROGRAMS**

# PERFORMANCE TEST

DESIGNED TO TEST THE 1540 OR 1541 SINGLE DISK DRIVE..

REQUIRED EQUIPMENT: C-64, SX-64 OR VIC-20 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
BLANK DISKETTE  
VERSION 2.0 TEST DISKETTE

## NOTE

All data currently stored on the diskette used in this test will be **DESTROYED**.

When the program is run, the following will be required:

1. *Insert a Blank Diskette in the drive.*

As the test runs, the following steps will be implemented:

- 1.1 The blank diskette will be formatted. (This should take about 90 seconds)
- 1.2 A file is opened, data is written to the file and the file is closed.
- 1.3 A file is opened, data is read and verified and the file is closed.
- 1.4 The file is scratched.
- 1.5 Data is written to tracks (1) and (35). (Inner and outer tracks)
- 1.6 The data is read and verified from these same tracks.
  - A stop adjust that is not set correctly will usually show up in STEP 5 as an error while trying to access track 1.
  - The disk status is displayed at the end of each operation.

# " PERFORMANCE BURN<sup>1)</sup>

DESIGNED TO TEST THE 1540 OR 1541 SINGLE DISK DRIVE..

REQUIRED EQUIPMENT: C-64, SX-64 OR VIC-20 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
BLANK DISKETTE  
VERSION 2.0 TEST DISKETTE

## NOTE

All data currently stored on the diskette used in this test will be **DESTROYED**.

When the program is run, the following will be required:

1. *Enter the Number of Passes the test is to run. (Press Return)*
2. *Insert a Blank Diskette in the drive.*

As the test runs, the following steps will be implemented:

- 2.1 The blank diskette will be formatted. (This should take about 90 seconds)
- 2.2 A file is opened, data is written to the file and the file is closed.
- 2.3 A file is opened, data is read and verified and the file is closed.
- 2.4 The file is scratched.
- 2.5 Data is written to tracks (1) and (35). (Inner and outer tracks)
- 2.6 The data is read and verified from these same tracks.

- A stop adjust that is not set correctly will usually show up in STEP 5 as an error while trying to access track 1.
- The disk status is displayed at the end of each operation.
- The test will continue to run until the selected number of passes are completed or it is manually terminated.
- The number of the current pass being run will be displayed.
- The total number of passes run and the number of encountered errors are displayed at the end of each pass.
- The test will halt if the number of passes versus the number of errors reaches a predetermined ratio.

# SYSTEM TEST

DESIGNED TO TEST THE 1540 OR 1541 SINGLE DISK DRIVE..

REQUIRED EQUIPMENT: C-64 OR SX-64 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
FORMATTED DISKETTE  
VERSION 2.0 TEST DISKETTE

When the program is run, the operator will have a choice of several options.

**1. Pressing 'RETURN' will do a COMPLETE TEST as listed:**

- This is the recommended option.

1.1 Checks for the proper operation of the WRITE PROTECT SWITCH by simulating the open condition, (write protect tab on) and the closed condition, (write protect tab off).

- *Press 'W' to allow for this option only.*

1.2 Checks the BELT QUALITY by writing a sync mark to the diskette, then measuring the time period of each revolution.

Checks the MOTOR SPEED and allows for adjustment if the speed is not within the recommended tolerance.

- Any reading other than  $-1\text{ms}$ ,  $0\text{ms}$  or  $+1\text{ms}$  is considered out of the tolerance range and must be adjusted.

- *Press 'S' to allow for this option only.*

1.3 Checks for proper ZERO TRACK adjustment by bumping the head against the stop approximately 8 times.

- A failure here is normally an indication of a misadjusted stop adjust.

- *Press 'A' to allow for this option only.*

## SYSTEM TEST (Continued)

### 1.4 INITIALIZES the drive and checks the FORMAT Operation

- A failure here is usually due to a bad formatted diskette and the test should be rerun using a known good formatted diskette.
- *Press 'F' to allow for this option only.*

### 1.5 Initializes the drive and checks for proper READ/WRITE OPERATION by reading and writing to all 35 tracks on the diskette.

- A failure here is usually an indication of a bad formatted diskette and the test should be rerun with a known good formatted diskette.
- A failure here can also indicate a misadjusted stop adjust or a drive that is out of alignment.
- *Press 'R' to allow for this option only.*

### 1.6 *Press 'C' to allow this test to be run on a disk drive which is set at a DEVICE NUMBER other than 8. (Factory Setting)*

## SOFT ERROR TEST

"10 PASS SFTERR"  
"100 PASS SFTERR"

DESIGNED TO TEST THE 1540 OR 1541 SINGLE DISK DRIVE..

REQUIRED EQUIPMENT: C-64 OR SX-64 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
BLANK DISKETTE  
VERSION 2.0 TEST DISKETTE

The Soft Error Test is used to do an extended read/write performance test on the 1540 or 1541 single disk drive.

The only difference between the Soft Error Tests on the test diskette is the number of passes they run.

- The 10 pass Soft Error Test is used as a preliminary test. If the system completes 10 passes without error, the 100 Pass Soft Error Test should be run for final testing of the system. 10 pass Soft Error will indicate system failed because of insufficient passes (must be 100).

When the program is run, the following options will be available:

1. **Press 'RETURN' to run the test for the ALLOTTED NUMBER of passes.**
  - This is the recommended option.
2. **Press 'C' to allow this test to run on a drive where the DEVICE NUMBER has been changed from 8. (Factory Setting)**
3. **Press 'M' to allow the operator to SET their own PARAMETERS of the test.**

When the 'M' is pressed a SUB-MENU is displayed. Pressing 'C' from this sub-menu allows for the following options:

- 3.1 **NEW OR CONTINUOUS TEST:** When 'N'ew' is selected, the log is cleared at the start of the test. If 'C'ontinuous is selected, the existing log on the diskette is used as the starting condition and the test will continue from this point.
  - If the diskette has not previously been used in the Soft Error Test the 'N'ew option must be selected.
- 3.2 **WRITE, READ OR VARIABLE:** The test may be set to write only, read only or read with a rewrite of data after the designated number of read passes.
- 3.3 **NUMBER OF PASSES:** The total number of passes the test is to run.
  - If the test is to conclude itself a maximum of 500 passes may be entered.
  - If '0' is entered the test will run forever.

## SOFT ERROR TEST (Continued)

- 3.4 **FORMATTING:** A 'Y'es selected causes the diskette to be formatted by the program. A 'N'o selected will start the test without formatting.
- If the 'N'ew option was previously selected, 'Y'es must be selected now.
- 3.5 **SEQUENTIAL OR RANDOM:** This option allows for the selection of the track testing sequence.
- If 'S'equential is selected the tracks are tested in sequential order. (Track 1 thru 35)
  - If 'R'andom is selected the tracks are tested in a random fashion to allow complete exercise of the stepper mechanics.
- 3.6 **RESET OR BLINK:** This option allows a reset to take place at the end of the test or for the drive LED to blink in a series of one (1) Flash Codes to indicate the test is complete.
- If the blink option is chosen, the system must be reset, turned off and on, before the final results can be read.
  - If a printer is connected to the system, the final results will be output to the printer rather than the screen.
  - A good blank diskette is a 'MUST' for this test. Any data that may be stored on this diskette will be **DESTROYED**.
4. *Press 'D' to display the current MOTOR SPEED and allow for adjustment if the speed is not within the recommended tolerance.*
- If the indicated reading is different than - 1ms, 0ms or 1ms it is out of tolerance and must be adjusted.
- Once the speed is adjusted, press 'B' to test the DRIVE BELT.
- The belt tolerances will be displayed and the status indicated.
5. *Press 'O' to read the RESULTS of the test once the allotted number of passes have been run.*
- When the test is complete, the drive LED will blink in a series of one flash codes with a pause between them.
  - In order to read the test results, the system must be reset, turned off and on, before the 'O' is pressed.
6. *Press 'H' to display a chart of TEST END BLINKS and their meanings.*
7. *Press 'S' to do a test on the STOP ADJUST and allow for the proper adjustment if necessary.*

## SOFT ERROR TEST (Continued)

### TEST OVERVIEW

The Soft Error Test writes a worst case pattern to the diskette and then reads for the specified number of passes. The number of sectors tested is fixed at 16 per track with all 35 tracks tested.

The program keeps a log on the diskette of the number of passes and errors which occur during program run time.

The drive speed is measured by writing a sync mark on a track which is outside the normal range of the system and measuring the time (to 100 micro-second accuracy) the period of each revolution.

Belt quality is measured during the speed program by comparing two (2) successive revolutions of the diskette. This comparison is repeated twenty (20) times and the results are displayed.

- If a failure occurs during this test, the drive belt should be either replaced or reversed.
- A failure to follow this procedure may result in formatting or read errors.

The Error and Test Status of the system is displayed through the drive LED during program run time. During this time the following applies:

- Drive LED on Continuously: The Drive is Formatting.
- Drive LED Blinking at a Medium to Slow Rate: The Drive is either Reading or Writing Data.

The System Status, at test end, is indicated by short blinks of the LED followed by a long time interval per the following:

1. (1) BLINK ----- Test Completed (With or Without Errors)
2. (2) BLINKS ----- Test Halted (Due to Five (5) First Pass Retries)
3. (3) BLINKS ----- Test Halted (Due to Log Access Failure)
4. (4) BLINKS ----- Test Halted (Due to Format Failure)

When the test has completed, the RESULTS can be read and interpreted per the following:

**NUMBER OF PASSES:** The total number of passes completed on the system. A pass is testing all tracks on the diskette.

**TOTAL ERRORS:** The total number of errors that were encountered during the test. This count is incremented only once for each error, regardless of the number of retries necessary to recover the error. If this count reaches 1024 the test will terminate.

**COUNTABLE ERRORS:** The total number of errors that were encountered that required more than one (1) retry to recover. This value is obtained by TOTAL ERRORS minus RECOVERED ERRORS.

- The idea here is that a single error is probably due to electrical noise and should not be counted. If more than (255) total single errors are encountered, the system should be considered marginal at best.

**PASS/ERROR RATIO:** The number of passes versus the number of encountered errors. This value is obtained by NUMBER OF PASSES divided by NUMBER OF COUNTABLE ERRORS. This ratio must be greater than the minimum displayed in the test to consider the system passable.

## SOFT ERROR TEST (Continued)

**FIRST PASS RETRIES:** The total number of retries that were not successful.

- This value is obtained by NUMBER OF RETRIES minus FIRST RETRIES. These are determined for the first pass only.
- This value is a measure of diskette quality, as it will show how many persistent errors were encountered. If this value reaches five (5), it is an indication of a bad diskette and the test will halt.

**TRACK, ERROR, FIRST PASS RETIRES:** This listing breaks down the errors on a per track basis. A bad diskette is indicated by errors concentrated on the same track or adjacent tracks.

**ERROR TYPE:** This listing breaks down the errors according to the type as shown below:

- A. NHRD: Block Header not Found.
- B. SYNC: Sync Mark not found for Header or Data Field.
- C. NBLK: Data Block Identifier Character not found.
- D. BCKS: Checksum Error in Data Field.
- E. VRFY: Verify Error. (Read after Write failed)
- F. HCKS: Checksum Error in Header Field.
- G. DCOD: Error in Data Decoding.

- BCKS and DCOD Errors are normally caused by random electrical noise and will usually recover in one (1) retry.
- A persistent error, one requiring more than one (1) retry or more than twenty (20) errors recovered in the first retry, is a sign of a bad drive mechanism or marginal components.

**ERROR TIME:** The total number of errors per each 20 passes. An increasing error rate is an indication of either a bad diskette or a failing system.

**RECOVERY COUNT:** Total number of retries required to recover errors.

- A maximum of ten (10) retries are made before the error is considered a hard error and the system fails the test.

**PASS/FAIL MESSAGE:** This is the bottom line whether or not the system has passed or failed the test.

# **DISK FINAL TEST**

DESIGNED TO TEST THE 1540 OR 1541 SINGLE DISK DRIVE..

REQUIRED EQUIPMENT: C-64 OR SX-64 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
CBM SERIAL PRINTER  
SOFT ERROR DATA DISKETTE  
FORMATTED DISKETTE  
VERSION 2.0 TEST DISKETTE

This test is divided into two (2) sections.

SECTION 1: READS AND INTERPRETS DATA FROM THE SOFT ERROR DISKETTE.

SECTION 2: TESTS THE FORMAT AND READ/WRITE OPERATIONS.

## SECTION 1:

When the test is run the "First Run of the Day" question must be answered with a 'Y'es or 'N'o. The following will apply:

### 1. 'Y'es

- 1.1 Enter the test computer number. (Any number assigned to the C-64)
- 1.2 Enter the date the repair was completed. (Month-day-year)
- 1.3 Enter the time of the repair. (Hour/minutes in military time)

### 2. 'N'o

- 2.1 Skip all the above entries.

When 'RETURN' is pressed the program determines the system type (1540/1541) and also that a printer is connected and the power is on.

The soft error data diskette must be inserted in the drive. The following steps now apply:

- A. All program arrays are cleared.
- B. The serial number of the system, (disk drive under test) must be entered.
- C. Drive initialization is tested and soft error data is read in.
  - A 'READING' message will flash as the data is read.

## **DISK FINAL TEST (Continued)**

When all the soft error data has been read, a printout should start. Included in this printout is the following:

**COMPUTER NUMBER:** The number assigned to the C-64 used for testing.

**TEST NUMBER:** The number of tests read from this program.

- This number increments by one (1) with each system tested.

**SYSTEM:** The type of system being tested. (1540 or 1541)

- The system type is predetermined by the program.

**SERIAL NUMBER:** The serial number of the system under test.

**DATE:** The date entered as the repair date.

**TIME:** The time entered as the repair time.

**TOTAL PASSES:** The number of passes completed on the Soft Error Test.

**TOTAL ERRORS:** The number of errors encountered during the Soft Error Test run time.

**PASS/ERROR RATIO:** The ratio of passes versus errors of the Soft Error Test.

- This ratio must be at least (17).

**ERRORS:** This is a breakdown of errors encountered on a per track basis.

**ERROR TYPE:** This is a breakdown of the type of errors encountered during the Soft Error Test.

- Please see Soft Error Test for error definitions.

**ERRORS/20 PASSES:** This is a breakdown of the number of errors per each 20 passes of the Soft Error Test.

**RECOVERY COUNT:** This is the number of retries required to recover errors encountered during the Soft Error Test.

## DISK FINAL TEST (Continued)

### SECTION 2:

1. During this portion of the test the following steps are implemented:
  - A. The soft error data is saved to the diskette.
  - B. A header is written to the diskette.
  - C. The diskette is validated and the NEW command is implemented.
  - D. The motor speed is read and adjustment is allowed if the reading is not within the recommended tolerance.
    - The motor speed is out-of-tolerance if the indicated reading is different than  $-1\text{ms}$ ,  $0\text{ms}$  or  $+1\text{ms}$ .
2. A formatted diskette must now be installed for the following tests:
  - A. The initialize command is implemented.
  - B. The stop adjust is checked by a series of five (5) bumps.
  - C. A header is written to the diskette.
  - D. Data is written, then read back and verified, first to all odd tracks then to all even tracks.
3. The FINAL RESULTS are printed to the printer in the following format:
  - A. The system (passes or fails) the Soft Error Test.
  - B. The system (passes or fails) the header portion of the test.
  - C. The current motor speed of the system.
  - D. The system (passes or fails) the read/write test.
  - E. The bottom line. (The system passes or fails)
    - If the system should fail the Soft Error Test, the read/write test will not be done.
    - Once the Final Test is run, all data stored on the soft error diskette will be **DESTROYED**.
    - It is recommended that a printout of the Final Test be returned to the customer with the repaired system.

# ALIGNMENT TEST

"DISK ALIGNMENT"

DESIGNED TO TEST THE 1540 OR 1541 SINGLE DISK DRIVE..

REQUIRED EQUIPMENT: C-64 OR SX-64 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
DUAL TRACE SCOPE  
ALIGNMENT DISKETTE (CBM P/N 970016-01)  
FORMATTED DISKETTE  
VERSION 2.0 TEST DISKETTE

When the program is run, the following options will be available:

1. Press 'SPACE' to run ALL AVAILABLE tests..
  - This is the recommended option.
2. Press '1' to test for proper drive LED operation. (RED LED)
3. Press '2' to test for proper WRITE PROTECT SWITCH operation.
4. Press '3' to test for the proper setting of the STOP ADJUST and for smoothness of stepper motor operation.
5. Press '4' to display the current MOTOR SPEED and allow for adjustment if the speed is out of the recommended tolerance.
  - The motor speed is out-of-tolerance if the indicated reading is different than - 1ms, 0ms or + 1ms.
6. Press '5' to allow for monitoring of the CATS EYE SIGNAL for evenness, correct amplitude and to adjust if necessary. Rotate the stepper motor to obtain maximum display per Figure 1-1 and 1-2.
  - This option requires a special 48 TPI alignment diskette. (Commodore part number 970016-01)
  - A dual trace scope, with external sync capabilities, will be necessary for proper alignment. The probes are to be connected as follows:

VERSION BOARD	PROBES CONNECTED	EXTERNAL SYNC
LONG PCB x 1 PROBE	PINS 7 AND 8 (UH7)	PIN 9 (UC2)
SHORT PCB x 1 PROBE	PINS 7 AND 8 (UF3)	PIN 37 (UC1)

- Scope settings should be adjusted for the best possible display of the Cats Eye Signal.

## ALIGNMENT TEST (Continued)

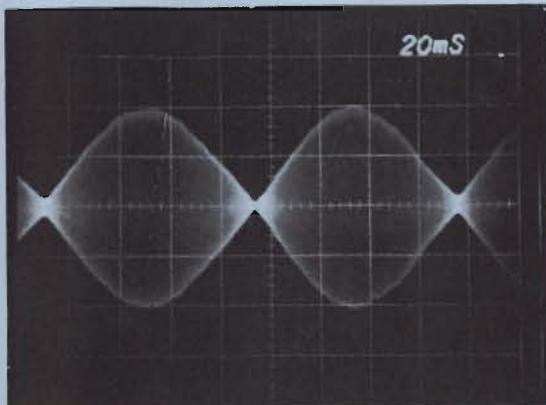


Figure 1-1. Head Radial Alignment

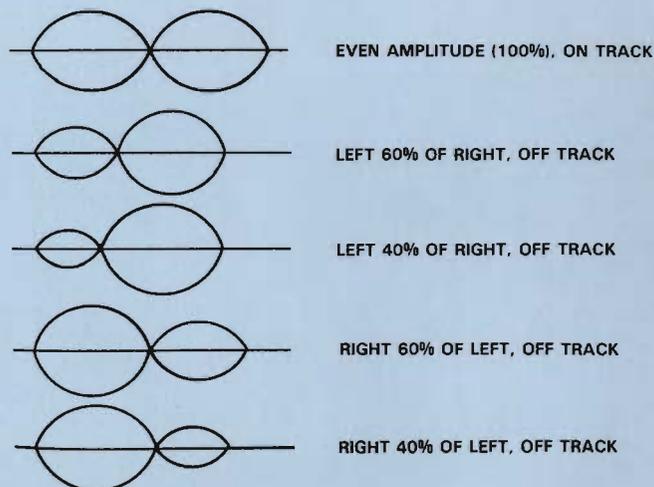


Figure 1-2. R/W Head Radial Alignment

7. **Press '6' to check the setting of the STOP ADJUST and allow adjustment if it is not correct. The following options are available:**
  - A. Press 'C' to do the test on the stop adjust and determine if an adjustment is necessary.
    - If the stop adjust must be set, the drive should be aligned prior to the adjustment.
  - B. Press 'A' to allow for drive alignment.
  - C. Press 'J' to allow for proper setting of the stop adjust, if it has been determined this is necessary.
8. **Press '7' to do the final READ/WRITE test on the system.**
  - This test reads, writes and verifies data to random tracks on the diskette.
  - A known good formatted diskette is necessary here.
9. **Press '8' to allow this test to be run on a system that has been set at a DEVICE NUMBER other than 8. (Factory Setting)**
10. **Press '9' to ABORT the testing.**

**SECTION TWO**  
**DISK DRIVE**  
**UTILITY PROGRAMS**

**SECTION TWO**  
**DISK DRIVE**  
**UTILITY PROGRAMS**

# **DISK FORMATTER**

DESIGNED TO FORMAT A BLANK DISKETTE..

REQUIRED EQUIPMENT: C-64, SX-64 OR VIC-20 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
BLANK DISKETTE  
VERSION 2.0 TEST DISKETTE

## **NOTE**

The format will **DESTROY** all data currently stored on the diskette.

When the program is run, the following entries will be necessary:

**1. Enter the NAME to be assigned to the blank diskette.**

- The assigned name is limited to a length of (16) characters and may be either alpha, numeric or a combination.

**2. Enter the ID to be assigned to the blank diskette.**

- The assigned ID is limited to a length of (2) characters and may be either alpha or numeric but NOT a combination.

**3. Enter the DEVICE NUMBER of the system being used for formatting.**

**4. START THE FORMAT if all information entered is correct OR ABORT if wrong information has been entered.**

- When the format is complete, the disk status is displayed to ensure no errors were encountered.

# **"FILE SCRATCHER"**

DESIGNED TO SCRATCH FILES FROM A DATA DISKETTE..

REQUIRED EQUIPMENT: C-64, SX-64 OR VIC-20 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
DATA DISKETTE  
VERSION 2.0 TEST DISKETTE

When the program is run, the following entries will be necessary:

1. *Enter the NAME of the file to be scratched.*
2. *Enter the DEVICE NUMBER of the system being used for scratching.*
3. *SCRATCH THE FILE if all information entered is correct OR ABORT if wrong information has been entered.*
  - When the scratch is complete the disk status is displayed to ensure no errors were encountered.
  - When all desired files have been scratched and 'E' is pressed to end the program, the BAM will be updated by the program.

# **SINGLE BACKUP** "DISK BACKUP"

DESIGNED TO COPY A DISKETTE WITHIN ONE (1) SINGLE DISK DRIVE..

**REQUIRED EQUIPMENT: C-64 OR SX-64 COMPUTER  
1540 or 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
DATA DISKETTE  
BLANK DISKETTE  
VERSION 2.0 TEST DISKETTE**

When the program is run, two (2) types of backup options are available:

**1. Pressing 'B' allows for the BAM SELECT Backup.**

- This is the fastest of the backups as only the tracks of the source diskette which contain data will be copied.

**2. Pressing 'D' allows for the DIRECT Backup.**

- This backup copies all sectors of all tracks regardless if they contain valid data or not.

Once the backup option has been chosen, the operator must enter the name and ID that is to be assigned to the destination diskette. (Blank diskette)

- The Name assigned to the destination diskette is limited to a length of 16 characters and may be either alpha, numeric or a combination.
- The ID assigned to the destination diskette is limited to a length of 2 characters and may be either alpha or numeric but NOT a combination.

The current operation being performed by the system will be displayed in the OPERATOR INTERVENTION SECTION and the operator must follow the flashing instructions as each operation is complete.

- The destination diskette will be formatted to the assigned name and ID before any data is written.
- The destination diskette and source diskette must NOT have the same name or ID.

As data is read into the memory of the C-64, the buffer on the display will go toward the full mark. When the buffer is full and the diskettes have been exchanged, the buffer will go toward the empty mark as the data is written to the destination diskette.

- For a complete copy of a full diskette, approximately 6-7 full buffers are required.

When all data has been copied the message BACKUP COMPLETE will flash in the operator intervention section and the destination diskette is ready.

# CHANGE DEVICE #

DESIGNED TO CHANGE THE PRIMARY ADDRESS OF THE 1540/1541..

REQUIRED EQUIPMENT: C-64, SX-64 OR VIC-20 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
VERSION 2.0 TEST DISKETTE

When the program is run, the following entries are necessary:

**1. Select which TYPE OF SYSTEM is to be changed.**

- For the 1540 and 1541 the selection will be '1'.

**2. Enter the DEVICE NUMBER the system is currently set to.**

- Factory set to 8.

**3. Enter the DEVICE NUMBER the system is to be changed to.**

- The range of device numbers for the 1540 and 1541 are 8-11 only.

When all information has been entered and checked for accuracy, pressing 'SPACE' will initiate the change.

- Once the device number has been changed, it will keep the assigned number until the system is reset. (Turned off and on)

The device number of the 1540 and 1541 can also be changed via hardware (Permanent change). Once the hardware change has been implemented, the system will keep the assigned number until it is changed again via hardware. The channel can be altered to # 9, 10, or 11 by two methods:

- 1) Refer to appropriate board layout drawing for the location of the pads provided for this purpose. The device change pads must be CUT to alter the channel number and re-soldered if another change is needed later.
- 2) The preferred method to alter the device number is to lift certain pins of the 6522 chip. The I.C. should always be socketed, so removal of the chip is simple. Once removed, the proper pin can be carefully bent to eliminate it from the circuit. If another change is needed, simply remove the I.C. and re-install with the pin back in place.

PCB ASSY #	LOCATION	DEVICE #	LIFT PIN
1540008	UAB1	9	15
1540048,251748 and 251834	UC3	10	16
	UC3	11	15 and 16

# "DISK COPY/ALL"

DESIGNED TO COPY FILES FROM ONE 1540/1541 TO ANOTHER..

REQUIRED EQUIPMENT: C-64, SX-64 OR VIC-20 COMPUTER  
(2) 1540 OR 1541 SINGLE DISK DRIVES\*  
MONITOR OR TV SET  
DATA DISKETTE  
BLANK DISKETTE  
VERSION 2.0 TEST DISKETTE

\* THE TWO (2) SYSTEMS BEING USED MUST BE SET AT DIFFERENT DEVICE NUMBERS.

When the program is run, the following options will be available.

1. *Which way the FILE TRANSFER is to take place. (e.g. Device 8 to Device 9)*

2. *Is the destination diskette to be NEWED?*

- A. If the destination diskette is blank, or the information contained is no longer required, a 'Y'es should be selected.
- If 'Y'es is selected, the operator must enter the name and ID to be assigned to the destination diskette.
    - The Name assigned to the destination diskette is limited to a length of 16 characters and may be either alpha, numeric or a combination.
    - The ID assigned to the destination diskette is limited to a length of 2 characters and may be either alpha or numeric but NOT a combination.
    - When the destination diskette has been formatted, the blocks free on the destination diskette are displayed and the pattern match option is offered.
- B. If the destination diskette contains valid data and files are to be added, a 'N'o should be selected.
- If 'N'o is selected, the blocks free on the destination diskette will be displayed and the pattern match option is offered.

## **DISK COPY ALL (Continued)**

### **3. The *PATTERN MATCH* allows for the following capabilities:**

- A. If the name of a particular file is entered, only that file will be displayed for copy selection.
- B. If just certain characters are entered, all files beginning with these characters are displayed for copy selection.
- C. If 'RETURN' is pressed, all files on the source diskette are listed one at a time for copy selection.

### **4. When a file is displayed for *COPY SELECTION*, the operator will have the choice to copy the file 'Y'es or skip the file 'N'o.**

- A. Pressing 'Y'es, followed by 'RETURN', for any file, copies all remaining files on the source diskette.
- B. Press 'N'o, followed by 'RETURN', any file skips all remaining files on the source diskette.
- C. A file cannot be copied to the destination diskette if it is already present under the same name.

**SECTION THREE**  
**COMPUTER DIAGNOSTIC**  
**AND TEST PROGRAMS**

**SECTION THREE**  
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**AND TEST PROGRAMS**

# **'' C-64 BURN-IN ''**

**DESIGNED TO TEST THE C-64 OR SX-64 COMPUTERS..**

**REQUIRED EQUIPMENT: C-64 OR SX-64 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
VERSION 2.0 TEST DISKETTE**

When the program is run, the following steps are implemented:

1. The C-64 burn-in data is loaded from the test diskette.
2. Rows of squares are displayed simulating IC's with numbers representing their location on the PCB.
  - If a square is blacked out during the test, it is an indication of a defective IC and it must be replaced.
  - The testing of the SID chip is done by audible tones only.
  - This test is designed as a burn-in test to ensure the system does not fail after warmup.
  - For more detailed testing, the C-64 diagnostic cartridge should be used.

# ' ENHANCER )'

DESIGNED TO RUN CERTAIN PROGRAMS ON THE C-64 WITH VERSION 2 KERNAL ROM..

**REQUIRED EQUIPMENT: C-64 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
VERSION 2.0 TEST DISKETTE**

With the release of the Kernal 2 ROM for the C-64, it was discovered that much of the public domain software (among others) did not appear to run correctly. It was determined the reason for this was undefined colors within a program were defaulting to the background color, thus were not visible on the display.

Once the Enhancer is run, most of the problem programs will run correctly.

- On the version 2.0 test diskette is a program called Arrow Game. This is a public domain program that will not run with the Kernal 2 ROM. If the C-64 is suspected of the Kernal 2 bug, try this program first without the Enhancer, then with Enhancer loaded and run.

There are three (3) simple ways to determine if a C-64 has the Kernal 2 ROM installed:

1. Type 'poke 1024,160' and press 'RETURN'.
  - If a solid square does not appear in the top left corner of the display, then the Kernal 2 ROM is installed in the C-64.
2. Type 'print peek (65408)' and press 'RETURN'.
  - If a '0' is displayed, the Kernal 2 ROM is installed in the C-64.
3. Open the unit and look at the ROM at location U4.
  - If the Number 901227-02 is printed on the top of the IC at location U4, the Kernal 2 ROM is installed in the C-64.
4. It is recommended that all Kernal 2 ROMs be replaced with the latest Kernal 3 ROM. (Commodore part number 901227-03)

## **VIC-20 BURN-IN**

DESIGNED TO TEST THE VIC-20 COMPUTER..

**REQUIRED EQUIPMENT: VIC-20 COMPUTER  
1540 OR 1541 SINGLE DISK DRIVE  
MONITOR OR TV SET  
VERSION 2.0 TEST DISKETTE**

\*\*\* In order to load this test into the VIC-20, an 8K Memory Expander must first be inserted. The Memory Expander must be set to Address A000 Hex by setting switch 4 inside the Expander to ON and the rest OFF.

When the program is run, the following steps are implemented:

1. The VIC-20 burn-in data is loaded from the test diskette.
2. Rows of squares are displayed, simulating IC's with addresses representing their memory location on the PCB.
  - If a square is blacked out during the test, it is an indication of a defective IC and must be replaced.
  - This test is designed as a burn-in test to ensure the system does not fail after warmup.
  - For more detailed testing, the VIC-20 diagnostic cartridge should be used.

**SECTION FOUR**  
**BASIC COMMANDS**  
**VIC-20 \*\* C-64**

**SECTION FOUR**  
**BASIC COMMANDS**  
**VIC-20 \*\* C-64**

## BASIC VIC-20 AND C-64 COMMANDS

The following are some of the most common Basic Commands used in the operation of the C-64 and VIC-20 Computers. Also listed is a format example of each command. For more detailed information please refer to the VIC-20 or C-64 Programmers Reference Guide.

COMMAND FUNCTION	COMMAND FORMAT
<p><b>'FORMAT' or 'NEW' a blank diskette</b></p>	<p>-- VIC-20 and C-64 BASIC --  open 1, DN, 15: print # 1, "nX: disk name, ID"  close 1</p> <p>*DN = device number  *X = drive number (always 0 on 1541)  *DISK NAME = any combination of digits or letters. (Up to 16 characters)  *ID = any 2 digits or 2 letters.</p> <p><b>Example: To format a diskette called (commodore) with the ID (bm) in drive (0) of device number (8).</b>  -- open 1, 8, 15: print # 1, "n0: commodore, bm" (PRESS RETURN)  close 1 (PRESS RETURN)</p>
<p><b>'SAVE' a program on a diskette</b></p>	<p>-- VIC-20 and C-64 Basic --  save "X: program name", DN</p> <p>*X = drive number (always 0 on 1541)  *PROGRAM NAME = any combination of digits or letters. (Up to 16 characters)  *DN = device number</p> <p><b>Example: To save a program called (commodore) to drive (0) of device number (8)</b>  -- save "0: commodore", 8 (PRESS RETURN)</p>
<p><b>'LOAD' a program from disk</b></p>	<p>-- VIC-20 and C-64 Basic --  load "X: program name", DN</p> <p>*X = drive number (always 0 on 1541)  *PROGRAM NAME = name of the program to be loaded. (Spelling must be exactly as it is on the diskette)  *DN = device number</p> <p><b>Example: Load a program called (commodore) from drive (0) of device number (8)</b>  load "0: commodore", 8 (PRESS RETURN)</p>
<p><b>'RENAME' a file to another name</b></p>	<p>-- VIC-20 and C-64 Basic --  open 1, DN, 15: print # 1, "rX: new = old"  close 1</p> <p>*DN = device number  *X = drive number (always 0 on 1541)  *NEW = new name of the file  *OLD = original name of the file</p> <p><b>Example: To change the name of a file called (commodore) to (cbm) on drive (0) of device number (8).</b>  -- open 1, 8, 15: print # 1, "r0: cbm = commodore" (PRESS RETURN)  close 1 (PRESS RETURN)</p>

## BASIC VIC-20 AND C-64 COMMANDS (Continued)

COMMAND FUNCTION	COMMAND FORMAT
<p><i>'INITIALIZE' the disk drive</i></p> <p><i>Example: To initialize drive (0) of device number (8)</i>            -- open 1,8,15:print # 1,"i0" (PRESS RETURN)            close 1 (PRESS RETURN)</p>	<p>-- VIC-20 and C-64 Basic --            open 1,DN,15:print # 1,"iX"            close 1</p> <p>*DN = device number            *X = drive number (always 0 on 1541)</p>
<p><i>'READ' diskette directory</i></p> <p><i>Example: To read the directory from drive (0) on device number (8)</i>            -- load "\$",8 (PRESS RETURN)            list (PRESS RETURN)</p>	<p>-- VIC-20 and C-64 Basic --            load "\$",DN            list</p> <p>*DN = device number</p>
<p><i>'SCRATCH' a file from a diskette</i></p> <p><i>Example: To scratch a file named (commodore) from drive (0) on device number (8)</i>            -- open 1,8,15:print # 1,"s0:commodore" (PRESS RETURN)            close 1 (PRESS RETURN)</p>	<p>-- VIC-20 and C-64 Basic --            open 1,DN,15:print # 1,"sX:file name"            close 1</p> <p>*DN = device number            *X = drive number (always 0 on 1541)            *FILE NAME = file to be scratched</p>



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