SCOPY 810 USER GUIDE
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INTRODUCTION

Overview

SCOPY 810 is an efficient and easy to use disk sector copier for the
ATARI 810 or compatible disk drives. Among the features of SCOPY 810
are the following:

1. On a 48K system, the program will copy a full disk in only two
passes.
2. An improved method for writing with verification is used, for a
significant speed increase.
3. The program is menu driven with default values that can be selected
by merely pressing the RETURN key.
4. One or two disk drives can be used. The drives can be numbered
from one to eight.
5. The user can choose whether writes are verified or not.
6. A format option is included.
7. Multiple copies can be made.
8. An offset can be specified between the starting read sector and the
starting write sector.

SCOPY 810 is designed to be of best use for the following applications:

1. The program is great for making fast back-ups of a full disk
containing important files, such as text or database information.
2. The feature for making multiple copies will be welcomed by people
in charge of maintaining a user group library.
3. It is often desirable to duplicate a disk before attempting to
recover lost files using DISK FIXER (APX 20010). SCOPY 810 will pass
by sectors that give an error when they are read.
4. SCOPY 810 will aid in any applications that do not use a DOS file
structure for storing data, but rather deal with data on a sector
basis. For example, SCOPY 810 will help machine code programmers
developing autoboot disks. The program is also great for copying the
"screens" on a FORTH disk.

SCOPY 810 is not intended to be used for purposes of copying, rather
than purchasing, commercial software, and will not, repeat NOT copy
disks which are protected.

Minimum RAM and accessories

8K RAM required
ATARI 810 or compatible disk drive

General terms

An understanding of these terms is essential to the proper use of SCOPY 810.

1. Disk drive
The disk drive is a device used for mass storage and retrieval of data. The major functional components of a disk drive include a motor to spin an inserted disk, and a read/write head which performs the actual data transfers. The ATARI 400/800 computers allow several ATARI 810 disk drives or compatible disk drives to be used simultaneously. Read the owners manual for information regarding the installation, operation and maintenance of the drive.

2. Disk
The disk drive stores data to and retrieves data from a disk. The disk is a circular piece of magnetic media with a hole in the center, enclosed in a protective square envelope. The disk must be inserted in the disk drive. Great care should be taken in the handling of disks. Keep these points in mind:

a. When the disk is not in the disk drive, place the disk in the paper envelope provided for safe keeping.
b. Never touch the exposed parts of the magnetic media, especially the underneath side where the data is actually stored.
c. Do not allow a disk to be exposed to magnetic fields or sources of radiation, such as sunlight or television sets.
d. Be gentle in handling disks. Do not abuse the flexible nature of a disk by folding it in half. Avoid applying pressure to the disk, such as by sitting on it. Store disks at acceptable temperatures. They make expensive Frisbees (trademark Wham-O company).
e. It is suggested that a disk not be inserted or removed while the drive BUSY light is on. Also, it is not a good idea to turn a disk drive off or on when a disk is inside.

3. Sector
A disk is divided into several parts of equal storage capacity called "sectors". The disks used by the ATARI 810 disk drive have seven hundred twenty sectors of one hundred twenty eight bytes each, for a total storage capacity of 90K.

4. Density
This term is an indication of the storage capacity of a disk and is related to the size of a sector. The ATARI 810 disk drive uses "single density" disks.

5. Reading
The process of the disk drive extracting data stored on the disk and sending it to the computer is called "reading".

6. Writing
The process of the disk drive storing data from the computer to a disk is called "writing".

7. Verifying

The process of rereading data previously written, to make sure it was written correctly, is called "verifying". Verification is a form of error checking.

8. Formatting

The process of the disk drive erasing a disk and creating sectors is called "formatting". New disks must first be formatted in order to prepare them for general use. If a disk cannot be formatted after several attempts, it is an indication that the disk is damaged ("bad"). On the other hand, successful formatting is not necessarily a guarantee that a disk is okay ("good").

9. Write protect

On the right edge of a disk can be found a small indentation. When this indentation is covered with a piece of non-transparent material such as a "write protect tab" commonly supplied with blank disks, the disk drive will not allow data to be written to the disk. An error will be generated if an attempt is made to write to a disk protected in this manner. Reading will function normally. The use of the write protect feature is simply a safeguard against accidental tampering of important data.

The sector copying process and related terms

Here is a description of the simplest form of a sector copy process and an explanation of the terms that will be used in later parts of this manual.

1. Source

The source disk is the original disk from which data will be read for later writing to another disk. One way of looking at it is to think of the source disk as "sending" data. The data on the source disk is never altered. The drive in which the source disk is inserted is called the "source drive".

2. Destination

The destination disk is the disk to which previously read data will be written. It can be viewed as "receiving" data from the source disk. The drive in which the destination disk is inserted is called the "destination drive". If only one drive is being used, the source and destination drives are actually the same drive. A single drive arrangement will neccessitate a switching of disks during the copying process. The source disk will first be placed in the drive and read. In order to write the destination the source disk will have to be removed and the destination disl inserted. If multiple copies are being made, the different destination disks will have to be inserted one at a time.

3. Pass

The simplest form of the sector copying process is to read sectors from the source disk into memory until memory is full, and then write from memory to each destination disk all of the sectors that were just read in. This sequence is called a "pass". Since a disk has a storage

capacity of 90K and the ATARI 400/800 computers normally have a memory limit less than that, one pass may not be sufficient to duplicate a disk, depending on the number of sectors being read and the nature of the data. When two drives are used, the number of passes required will be of no significance to the user. If only one drive is used, each pass will require the switching of the destination disk for the source, and back.

4. Blank sector
When a disk is formatted, each sector is erased by having one hundred twenty eight bytes of the zero character written to it (see the section "Program limitations and warnings" for one exception to this). Each sector will always retain this pattern of all zeroes until data is written to the sector. These unused sectors are called "blank sectors". The presence of non-zero bytes in a sector is an indication that a sector has been used at one time and may possibly still be in use. SCOPY 810 keeps track of all sectors it reads that are blank.

Special function keys

SCOPY 810 uses only some of the keys on the ATARI 400/800 keyboard. The keys used are the digits zero through nine, the letters A through F and also Y and N, the RETURN key, and the BREAK key. Except when SCOPY 810 is reading or writing/verifying sectors, the BREAK key can be pressed to abort the program at any time. All other keys, including CTRL, SHIFT, and CAPS/LOWR, are ignored. Of the console switches to the right of the keyboard, SCOPY 810 uses only the ones marked SYSTEM RESET and START. The START key is used to begin or continue copying, or restart the program after an abort or error. The SYSTEM RESET key can be pressed at any time to abort and restart the program.

GETTING STARTED

Program loading

Follow the standard method for loading an autoloading disk. This procedure is described here for your convenience.

1. If the disk drive is not on, turn it on and wait for the BUSY light to go off. Insert the disk which contains the SCOPY 810 program, just as any other disk would be inserted into the drive.
2. Open the cartridge cover of your ATARI 400/800 computer. Remove any cartridges that may be there. Close the cartridge cover.
3. If the power switch of the ATARI 400/800 was already on, closing the cartridge cover will have caused the computer to turn on and the disk drive to be booted. Otherwise, turn the power switch on now.
4. The SCOPY menu should soon appear on the display. The program will be waiting for user input.

The first display screen

The only display ever produced by SCOPY 810 is a black and white menu

with nine main parameters. At the top of the screen should appear the identification "SECTOR COPIER". Below that is the actual title, author identification, version number in the form of a date, and copyright notice.

PROGRAM OPERATION

SCOPY 810 operates under two main modes. The first mode consists of a menu of sequential parameters that must be set and questions that must be answered. This information regulates the second mode, which is the reading and writing of the sectors.

Parameter set mode

The user must establish certain characteristics of the sector copy before the copying can begin. These characteristics include how much of the source disk is to be copied, how many copies are desired, whether to verify or format, and so on. This information must be communicated to SCOPY 810 as guided by the program. The parameters fall under two main categories; numerical and conditional. Numerical responses involve entering valid hexadecimal numbers, while conditional questions require simple "yes" or "no" responses. At each line, SCOPY 810 indicates that it is waiting for input by displaying a little white square (known as a "cursor") on the righthand side of the line. Also, every time the cursor appears on a line, a default value will appear next to the cursor. This default value indicates the response the user will most likely choose for that particular question. If necessary, this value can be changed by entering information from the keyboard. When the desired value appears, whether it is the default value or not, the RETURN key must be pressed to tell SCOPY 810 to move on to the next line. The BREAK key can be pressed any time to abort this mode. In that case, the START key must be pressed to restart SCOPY 810.

Numerical parameters

SCOPY 810 requires the use of hexadecimal numbers rather than decimal numbers. (This may be an inconvenience to some users. On the other hand, those persons who will be using values other than the default values will probably also be familiar with the hexadecimal number system anyways.) See the TECHNICAL INFORMATION section for information on how to convert between the two number bases.

Hexadecimal numbers are entered from the keyboard using the digit keys zero through nine, and the letter keys A through F. As each digit is entered, those already on the screen move to the left and the leftmost digit disappears. This method for entering numbers is similar to that used on some calculators. When the desired number is displayed, press the RETURN key.

Two things may happen when the RETURN key is pressed. The cursor may move to the next line, which is good, or a warning beep will sound and the cursor will not move. The warning beep indicates that the number

chosen was invalid. See the "sequential menu parameters" section for information regarding which numbers may be illegal for certain parameters.

Conditional parameters

These questions are easy to answer because they require only a simple "yes/no" answer. Pressing the Y and N keys causes the words YES and NO to appear by the cursor. When the desired response is displayed, press the RETURN key. There are no invalid responses possible.

Sequential menu parameters

To copy a whole disk, simply hit the RETURN key eight times, thereby choosing all of the default values. For other cases, each menu parameter is explained below.

1. SOURCE DRIVE (1 default)
Here the user must enter the drive number for the source drive. If the source drive is drive number one, no keys need be typed except the RETURN key. Numbers from one to eight are valid drive numbers.

2. DESTINATION DRIVE (1)
Enter the drive number of the destination drive. If only one drive is being used, this number will be the same as the source drive number. Again, numbers from one to eight are valid drive numbers.

3. STARTING READ SECTOR (001)
If desired, copying does not have to start at the first sector. Any valid sector number from 001 to 2D0 can be entered. The default 001 should be entered, however, in order to copy the entire disk. If the disk contains DOS files, it is strongly recommended that the whole disk be copied rather than just a part.

4. ENDING READ SECTOR (2D0)
Any number from the starting read sector to 2D0, inclusive, can be entered. To copy the whole disk, the default 2D0 should be entered. A special case will occur if the starting read sector is 2D0. The ending read sector will be forced to 2D0 and the cursor will skip to the next line.

5. STARTING WRITE SECTOR (same value as starting read sector)
This parameter is for special uses only, as described later. It is used to specify an offset to the starting read sector. For normal use, the default value should be selected. Otherwise, valid sector numbers would range from 001 to (2D0 + starting read sector - ending read sector). A special case will occur when the whole disk is being copied. If the starting read sector is 001 and the ending read sector is 2D0, a value of 001 will be forced for this parameter and the cursor will skip to the next line.

6. NUMBER OF DESTINATIONS (01)
This parameter controls the number of copies that will be made. Two hundred fifty five (255) copies is the maximum. Keep in mind the fact

that the displayed number is in hexadecimal form.

7. VERIFY WRITES? (YES)

The decision of whether or not to verify writes should be based upon the reliability of the disk drive and the importance of the data. Choosing no verification will cause the writing of each destination to take half the amount of time that it would take with verification.

8. FORMAT DESTINATIONS? (NO)

If the format option is selected, each destination will be formatted before being written to. The actual formatting process is controlled by the drive. This formatting alone is not sufficient for a disk to support DOS files. It is expected that necessary DOS sectors will be included in the copy. SCOPY 810 cannot be used to merely format disks without writing to them.

9. WRITE BLANK SECTORS? (opposite of response to preceeding question)

The only time when it is safe to not write blank sectors is when the destination disk is blank. The choice is provided in case the destination disk was formatted earlier. It is strongly recommended that when copying a disk with DOS files, either the destination should be formatted or blank sectors should be written. Answering "no" to both questions could possibly cause directory problems later. If the source disk does not have DOS files, use of this feature is left to the judgement of the user.

Sector reading/writing/verifying mode

When the last question is answered, either an error message or one of two prompts will appear. The TROUBLESHOOTING section provides details on error messages. The two possible prompts are SOURCE and INSERT DISKS. Both messages request that the source disk be inserted in the source drive. The second prompt occurs only when two drives are being used to make one copy, so the destination disk should be inserted in the destination drive also. It is always a wise precaution to put a write protect tab on the source disk. When ready to begin the actual copying, press the START key.

Assuming no errors occur, the READING message and a number will appear in the prompt line, and sector data will appear in a window below the prompt line. The READING message indicates that SCOPY 810 is currently reading sectors from the source disk, and the number after the READING message tells the current sector number in hexadecimal form. The data window will be flashing characters faster than they can be read. This reading process will continue until either the buffer is full or the last sector to copy has been read.

After sectors have been read from the source disk, they must be written to the destination disk. If two drives are being used to make one copy, SCOPY 810 will automatically proceed to write to the destination disk which was inserted earlier at the INSERT DISKS prompt. In all other cases, the prompt DESTINATION, followed by a hexadecimal number, will appear. The destination disk must now be inserted into the destination drive. If only one drive is being used, it will be necessary to remove the source disk before inserting the destination

disk. The number after the prompt DESTINATION will first be 01. If multiple copies are being made, this number will change on later passes to indicate which destination disk is needed. Press the START key to continue with the copying.

As when SCOPY 810 was reading the source disk and displayed the READING message, the WRITING message will appear when SCOPY 810 is writing to the destination disk. The hexadecimal number after the word WRITING indicates the current sector. Writing continues until either the buffer is depleted or the last sector is written. If the verification option was selected, SCOPY 810 will then display a VERIFYING message and reread the sectors just written. One attempt will be made to correct each sector that did not verify properly.

This process of reading and writing passes will continue until all destination disks that did not cause writing/verifying errors have been written completely. It should be noted that when making multiple copies, SCOPY 810 follows different procedures for one and two drive arrangements. If a single drive is being used, one read pass is written to each destination before the next pass is read. For two drives, all reading and writing is performed for one destination until that destination is complete, then the next destination is requested. Although the two drive method is more convenient, the one drive method may actually be more efficient for mass copying.

When SCOPY 810 is done, the message COPY COMPLETED will appear. The display will soon enter the "attract" mode (changing colors) to protect the screen phosphors.

TROUBLESHOOTING

Boot errors

The SCOPY 810 disk will not boot if the cassette was also booted or if a cartridge is installed.

Error codes and messages

The only possible error codes that SCOPY 810 might generate are serial input/output errors from the SIO handler in the operating system. Error codes are reported in hexadecimal form. They can appear in two different messages.

Error messages

One message says ERROR ON. This indicates some sort of error with the drive and can occur only when SCOPY 810 is starting a reading or writing/verifying mode, switching between reading and writing/verifying operations, or when a drive is formatting a disk. The number after the word ERROR is the error code, and the number after the word ON is the drive number. The most common error is the timeout error 8A (138), and the most common cause of this error is the selection of a drive number when there is no corresponding drive. For example, specifying the destination drive to be number two, when there is no drive set as

number two, will result in the message ERROR 8A ON 2.   The   ERROR   ON
message causes SCOPY 810 to abort.

Another message says ERROR AT and is reported whenever an error occurs
at some specific sector. The number after the word ERROR is the error
code, and the number after the word AT is the number of the sector that
gave the error. There are various causes for errors that occur at
specific sectors. These causes are described in the next section.
What happens after this error depends on whether SCOPY 810 was reading
or writing/verifying.

If SCOPY 810 was reading, one of two things can be done after the ERROR
AT message appears. The whole program can be aborted by pressing the
BREAK key, or the sector will be bypassed and reading will continue at
the next sector if the START key is pressed.   Nothing is written to
destinations in the place of a sector that was skipped during reading.
Sectors that were bypassed in reading are bypassed in writing/verifying.

In response to an ERROR AT during writing or verifying, the BREAK key
can be pressed to abort the whole program, or the START key can be
pressed to continue.   SCOPY 810 will proceed directly to the next
destination, if there is one. Once a write/verify error has occurred
on a destination, that disk will not be written to again.   If multiple
copies are being made with a single drive, only those destinations that
have not caused errors will be requested each pass.

Format error

There is one other error message that says FORMAT ERROR and indicates
that a destination disk could not be successfully formatted after two
attempts. Pressing the START key causes SCOPY 810 to continue to the
next destination.

Error codes

Here are the only possible error codes that SCOPY 810 can generate,
with explanations to possible causes and solutions.

8A (138) DEVICE TIMEOUT
The SCOPY 810 program does not recognize that the disk drive exists.
The requested drive did not respond within a certain time period.
Check to make sure that the disk drive is plugged in and power is on
(power light indicates this). Be sure that the drive code number is
set properly. Also, bad I/O cable connections from the computer to the
drive can cause this error.   Finally, the drive may have been busy
trying to read or write a sector or format a disk.   If that is the
case, wait for the drive to stop. Sometimes it is necessary to abort
the program, remove the disk, turn the drive off and then on, wait for
the BUSY light to go out, and restart the program.

8B (139) DEVICE NAK (no acknowledge)
This error can be caused by program error, bad cable, or other problem
with a sector. SCOPY 810 has no known bugs, so check the cable.

8C (140) SERIAL BUS INPUT FRAMING ERROR
Frequent occurrence of this error indicates a hardware problem. Have
the computer and the disk drive checked.

8E (142) SERIAL BUS DATA FRAME OVERRUN ERROR
This is another error that should not occur often. Have the computer
and disk drive checked if this error occurs frequently.

8F (143) SERIAL BUS DATA FRAME CHECKSUM ERROR
A "noisy" (subject to bad connections and interference) cable would be
one cause of this error. This error may also indicate that sector data
has been damaged, either by physical damage to the disk or by some
force such as radiation altering the data. Check the cable and retry a
few times.

90 (144) DEVICE DONE ERROR
This error is most commonly caused by attempting to write to a write
protected disk. Remove the write protect tab if it is desired to write
to the disk. This error can also be caused by other device problems,
such as damaged sector data, or drive speed problems.

Program and operating system bugs

There are no known bugs in the SCOPY 810 program as of the version
date. The author would greatly appreciate being informed of any bugs
discovered in the program.

There is a bug in revision A of the ATARI 400/800 operating system that
can cause the disk drive to appear to "go to sleep". This can be
detected when a READING, WRITING, or VERIFYING message appears in the
prompt line and the drive is inactive for so long that the BUSY light
goes off. If this should happen, the drive may eventually come "back
to life", but better yet, press the BREAK key. This will force SCOPY
810 to retry the current operation. (Pressing the BREAK key when SCOPY
810 is not reading, writing, or verifying will cause the program to
abort.)

Program limitations and warnings

Whenever SCOPY 810 is used to copy DOS files, it is strongly suggested
that either the destination disk be formatted or blank sectors be
written. If this is not done, old directory information on the
destination disk may not be overwritten, possibly causing problems
later.

Another precaution must be taken to avoid a similar problem when
copying a disk that contains DOS files. The eight directory sectors
and volume table of contents sector must be included in the copy. This
means that sectors 168 to 170 (360 to 368 decimal) must be within the
copy range, between the starting and ending read sectors. In general,
when copying a disk that has DOS files, copy the whole disk.

The SCOPY 810 program is not always the best choice for copying a disk

in some cases. If a disk contains just a few short files stored using the DOS file structure, it would be faster to use menu selection J (DUPLICATE DISK) in the Diskette Utilities Package (DUP) of DOS II. The DUP copy utility uses the directory for information about which sectors to copy. SCOPY 810 does not use this information.

SCOPY 810 makes it impossible to enter illegal values during the parameter set mode. There is one particular instance, however, that SCOPY 810 cannot guard against. This potential problem occurs when SCOPY 810 is used to move a block of sectors on the disk to another area on the same disk (source and destination disks are the same disk, and the starting read sector is different from the starting write sector). If such a copy cannot be done in one pass, be sure that the two blocks do not overlap. Otherwise, it is possible that data written in one pass may overwrite data to be read in a later pass. Obviously this is a rather abstract type situation.

As part of an efficient memory management system, SCOPY 810 notes each sector that consists of all identical characters. This allows the efficient copying of a disk with several blank sectors. One complication, however, is that some ATARI 810 disk drives were released that do not create blank sectors when they format a disk. Rather than writing one hundred twenty eight zero characters, a different character is written. Although the SCOPY 810 memory management system compensates for this, such sectors are not treated as "blank" sectors when SCOPY 810 is writing or verifying. Every sector that contains nonzero data will be written and verified regardless of the response to the WRITE BLANK SECTORS? question. To determine whether a drive formats using the zero character, format a disk and then read it using SCOPY 810. If the majority of the sectors do not appear blank in the data window (window is not clear), the drive does not format using the zero character. In such a case it may be desirable to replace the 2K ROM inside the ATARI 810 with a later revision ROM (revision C as of publication date). Another feature of this ROM is that disks formatted with it have faster access times.

TECHNICAL INFORMATION

Numbering system conversions

SCOPY 810 uses hexadecimal (termed "hex" for short) numbers due to a programming tradeoff for better performance. Remember that the hexadecimal system uses base sixteen instead of ten. The only time this becomes inconvenient is when using sector numbers other than the default values. This section describes how to convert from the displayed hexadecimal sector numbers to decimal, and also decimal to hex.

DECIMAL AND HEXADECIMAL CONVERSION REFERENCE CHART

HEX	DECIMAL	DECIMAL	DECIMAL
0	0	0	0
1	1	16	256
2	2	32	512
3	3	48	
4	4	64	
5	5	80	
6	6	96	
7	7	112	
8	8	128	
9	9	144	
A	10	160	
B	11	176	
C	12	192	
D	13	208	
E	14	214	
F	15	240	

Hexadecimal to decimal conversion

This is very simple to do. SCOPY 810 always displays sector numbers in three digits, even if the leftmost digits are zero (leading zeroes). Take the rightmost alphanumeric digit and match it with the digit in the first decimal column of the chart above. Find the match in the second decimal column for the middle digit. Repeat this once again for the leftmost digit, using the third decimal column. The sum of the three matched values is the decimal equivalent. The following example shows how to convert the given hexadecimal number 2D0 to the decimal equivalent 720.

The 0 matches with   0.
The D matches with 208.
The 2 matches with 512.
The sum of 0 + 208 + 512 is 720.

The decimal equivalent is the sum of the matched value of the rightmost digit plus 16 times the matched value of the middle digit plus 256 times the value of the leftmost digit.

Decimal to hexadecimal conversion

This conversion is slightly more complicated. Refer to the chart above. Find the greatest number in the third decimal column that is less than or equal to the given decimal number. Subtract this number from the given decimal number. Also, the matching hex digit is the leftmost digit in the three digit hexadecimal representation. After the subtraction, the remaining decimal value should be less than 256. Repeat this process with the second decimal column, finding the greatest number that is less than or equal to the remaining decimal value. After the subtraction, the remaining decimal number should be less than 16. Match to find the middle hex digit, and repeat one last time using the first decimal column. These three steps will have created three digits of a hexadecimal number that is equivalent to the

given decimal number. The following example shows how to convert from the given decimal number 720 to the hexadecimal representation 2D0.

All three numbers in the third decimal column are either less than or equal to 720, but 512 is the largest.
Subtracting 512 from 720 leaves 208.
The hex digit that matches with 512 is 2, which becomes the leftmost digit of the hexadecimal equivalent.
The greatest number in the second decimal column that is less than or equal to 208 is 208.
Subtracting 208 from 208 leaves 0.
The number 208 matches with the hex digit D, so the middle digit of the hexadecimal representation is D.
The greatest number in the first decimal column that is less than or equal to 0 is 0, which matches with the hex digit 0, so the hexadecimal representation of 720 is 2D0.

Advanced technical information

The SCOPY 810 program uses the operating system disk handler and directly calls the SIO handler. The disk handler, which calls the SIO handler, is easier to use but is somewhat less flexible than calling SIO directly. Whichever handler is used, certain parameters must be set in the DCB (device control block) at $0300. The DCB bytes, their functions, and the proper values are described as follows.

DDEVIC 0300 SERIAL BUS IDENTIFICATION
The serial bus is shared for disk drives, printers, and other RS-232-C peripherals. The SIO preceeds all serial bus commands with a device identification number, as a means of distinguishing which device the command is directed to. Disk drives respond only to the serial bus identification $31, so a $31 should be stored in DDEVIC before calling the SIO handler. The disk handler does this automatically.

DUNIT 0301 DEVICE UNIT NUMBER
Sometimes it is possible to have multiple devices of the same type, such as multiple disk drives. The unit number of the device that is to be accessed must be stored in DUNIT. The unit number of the first device is $01. Drive number two would be specified by $02.

DCOMND 0302 DEVICE COMMAND
The command byte tells the device which operation it is expected to perform. Here is a table of valid command bytes for the ATARI 810 disk drive.

COMMAND	CODE	FUNCTION
R READ	$52	get a sector
W WRITE	$57	put a sector with verifying
P PUT	$50	put a sector without verifying
S STATUS	$53	request status
! FORMAT	$21	format the disk

Note that in most cases, the command code is the ATASCII value of the first character in the command name. To read a sector, a $52 would have to be stored in DCOMND.

DSTATS 0303 DEVICE STATUS
This byte serves two purposes. When using the SIO, this byte specifies
the data direction (reading or writing).

VALUE, OPERATION, AND DIRECTION
 $00   send command frame only (no data transfer)
 $40   send command frame and receive data frame (read)
 $80   send command frame and send data frame (write)

The disk handler automatically sets DSTATS to the proper value for all
commands except PUT, which it does not support. After the disk handler
or SIO call, DSTATS will contain the status of the requested operation.
A one is returned for a successful operation, else the value is an
error code.

DBUFLO 0304 DEVICE BUFFER LOW BYTE
DBUFHI 0305 DEVICE BUFFER HIGH BYTE
This is a pointer that must be set to indicate where a received data
frame is to be stored, or where in memory resides a data frame that is
to be sent. The disk handler automatically sets this to the value of
DVSTAT ($02EA) if the STATUS operation is requested.

DTIMLO 0306 DEVICE TIMEOUT LOW BYTE
This location specifies the timeout length in time units about one
second in length. No response from a device within the time period
specified by DTIMLO causes a timeout error.

DBYTLO 0308 DEVICE BYTE COUNT LOW BYTE
DBYTHI 0309 DEVICE BYTE COUNT HIGH BYTE
This number establishes the length of the buffer pointed to by DBUFLO
and DBUFHI. The disk handler automatically sets this to four bytes for
a STATUS request, and one hundred twenty eight bytes for all other
commands. After a format operation, the disk handler stores the number
of bad sectors in DBYTLO. The ATARI 810 does not support any commands
which have data frames greater than one hundred twenty eight bytes, so
DBYTHI should always be set to zero. The disk handler automatically
does this.

DAUX1 030A DEVICE AUXILIARY INFORMATION BYTE ONE
DAUX2 030B DEVICE AUXILIARY INFORMATION BYTE TWO
For SIO, the significance of these two bytes is dependent on the
device. When the device is the disk drive, they are the low byte and
high byte of the sector number for operations that read and write disk
sectors. To access sector $2D0, a $D0 would be stored in DAUX1 and a
$02 would be stored in DAUX2.

The disk handler

To call the disk handler, a subroutine call must be made through the
disk handler interface vector DSKINV ($E453). The disk handler is
usually sufficient for most work with disk sectors, however, it does
have some limitations. The disk handler does not support the PUT
(write sector without verification) command, and will not handle sector
lengths of two hundred fifty six bytes, such as used by dual density
drives. In these cases the SIO utility must be used.

The SIO utility

The Serial Input/Output utility can be used to access any device that uses the serial bus. When using the SIO instead of the disk handler, it is important to remember that DDEVIC, DSTATS, DTIMLO and DBYTLO must be set by the user in addition to those that must be set before calling the disk handler. The SIO utility is called with a subroutine call to the serial input/output vector SIOV ($E459).

Further technical information

For more detailed technical information, consult the OS USER'S MANUAL. The disk handler is described in chapter five, I/O subsystem, Non-CIO I/O, Resident disk handler (pp. 86-89). Characteristics of the ATARI 810 disk drive are described in chapter five, I/O subsystem, Device characteristics, Diskette (pp. 96-98). The handler/SIO interface is described in chapter nine, Adding new device handlers/peripherals, Handler/SIO interface (pp. 130-132). Appendix C contains the SIO STATUS BYTE values. Appendix I is a Serial Bus I. D. and command code summary.

SAMPLE SESSION

In this hypothetical example we are going to make one "back up" of a disk which has some important data files, and we have only one drive, set to number one. Remember that this example is merely hypothetical in nature; SCOPY 810 behaves differently under different parameters, different disks, and different computer memory sizes.

The whole disk must be copied. Assuming that SCOPY 810 has been loaded and the main display has appeared (the cursor is at the first line), we begin. The default value or one for the source drive number is acceptable, so press the RETURN key. The default value one is also the correct value for the destination drive number, because we are using only one drive. Since we are copying the whole disk, the starting read sector must be 001, so press the RETURN key for the third line. Press the RETURN key again to choose 2D0 as the ending read sector. Remember that copying a whole disk is a special case which SCOPY 810 detects, so it will force the starting write sector to 001 and skip to the next line. We are making only one copy, so the default value of one destination is fine. It is selected by pressing the RETURN key. The data is important and we are in no rush, so verification is desired. Again the default "yes" is acceptable and it is chosen by pressing the RETURN key. The destination disk (in this example) was previously formatted, so we do not want to choose the format option. Press the RETURN key to choose the default "no" for no formatting. Finally, to be safe, blank sectors should be written, if there are any, so our response to this is "yes", which is the default, which is selected by pressing, you guessed it, the RETURN key. Now wasn't that easy?

If the disk drive is turned on, connected, and working properly, the message in the prompt line should now read SOURCE. The source disk is

inserted, and the copying is started by pressing the START key. The message READING appears and the data window goes crazy showing all the sectors as they are read in. Assuming all goes well and there are no errors, soon the message DESTINATION 01 will appear, which tells us to remove the source disk, insert the destination disk, and press the START key. Now the message says WRITING. Later the message changes to VERIFYING. Then, because the disk was rather full and one pass was not sufficient, the message SOURCE appears, telling us to remove the destination disk and to insert the source disk a second time. Upon pressing the START key there is more reading and once again the prompt DESTINATION 01. The destination disk is switched for the source disk, the START key pressed, the WRITING and VERIFYING happens, and then because only two passes were required, the message COPY COMPLETED tells us that the copying is done. The SCOPY 810 program can be used again by pressing the START key to restart it.

Earlier, when setting the parameters, if one of the default values was not suitable, new values could have been entered before pressing the RETURN key. If new numbers were typed and then it was decided that the default value would have been satisfactory after all, that value can easily be typed in by pressing the appropriate keys. If the RETURN key was pressed and then it was decided to choose a different value, it would be necessary to abort by hitting the BREAK key and restart by pressing the START key. If a sector gave an error while reading, the program could be aborted, or reading could continue by pressing the START key. A sector error while writing or verifying ends the current destination, and ends the current copy if there are no more destinations.

FINAL NOTES

SCOPY 810 is a rather versatile sector copier that is ridiculously easy to use. The menu should be self explanatory. As mentioned in this guide, the program is not suited to certain types of copying, such as copying a disk that contains only a few short DOS files. The primary intended purpose of SCOPY 810 was to quickly backup whole disks to avoid losing precious data files to a "hungry" disk drive. The other frills just sort of found their way in.

Primary precautions for copying a disk of DOS files are that the whole disk be copied, and that either the destination be formatted or blank sectors be written.

The author hopes that users of SCOPY 810 will respect the hard work on the part of commercial software producers by not using SCOPY 810 to copy commercial software, including the SCOPY 810 program itself. The author spent a couple hundred hours perfecting the program, getting it to fit below $0C00 so that a whole disk could be copied in only two passes on a 48K system.

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Please do not attempt to contact the author by telephone.

Thank you for your support of this product.

Credits

You would not believe how much trouble one little program can cause!
The author wishes to thank the following people:

Ed Chu, for getting me started on writing the first version of a sector
copier

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...and it still doesn't do everything I wanted...

SCOPY 810 USER GUIDE OUTLINE

SIO ERROR CODE REFERENCE

8A (138) DEVICE TIMEOUT
8B (139) DEVICE NAK
8C (140) SERIAL BUS INPUT FRAMING ERROR
8E (142) SERIAL BUS DATA FRAME OVERRUN ERROR
8F (143) SERIAL BUS DATA FRAME CHECKSUM ERROR
90 (144) DEVICE DONE ERROR

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