CASDUP
T.M.

CASSETTE DUPLICATING PROGRAM
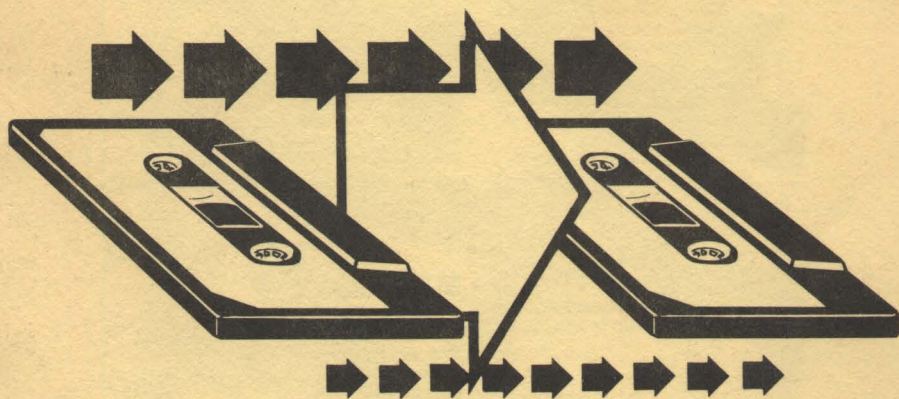
SOFTWARE for the
ATARI® 400/800/1200

VERVAN
Software
TM

CASDUP
by
Carl Evans and Eric Verheiden

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INTRODUCTION

The **CAS**sette **DUP**lication system provides the ATARI owner with a utility for creating backup copies of all types of ATARI cassette based software. **CASDUP** works on the ATARI 400/800/1200, and is provided in two parts: On side one of the cassette tape is **CASDUP 1**, which is a file-oriented (CIO) copy program. On side two of the tape is **CASDUP 2**, which is a sector-oriented (SIO) copying program. **CASDUP** can copy ATARI BASIC programs, machine language tapes, and even most of the so-called 'copy-protected' program tapes.

CASDUP 1

CASDUP 1 (side one) is a 2K byte machine language program that allows the creation of backup copies of most of your valuable ATARI 400/800/1200 software tapes. The file oriented operation of **CASDUP 1** makes it easier to create multiple program archive tapes.

LOADING INSTRUCTIONS - CASDUP 1

1. Turn the computer OFF and remove any cartridges from the machine. If any peripheral devices, such as the 850 Interface Module, are attached, turn them OFF as well.

2. Insert the **CASDUP** cassette into your 410 or 1010 program recorder (hereafter referred to as the 'recorder') with **CASDUP 1** (side one) facing up. Be sure that the tape is completely rewound. Now, push the PLAY button on the recorder.

3. Next, hold down the <START> key on the ATARI, and turn the computer on. After the computer beeps once, release the START key and press the <RETURN> key.

4. CASDUP 1 will automatically run after it is loaded into the computer. You will know that you have a successful load when the opening credits appear.

5. If the program fails to load properly, then one of the following may be the problem:

   a. Check for the presence of a cartridge. **CASDUP 1** will 'crash' if a cartridge is in the machine. Remove any cartridges, rewind the tape and try again.

b. Clean the heads in your recorder. Dirty heads cause more bad loads than most people realize. Refer to the operator's manual that came with your recorder for cleaning instructions.

c. Check your power and data cable connections. This is an unlikely cause of loading problems, but it does occur occasionally. Make sure all connections are firm.

d. If all else fails, try loading **CASDUP 1** into a friend's computer. If you still have no success, send the cassette back to us for replacement. (See instructions at end of manual.)

GENERAL INFORMATION - CASDUP 1

CASDUP 1 is ready for use as soon as the opening credits appear. No joysticks or other special controllers are required.

CASDUP 1 allows you to quickly and easily make reliable backup copies of most cassette based programs. **CASDUP 1** will copy data files, BASIC programs and machine language programs with equal ease.

CASDUP 1 supports the duplication of both single and multiple file programs. Although most programs have only one file, some programs have two or more files. (The largest number of files we have seen in a program so far is seven.) **CASDUP 1** will handle up to nine files at one time.

If you try to load a file that exceeds the memory capacity of your computer, **CASDUP** will display an appropriate error message. Large multi-file programs may have to be copied a few files at a time. (Refer to the section on Cassette File Structures)

CASDUP 1 supports backup of both 'continuous' and 'stop-start' files, as well as multi-file programs which mix the two modes. **CASDUP 1** will even allow you to convert stop-start files into continuous files. However, if you do this, then you should try loading and running the copy to make sure your 'new' version still runs. Some programs have internal timing loops that depend upon the stop-start format for proper operation.

You should always verify that **CASDUP** made a 'good' copy by loading the copy. If, after trying all the usual 'tricks,' you still can't get the copy to load, then you probably have one of two problems:

First, you might have made a mistake during the copying process. Second, you might have used a 'bad' blank tape. Contrary to popular opinion, not all cassette tapes will work reliably with your computer. Some tapes are so bad that you can't get them to work at all. We recommend that you always use computer-certified cassettes or reasonably high quality audio cassettes. Additionally, we recommend that you use C-30 or smaller cassettes for most of your everyday use, and never use a tape that is longer than a C-60. Cassettes that are longer than a C-60 sometimes use a lower mil (slightly thinner) tape which tends to stretch and distort with repeated use. It does not take much distortion to prevent the computer from reading your program.

DETAILED OPERATING INSTRUCTIONS - CASDUP 1

After loading the program, the first request for user input is "ENTER NUMBER OF FILES TO COPY." Enter a number from one to nine, and press <RETURN>. For single file programs you should enter a "1." If you don't know how many files your program has, but you suspect that it has more than one file, then you can enter '9' to find out. **CASDUP 1** will identify each file it loads as 'FILE 1,' 'FILE 2,' etc. When it fails to find another file, a 'BAD LOAD' error message will be displayed. The highest file number shown before the error message will be the number of files in the target program. You could also get a message that says "INSUF-FICIENT RAM TO COPY." This will make the process more difficult, but not impossible. The methods to get around this problem will become clearer as you read on.

The second request for user input is "AUTOMATIC INPUT? (Y OR N)." This question only appears when the number of files specified above is greater than one. Assuming that you want to copy two or more files, a response of "Y" followed by <RETURN> will cause **CASDUP 1** to load one file after another without pausing. This option is useful for copying a multi-file program. If you select manual input by answering this question with an "N" followed by <RETURN>, then **CASDUP 1** will stop after each file is loaded, and wait for you to press the <START> key before proceeding to load the next file. This option can be used to take programs from several tapes and write them all out to a single copy tape. For most cases, the backup copy you are making will require input from only one tape. When in doubt, use the "Y" response to the AUTOMATIC INPUT question.

The third request for user input is "CONTINUOUS MODE OUTPUT ONLY? (Y OR N)". If you respond with an "N," followed by <RETURN>, then the copy made of your program will be in exactly the same file format as the original. In other words, a 'continuous' copy will be made of a 'continuous' file, and a 'stop-

start' copy will be made of a 'stop-start' original. If you respond "Y" to the question, then all copies of your program files will use the continuous file format regardless of the format used by the original. The primary value of this feature is speed. Continuous files load in roughly half the time needed for a stop-start file. Some stop-start files are dependent upon the longer loading time for proper initialization, so you should not indiscriminately convert all of your files. Any time you do such a conversion, make sure that you carefully check out the copy for proper execution.

The fourth request for user input will be "PRESS START TO INPUT FILE." When you press the <START> key, the computer will beep once and immediately begin loading your original program file. So, be sure to have the original tape cued properly in your recorder, and have the PLAY button depressed before pressing <START>. When loading is complete, the computer will display the length of the file in hex bytes and the hex values of the first six header bytes. If the number of files specified by you was greater than one and you said "Y" to the 'AUTOMATIC INPUT' question, then **CASDUP 1** will automatically begin loading the next file without pausing. On the other hand, if you said "N" to the 'AUTOMATIC INPUT' question, then **CASDUP 1** will wait for you to press the <START> key before loading the next file. Note that if you hit the <BREAK> key, the computer will NOT halt operations unless you previously had selected the manual input mode.

After all files have been loaded, **CASDUP 1** will await a user response to "PRESS SYSTEM RESET TO RESTART" and "PRESS START TO OUTPUT FILE." If you press the <START> key then the computer will beep twice and immediately begin outputting files to your recorder. Therefore, before pressing the <START> key, make sure you have a blank cassette tape properly cued in your recorder and that the PLAY and RECORD buttons are both depressed. If more than one file has been loaded into the computer, then the computer will beep twice before each file is output (down-loaded). The computer will not pause between files. Upon completion of the down-loading, the computer will display the output message shown at the beginning of this paragraph. At that time you may make an additional copy by pressing the <START> key. When you have made all of the copies you wish, press <SYSTEM RESET>.

Any time <SYSTEM RESET> is pressed the computer will re-initialize **CASDUP 1** and display the opening credits. At this point you may load a new file by repeating the steps outlined above, or terminate operations by turning the computer OFF.

The <BREAK> key may be used during any read or write operation to immediately terminate that particular task. Think of the <BREAK> key as a manual EOF. For example, you are loading a file and you hear the normal loading noises from your TV monitor stop but the recorder keeps on playing. You can stop the recorder by pressing the <BREAK> key. Of course, pressing <SYSTEM RESET> has a similiar effect, but using the <BREAK> key preserves the files you have already loaded, whereas the <SYSTEM RESET> does not. At first glance, this feature may not appear to be extremely useful, but there are special cases where using the <BREAK> key is essential to getting a good copy of a file.

Some files, through accidental damage or some other means, do not have a normal EOF record. Since **CASDUP 1** keys off of EOF records, these programs have to be copied with the <BREAK> key being used to supply a manual EOF record. For example, say you have a four-file program which lacks an EOF record at the end of the first file. To copy this program, you must LISTEN to the first file loading in and hit the <BREAK> key as soon as the 'program noise' stops. When you do this, the EOF record is manually inserted at the end of that file. If you are in AUTOMATIC INPUT MODE, then **CASDUP 1** will automatically try to load the next file. Otherwise **CASDUP** will stop and wait for you to press the <START> key before proceeding to load the next file.

You can also use the <BREAK> key feature to recover the majority of a damaged file. Although this applies to both BASIC and machine language programs, we will explain the technique in terms of a CSAVEd BASIC file. If you listen to a BASIC file during a CLOAD operation, you can hear a difference in the tone coming from your TV monitor when the file stops loading properly. If you let the loading continue, you will end up with a bad load and an error message. You can recover the 'good' portion of the file by using **CASDUP 1** and hitting the <BREAK> key as soon as the 'bad' portion of the file is reached. When you output what **CASDUP** has loaded, you will have a CLOAD file that should load properly.

ERROR MESSAGES - CASDUP 1

BAD LOAD - The most probable cause is improper tape cueing. Reposition the starting point of the tape to where you would normally have it when loading that program into your computer. Press <SYSTEM RESET> and try loading it into **CASDUP 1** again.

INSUFFICIENT RAM TO COPY - Your computer does not have enough available memory to copy that particular file. Assuming that your computer has enough memory to run your program, then this message should only occur when you are copying multiple files whose combined size exceeds your computer's memory capacity. When this occurs, press <SYSTEM RESET> and repeat the copying procedure using a smaller number of files.

BAD OPEN - The cassette port failed to open properly for a read or write operation. Press <SYSTEM RESET> and try again. If the problem persists, then you may have a hardware problem.

BAD WRITE - You will get this message if you press the <BREAK> key during a write operation or if some other glitch occurs. When this happens, simply press <SYSTEM RESET> and start again.

Under rare and unpredictable circumstances, the serial I/O ports can become so scrambled as to cause your computer to 'freeze up' and refuse to respond to any keyboard inputs. This is a deficiency in the computer design and is not indicative of any particular problem with **CASDUP 1**. If this occurs, all you can do is turn the computer OFF and start over from the beginning.

SIMPLIFIED OPERATING INSTRUCTIONS - CASDUP 1

How to copy a single file program tape:

Step 1. Load the CASDUP 1 program as described in the section on loading.

Step 2. TV Display: ENTER NUMBER OF FILES TO COPY
User response: press <1>, press <RETURN>

Step 3. TV Display: CONTINUOUS MODE OUTPUT ONLY? (Y OR N)
User Response: press <N>, press <RETURN>

Step 4. Insert your program tape into the recorder and press the PLAY button. (Be sure the tape is properly cued!)

Step 5. TV Display: PRESS START TO INPUT FILE
User Response: press <START>

These five steps get your program loaded into **CASDUP**. When the loading process is complete, you are ready to make a copy.

Step 6. Insert a blank tape into your recorder and press the PLAY and RECORD buttons simultaneously. (Be sure the tape is properly cued!)

Step 7. TV Display: PRESS SYSTEM RESET TO RESTART; PRESS START TO OUTPUT FILE.
User Response: press <START>

When the recorder stops and the TV Display of Step 7 is repeated, you will have made a copy of your program tape. If the copy does not work like the original, then you may have to use one or more of **CASDUP 1**'s special features, described in the preceeding text.

CASDUP 2

CASDUP 2 is a sector oriented copying utility that will copy virtually any ATARI 400/800/1200 program tape, including BASIC program files, data files, 'boot' files, and even most so-called 'uncopiable' machine language tapes. **CASDUP 2** does not recognize files as such, but rather simply copies any data on the tape. **CASDUP 2** resides in about 2K bytes of memory, and uses all additional memory as a buffer during the copying process.

LOADING INSTRUCTIONS - CASDUP 2

1. Turn the computer OFF and remove any cartridges from the machine. If any peripheral devices, such as the 850 Interface Module, are attached, turn them OFF as well.

2. Insert the **CASDUP** cassette into your program recorder (hereafter referred to as the 'recorder') with **CASDUP 2** (side two) facing up. Be sure that the tape is completely rewound. Now, push the PLAY button on the recorder.

3. Next, hold down the START key on the ATARI, and turn the computer on. After the computer beeps once, release the START key and press the RETURN key.

4. **CASDUP 2** will automatically run after it is loaded into the computer. You will know that you have a successful load when the opening credits appear.

If **CASDUP 2** fails to operate properly, or will not load, refer to the loading instructions for **CASDUP 1** in the first section, for possible remedies.

OPERATING INSTRUCTIONS - CASDUP 2

LOADING STANDARD FORMAT TAPES - CASDUP 2

Insert the tape to be copied in your recorder and cue the tape to its normal loading point.

Press the PLAY button on the recorder.

Press the <START> key on the computer. The tape recorder will immediately turn on and the message "LOADING TAPE" will appear on the display. (The computer will not beep.)

After a short wait, you should hear the normal sounds of records loading emitting from your TV speaker. **CASDUP 2** will load everything on the tape and stop if any of the following conditions are met:

1. No data is present for 35 seconds.
2. The <BREAK> key is pressed.
3. All of the computer's memory is full of data.

If any errors occur during the load, you will be given an error message, which will be covered in a later section.

If the tape will not load properly using this procedure, then refer to the section on loading non-standard format tapes.

When a tape has loaded, you will see displayed the length (in hex records) of the data, and the hex values of the first six header bytes. This information will probably be of real use only to advanced users. For everyone else, these messages simply signify the end of the loading operation.

If you have a successful load, then skip to the section on writing copies to cassette.

LOADING NON-STANDARD TAPES - CASDUP 2

Insert the original tape into your recorder and press the PLAY button. Make sure the tape is properly cued.

Press the <OPTION> key to go to non-standard format mode.

Press the <START> key. The tape recorder will immediately turn on and the message, "LOADING TAPE" will be displayed on the T.V. monitor. (The computer will not beep.)

The <BREAK> key is ignored in this mode.

When you have a successful load, go to the next section on writing copies to cassette. If you have problems, repeat the above steps.

WRITING COPIES TO CASSETTE - CASDUP 2

Insert a blank cassette into your recorder and make sure that the tape is properly cued.

Simultaneously press the PLAY and RECORD buttons on your recorder.

Press the <START> key on your computer. The tape recorder will immediately turn on. The computer will display the message, "COPYING FILE." (The computer will not beep.)

When the copy has been written to tape, the recorder will turn off and the computer will display the message, "OPERATION COMPLETE."

You may make other copies by putting another blank cassette in the recorder and repeating the steps listed above.

To copy a different program, press the <OPTION> key to reinitialize **CASDUP 2**. This will put you back in standard format mode with checksum enabled.

SPECIAL FEATURES OF CASDUP 2

CASDUP 2 has two special features that should seldom have to be used, but are there if you need them:

CHECKSUM DISABLE - If you get a bad load with a STATUS BYTE = $8F, then you can possibly obtain a good load by disabling the checksum operation. This may be done by pressing <SELECT> while the main command menu is displayed. Press <SYSTEM RESET> to void this choice.

RETRY INPUT - if you get a bad load, it may be due to garbage between records on the tape. **CASDUP 2** will 'remember' how many records were loaded before the error occurred. If you rewind the tape and press the <SELECT> key while in the secondary command menu, **CASDUP 2** will try to load the program again. When the 'good' count is reached, **CASDUP 2** will insert an Inter Record Gap (time delay) immediately after the last known good record, and then try to load a new record.

ERROR MESSAGES - CASDUP 2

INSUFFICIENT RAM TO COPY - If this message appears during the copying process, your computer does not have enough available memory to copy all of the information on that tape. Assuming that your computer can normally run the program you are trying to copy, then this message should occur when you are copying multiple files whose combined size exceeds your computer's memory capacity. When this occurs, you will probably have to copy only a part of the tape (one file) at a time. You can manually stop the tape by pressing the <BREAK> key when an inter-file gap occurs. Such gaps are identifiable by a long period of silence during a load.

STATUS BYTE = XX

STATUS BYTE ERROR CODES - If you get a bad load, or abort the operation, a STATUS BYTE=XX error message will appear. The codes have the following meanings: (all are in hex format)
80 <BREAK> key abort
8A Device timeout
8B Device does not acknowledge
8C Framing error
8E Overrun error
8F Checksum error

Some of these errors are related to hardware difficulties, so refer to your computer manual for help.

SPECIAL CASE - If the STATUS BYTE is equal to 8F, then disable the checksum verification which is normally performed during a load. Press <SELECT> when the command options are displayed, and try loading the tape again.

CASSETTE FILE STRUCTURES

The following is a brief discussion of cassette file structures used on the ATARI computer system. The information may be useful in understanding the operation of the **CASDUP** system.

Programs are recorded on cassette tape with a structure (or format) which is determined by a small portion of your computer's operating system. This small piece of the operating system is called the *cassette handler*. The overall program storage structure is called a *file*. Most programs are stored using a single file; but for various reasons, some programs are stored using two or more files. The latter type of program is what we refer to as a 'multiple' or 'multi-' file program.

A file is subdivided into *records*. The first record of a file is called the *header* record. The last record of a file is called an *end-of-file* (EOF) record. All of the records in between are called *data* records. Although one record follows another record sequentially, records are not really contiguous. They are separated by blank spaces called *inter-record gaps* (IRG).

The fundamental building blocks of a file are the data records. All records, except the EOF record, are data records. Usually, the 128 data bytes of a data record will contain a small segment of your program. Obviously, even a relatively small program will require the use of many data records. Under normal conditions, a data record will not be the last record in a file. This position is usually occupied by an EOF record.

The first data record of a file usually contains special information for the operating system. Although this record is referred to as a *header* record, it differs from a data record primarily in that it is the first record in a file. For machine language files, the significance of this record is found in the first six data bytes. The first byte is not used by the computer, but the next five bytes tell the *boot loader* everything it needs to know to load a machine language file. The second byte tells the computer how many records are in the file, including the header record. The third and fourth bytes specify the (low and high) memory address where initialization of the program should begin (the entry point for the program).

BASIC files are handled by a different portion of the operating system, and hence, the *header* record differs from the equivalent record for a machine language file. In fact, for a BASIC file, the *header* may be several records long. The specific length of this header depends upon a number of things. The first thing to consider is whether the file is tokenized or not. A file stored by the SAVE or CSAVE command is tokenized and has a rather long, complicated header. This header consists of two blocks of information. The first block contains seven of the nine zero-page pointers that BASIC uses to maintain the token file. The second block contains the program's variable name and variable value tables. The header, as defined here, will use as many records as

necessary to hold these two blocks. The header for a non-tokenized file, such as one stored by the LIST command, is relatively short and uncomplicated, because these files are treated like keyboard input.

An *end-of-file* (EOF) record differs from other records in two areas. First, it has a special code in the third byte that tells the computer that 'this is an EOF record.' Second, all of the data bytes are set to zero. An EOF record is always the last record of a file. BASIC does not normally use the EOF record. BASIC usually uses the partial data record which preceeds the EOF as an end of file marker.

Every normal record consists of 132 eight bit bytes. The first two bytes are used for speed control. The third byte is a special flag for identifying the type of record. The next 128 bytes are data bytes that may contain your program or other special information. The last byte of a record is a checksum byte which is used for read verification. The noise you hear on your TV monitor during read or write operations is the sound of a record. Some 'copy-protected' cassette programs make use of a technique that allows the number of data bytes (128 normally) to be changed to some other number. The only way to copy such programs is by using SIO. A CIO copier won't work on them.

The first two bytes of a record are used for speed control by your computer. The computer measures the time required to read these two bytes and makes small adjustments in some of the operating system variables. This process, called *baud rate synchronization*, tells the computer when and how fast information will be coming from your tape recorder.

The third byte of a record is a *special control code byte* that usually has one of three values. A value of **$FE** (hexadecimal) indicates that the record is an EOF record. A value of **$FC** says that all 128 bytes are full (used). This code also applies to a header record. All data records except the last one in a file will have this same control code. The last data record may have this code, but will not have it the majority of the time. Usually the last data record will have a control code of **$FA**. This code tells the computer that only some of the data bytes are full. The actual number of full data bytes will be given in the 128th data byte. The only time the last data record will not have the **$FA** code is when the size of your program is an even multiple of 128 bytes.

The last byte of a record is a *checksum byte*. The computer uses the value of this byte to validate, or verify, that the preceeding 128 data bytes were read properly. When your computer writes a

record onto a tape, a *checksum* is calculated for the 128 bytes in that record. This checksum is the value stored in the checksum byte. When the computer reads a record from tape, a new checksum is calculated for the 128 data bytes in that record. This new checksum is then compared to the value of the checksum byte. If the two checksums are equal then the computer proceeds to the next record. On the other hand, if the two values do not agree, you will get an error message.

The inter-record gap (IRG) between records actually is the sum of two gaps. Every record is preceeded by a *pre-record write tone* (PRWT) and is followed by a *port-record gap* (PRG). When records are concatenated, the resulting IRG equals the sum of the PRWT and PRG. The basic difference between continuous files and stop-start files is the length of IRG. Essentially, a continuous file has a small IRG, while stop-start files have a large IRG. The longer gap used with the stop-start files is just about IRG. The longer gap used with stop-start files is just about enough time to stop the cassette motor, restart it, and get the motor speed up to normal before the beginning of the next record. These electro-mechanical operations require far more time than the short IRG between records in a continuous file. There are conditions where the computer cannot accept data fast enough to accommodate non-stop loading. This is the reason for having two kinds of files.

The PRWT of a continuous file is not fixed. It is dependent upon software control and may have virtually any value. Stop-start files have a PRG anywhere from zero up to one second.

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