LEARN TO
PROGRAM
BASIC
PROGRAMMING
TOOLS
TRICKY TUTORIAL no.13

```
KE 87,34:POKE 207,99:NEXT
TO X+27,Y+88:SOUND 0,2,8,
10,12:FOR I = LEN(ABS(INT
HEN GOSUB 50:READ BOOK:B(
: Z = PEEK(242):LIST 800,
```

BASIC PROGRAMMING TOOLS

TABLE OF CONTENTS

INTRODUCTION

Here we are again at von Chip's school of programming. Today I am going to offer you the special session that I have been   promising. Here are some of my favorite programming tools to make life much easier. These we submitted by some of my honor students out there in ATARIland. Here is what each program does:

RENUMBER, DELETE, TRACE: These three commands are added to the Basic language for you. You will find writing a program much easier when you use my RENUMBERING and DELETE utilities to keep your coding in order. When you encounter one of those nasty "BUGS" that are hard to find, you can use my TRACE utility to step through your program, line by line, until you find the problem.

EXPANDER: Many programmers like to use as many statements as they can on a single line. Code written like that can be unmanageable and very difficult to read. I have provided "EXPANDER" to allow you to expand such programs out into single line statements that make sense.

QUICKREF: When your programs have many variables or constants in them, making changes can be difficult. QUICKREF will tell you how many variables you used, where they were used, and how much memory they required. It will also tell you how much memory the program uses as well as other data that will help you in making that amount smaller. QUICKREF is written in assembly language and is very "QUICK" and efficient. You'll love it!

LISTER: A bonus for printer owners! For printing ATARI program listings that might have special characters in them, I give you two separate "LISTER" programs. If you have an EPSON printer then you will be able to print the actual characters that you see on the screen. Otherwise, the alternative LISTER program allows special characters to be verbally displayed in brackets within your listing, ON ANY PRINTER!

Any defective tapes or disks should be returned to:

Educational Software Inc.
4565 Cherryvale Ave.
Soquel, CA 95073

ULTIMATE RENUMBER UTILITY
by
(C)1981 J. E. Wilder & D. J. Wilder
Version 2, May 1983

INTRO:

RENUMBER UTILITY provides a convenient RENUMBER function for ATARI BASIC which operates like a built-in command. You can change line numbers from any line you choose to the end of the program and all references to these lines in any statement are changed at the same time. This utility also provides a command to delete a range of lines from your BASIC program. In addition, when you press the BREAK key to stop operation of your program, you can either continue pressing BREAK to step through the program, one statement at a time, or type CONT and have operation resume at the next statement - not necessarily the next line as with the ATARI BASIC command. This BREAK-STEP operation can be very useful for finding errors in programs.

TECHNICAL NOTES:

As ULTIMATE RENUMBER UTILITY is entirely in machine language and operates directly on a BASIC program in memory, it is fast and no extra BASIC lines appear with yours when you list or save your program. It is not affected by a BASIC LOAD or NEW command or a SYSTEM RESET. It loads in wherever the low memory boundary is found and moves the MEMLO vector up by 1112 bytes to reserve space for itself. Page six of RAM is left open for use by your BASIC program for USR machine language routines or data storage. If any part of this utility is lost because you called DOS with no MEM.SAV file or you did a POKE in memory, the whole program disengages at the next keyboard input. The screen clears and that input is ignored, but your BASIC program is protected against loss due to faulty machine code.

DISK USERS:

With a modified Disk Operating System, the RENUMBER utility locates itself accordingly; but if your MEMLO value is more than 7420, the critical part will not be safe from a DOS call with no MEM.SAV file. In this case, when you call DOS, the normal initialization vector is restored and you are prompted to save your BASIC program and push RESET. This will erase both the RENUMBER utility and your BASIC program, but you can then call DOS. In other words, don't call DOS without a MEM.SAV file or you'll erase RENUMBER from memory!

MEMORY REQUIREMENTS

Memory requirements are only 16K RAM for either cassette or disk system.

RENUMBER

LOADING THE UTILITY INTO MEMORY

1. If you have another program in memory, save it on cassette or disk and turn the computer off so that the RENUMBER program can 'boot' on power up.

2. If you have an ATARI 850 Interface Module, make sure it is off during the boot operation. You can turn it on later to use a printer connected to the parallel port, but you can't use the RS232 ports with this utility.

3. If you are using a disk version, the disk drive must be turned on first and the BUSY light must go out before you insert the RENUMBER diskette.

4. With the RENUMBER disk or cassette in place, turn the computer on and the program will load into memory (on tape version hold the START KEY down while turning on the switch and push RETURN after the 'beep'). The READY prompt tells you that this utility is loaded and ready to use when needed.

USING ULTIMATE RENUMBER UTILITY

To RENUMBER a BASIC program in memory, type the RENUMBER command which may be abbreviated to REN. (be sure to include the period). The format is:

RENUMBER [lineno][,lineno[,incr]]

Where the first parameter is the starting line number. All lines are RENUMBERed from here to the end of your program. If this line number is not found, RENUMBERing starts at the next higher line number. Default value is zero. The second parameter is the new number to be assigned to this line. It must not be less than the first parameter to avoid overlapping lines that aren't RENUMBERed. If it is less, the same value is used. Default value is ten. The third parameter is the increment to be used between RENUMBERed lines of your program. If it's zero, a value of one is used. Default value is ten.

Example: RENUMBER 120,200,20

This will change line # 120 into 200 and the rest of the lines will follow in steps of twenty. You may then add new lines numbered from 120 to 199. All parameters are optional and default values will be used for any not given.

For example, to RENUMBER a program from line 120 to the end in steps of 10, type REN.120. You may omit parameters by typing a comma to skip a value. To RENUMBER the whole program in steps of five, using 10 as the new first line number, type REN.,,5. If you accept the default values for all three parameters, just type RENUMBER (or REN.) and push RETURN. Noninteger parameters are rounded to the nearest

integer and any greater than 32767 or negative show an error. Any reference number not among the lines to be changed is left as it was. If new line numbers would get too big or no lines are found, none are changed and 'LINE # TOO BIG' displays.

EXPRESSIONS AS LINE REFERENCES

ATARI BASIC allows the use of variables or expressions in place of line number references. Since we can't be sure such references are correct after RENUMBERing, the numbers of any lines containing them are listed on the screen with the message,'CHECK EXPRESSION IN LINE'. The line number is repeated for each statement containing such an expression in the line. Check all these expressions to make sure they're correct for the new line numbers. As a help, if the expression begins with a number, it is treated as a tie to a specific line number. For example, in the statement RESTORE 300+10*A, the '300' is subject to RENUMBERing but the '10' is not. Likewise in GOTO MARK+100 the '100' would not be changed because it isn't the first value in the expression. You should write programs with this in mind.

If your program has more than twenty statements with expressions for line numbers, the first twenty show on the screen, followed by '& MORE'. To find the rest, write down the ones on the screen then RENUMBER again, using the same parameters as before.

MOVING BLOCKS OF PROGRAM LINES

To move a group of lines from one part of your program to another, LIST the part on cassette or disk that you want to place earlier in the program, and remove these lines from program memory using the DELETE command. Next, RENUMBER the lines above the new location to be higher than those being moved. Then ENTER the lines back into memory from the cassette or disk. Finally, correct any references in the moved part to lines of the part that was RENUMBERed while it was on cassette or disk.

USING THE DELETE COMMAND

To DELETE a range of lines, type the command (abbreviated DEL.) in the format:

DELETE lineno [,lineno]

The first parameter is the number of the first line to be deleted and the second is the last. All lines between these will be deleted. If only one line is to be deleted, you may omit the second line number. At least one line number must be entered or the DELETE command will not be accepted.

RENUMBER

USING BREAK-STEP AND CONTINUE

While your program is running, you can push BREAK to
stop it. Then, each time you push BREAK, one more statement
will be executed and the display will show what line you are
on. Between steps, you can do immediate mode operations
such as print the values of variables to help in debugging
your program. You can list your program too, but if you
push any key on the keyboard while the operation is going
on, you will not be able to continue running your program.
Any I/O operation which uses IRQ interrupts will have the
same effect. If you type CONT your program will start
running again at the next statement - not necessarily on the
next line.

CAUTION: IF YOU PUSH "BREAK" TO STOP YOUR PROGRAM DURING AN
I/O OPERATION SUCH AS READING DATA FROM TAPE OR WRITING TO A
PRINTER, DO NOT TRY TO CONTINUE OR SOME OF THE DATA WILL BE
LEFT OUT. LIKEWISE, YOU CANNOT STEP THROUGH AN I/O
OPERATION WITH THE BREAK KEY.

VECTOR AND MEMORY USAGE

The immediate IRQ interrupt vector is used to give
control to the command search routine whenever the RETURN
key is pushed. It also stores the index to the next command
in location 4 when the first key is pushed from the
immediate mode GET RECORD routine and clears this location
on an interrupt not from the GET RECORD routine. Vectors
for both cassette and disk initialization are set to the old
MEMLO value where our initialization routine is loaded.
This routine sets the new MEMLO value and the interrupt
vector address at startup and whenever the RESET key is
pushed to make this utility RESET-proof. The numbers of
lines containing expressions for line number references are
stored in the printer buffer. Other temporary data is
stored in parts of zero page RAM used for BASIC floating
point numbers.
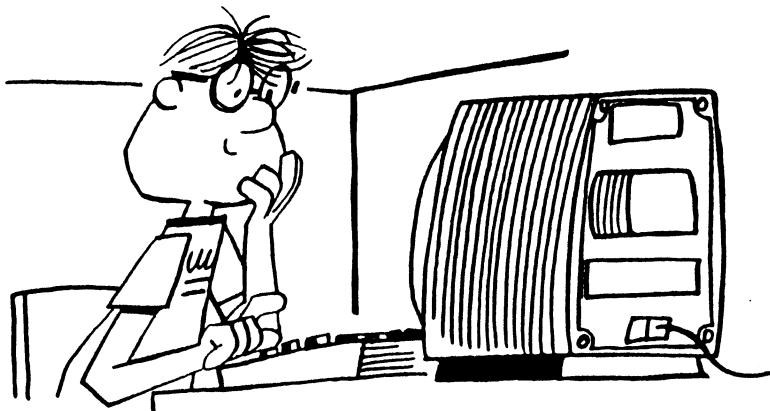
EXPANDER

Stan Gilbert

(Not available for tape users)

How many times have you tried to read a Basic program someone wrote that looked like this:

```
10 DIM D$(40),L$(40),M$(40):D$=" ":D$(34)="
":D$(2)=D$:L$="-":L$(34)="-":L$(2)=L$
100 GRAPHICS 0:SETCOLOR 1,0,0:SETCOLOR 2,0,10:? "THIS
IS A TEST":? :? "Γ ";L$;"⌐"
200 FOR I=1 TO 14:? "|";D$;"|":NEXT I:?
"L";L$;"⌐":POSITION 13,9:? "THIS IS A BOX":POSITION 2,20:END
```

It can get kind of messy trying to see that all the program does is this:

RUN

THIS IS A TEST

THIS IS A BOX
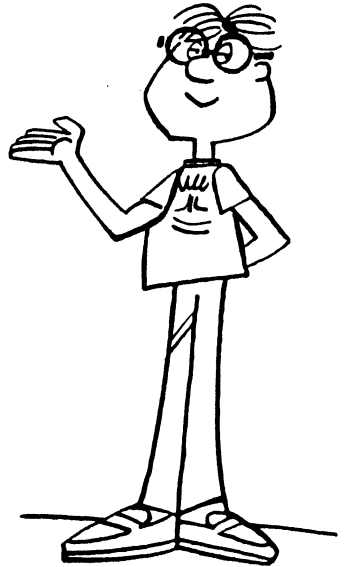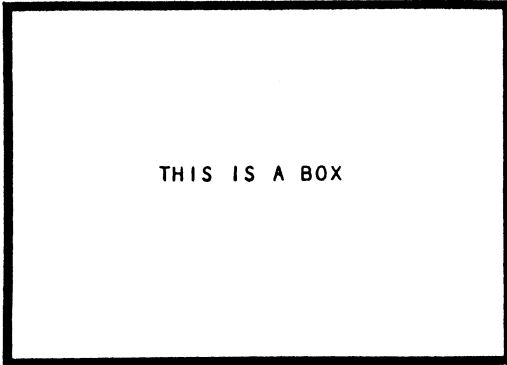
READY

Of course NONE OF US would ever write such messy and cramped code, but JUST IN CASE someone else does ......

EXPANDER

HOW TO USE EXPANDER:

The first thing you must do to prepare a program to use EXPANDER is to RENUMBER it. The program MUST start with a line number greater than 999 and the lines should be incremented enough to allow plenty of extra numbers between them for the multiple statements to occupy. For instance the example above has numbered lines of 10, 100, and 200. These offer plenty of room for lines to be added in between. If you needed more room, just run the renumber utility we have already discussed.

Once the program is RENUMBERed then it must be LISTed to disk with a filename extension of .LST. Here is an example:

LIST"D:SAMPLE.LST"

Now you simply RUN "D:EXPANDER" and the EXPANDER program will LOAD and RUN. You will then get a prompt that requests the SOURCE.LST filename. The source filename is the name you just used to LIST your program with. In our case we used "SAMPLE". EXPANDER will open the source file and create a destination file with the same name but an extension of ".EXP". Make sure you do not already have a file with that name as it will be erased and a new one created. EXPANDER will LIST the expanded program file to disk as it lists it to the screen. Once completed you can ENTER the FILENAME.EXP and RENUMBER your code to suit you. Here is our sample after expansion:

```
1000 DIM D$(40),L$(40),M$(40)
1001 D$=" "
1002 D$(34)=" "
1003 D$(2)=D$
1004 L$="-"
1005 L$(34)="-"
1006 L$(2)=L$
1020 GRAPHICS 0
1021 SETCOLOR 1,0,0
1022 SETCOLOR 2,0,10
1023 ? "THIS IS A TEST"
1024 ?
1025 ? "+";L$;"+"
1040 FOR I=1 TO 14
1041 ? "|";D$;"|"
1042 NEXT I
1043 ? "+";L$;"+"
1044 POSITION 13,9
1045 ? "THIS IS A BOX"
1046 POSITION 2,20
1047 END
```

And then renumbering:

```
RENUMBER 1000,1000,10

1000 DIM D$(40),L$(40),M$(40)
1010 D$=" "
1020 D$(34)=" "
1030 D$(2)=D$
1040 L$="-"
1050 L$(34)="-"
1060 L$(2)=L$
1070 GRAPHICS 0
1080 SETCOLOR 1,0,0
1090 SETCOLOR 2,0,10
1100 ? "THIS IS A TEST"
1110 ?
1120 ? "+";L$;"+"
1130 FOR I=1 TO 14
1140 ? "|";D$;"|"
1150 NEXT I
1160 ? "+";L$;"+"
1170 POSITION 13,9
1180 ? "THIS IS A BOX"
1190 POSITION 2,20
1200 END
```

This becomes much easier to read and maintain. It might even get an A+ the next time old Professor von Chip gives a test!
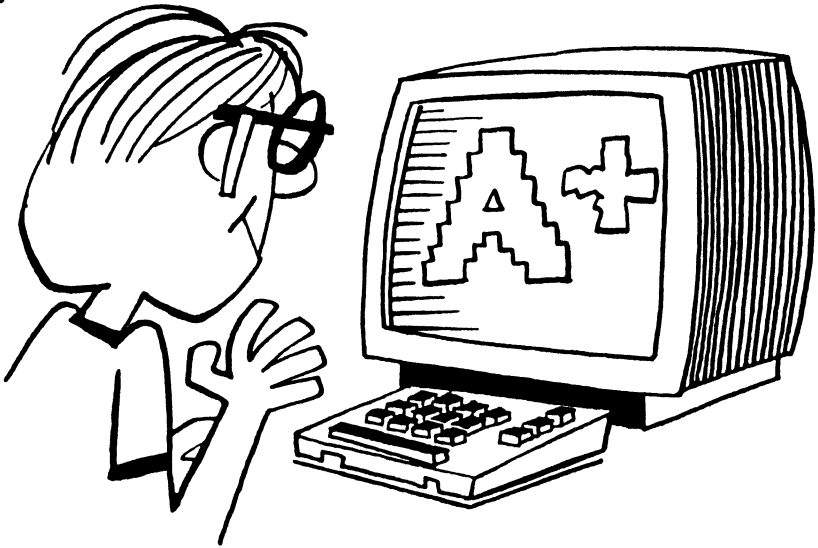
QUICKREF
by

Don Wahrmund and Gary Hewer

INTRODUCTION

If you need to quickly find every place an Atari BASIC
variable is used within a large BASIC program, QUICKREF can
help. This utility program alphabetically lists all the
variables used in a BASIC program on the screen or on a
printer. Underneath every variable, all the BASIC line
numbers which refer to the variable are listed. This
program also lists the numeric constants used in a BASIC
program. It shows the number of times each constant was
used and lists the constants in order based on how often
each was used. This information is valuable to BASIC
programmers because numeric constants can consume a lot of
computer memory.

Next, QUICKREF tells how many bytes of computer memory are
being used by a program and by the constants and remarks
contained within the program. This program also tells how
many bytes are being used by the system tables which hold
the variable names and values. Finally, it tells the number
of bytes of memory left available for dimensioned strings
and arrays plus free memory. QUICKREF is a useful tool to
help a BASIC programmer debug programs and use computer
memory effectively.

LOADING QUICKREF INTO COMPUTER MEMORY

If you have the cassette version of QUICKREF

1. Remove any program cartridge from the cartridge slot of
    your computer console.

2. Have your computer turned off. Also have any disk
    drives or Atari 850 Interface Module turned off.

3. Insert the QUICKREF cassette into the program recorder's
    cassette holder. Press REWIND on the recorder until the
    tape rewinds completely. Reset the tape counter to 000
    and ADVANCE the tape until the tape counter shows you're
    at the start of QUICKREF.

4. Press PLAY to prepare the program recorder for loading
    QUICKREF.

5. Turn on your computer while holding down the [START]
    key.

-10-

6. When you hear a beep, release the [START] key and press the [RETURN] key. The program will load into computer memory and start automatically. The program's first display screen will appear as shown in Figure 1A.

7. Remove the QUICKREF cassette from the cassette recorder

8. If you plan to use your printer, turn it on now. Also turn on the ATARI 850 Interface Module if it is required to operate your printer.

If you have the diskette version of QUICKREF

1. Turn on your disk drive.

2. When the BUSY light goes out, open the disk drive door and insert the BASIC Utilities Tricky Tutorial diskette with the label in the lower right-hand corner nearest to you.

3. Turn on your computer and your TV set. Atari DOS 2.0S will automatically load into computer memory.

4. If you plan to use your printer, turn it on. Also turn on the ATARI 850 Interface Module if it is required to operate your printer.

5. Type "L" for BINARY LOAD and press [RETURN].

6. Type the filename "QUICKREF" and press [RETURN].

7. As the program automatically loads into computer memory, this message appears on the TV screen:

> LOADING QUICKREF
> PLEASE WAIT...

Then the program's first display screen appears as shown in Figure 1B.

8. Remove the QUICKREF diskette from the disk drive after the BUSY light goes out.

QUICKREF

THE FIRST DISPLAY SCREEN

If you have the cassette version of QUICKREF

The first display screen contains the program title, version number, and date. The yellow prompt line at the top of the screen instructs you to insert your BASIC saved program cassette. The same line also informs you that you may press the [START] key to proceed. The first display screen looks like this:

Figure 1A

```
┌─────────────────────────────────────────┐
│           ___ QUICKREF ___                │
│   Insert cassette, press PLAY & START.    │
│                                           │
│           QUICKREF Rev 1.2                │
│        ───────────────────                │
│              7/15/83                      │
│    ATARI BASIC Variable Cross Reference   │
│    (c) 1983    Don Wahrmund & Gary Hewer  │
│                                           │
│   You must first SAVE"C: your program.    │
└─────────────────────────────────────────┘
```
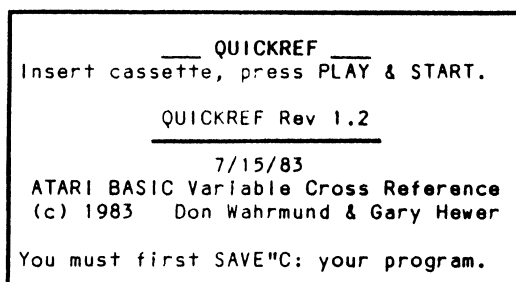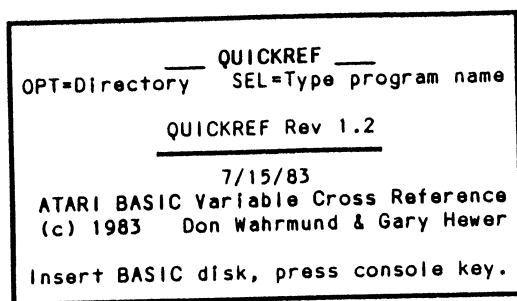
You are now in the QUICKREF utility program and are ready to start using this program on your BASIC programs saved on cassette.

-12-

If you have the diskette version of QUICKREF

The first display screen contains the program title, version number, and date. The blue option line at the bottom of the screen instructs you to insert your BASIC saved program diskette. The yellow prompt line at the top of the screen informs you which keys you may press. Press the [OPTION] key to see an alphabetic directory of the files on your disk. Instead, press the [SELECT] key if you want to directly type in the name of the BASIC saved program you wish to have referenced. The first display screen looks like this:

Figure 1B

```
┌────────────────────────────────────────────┐
│            ___ QUICKREF ___                 │
│  OPT=Directory    SEL=Type program name     │
│                                             │
│             QUICKREF Rev 1.2                │
│            ─────────────────                │
│                7/15/83                      │
│  ATARI BASIC Variable Cross Reference       │
│   (c) 1983   Don Wahrmund & Gary Hewer       │
│                                             │
│  Insert BASIC disk, press console key.       │
└────────────────────────────────────────────┘
```

SAMPLE APPLICATION USING CASSETTE

Let's go through a sample application of QUICKREF. Let's assume you want to see all the variables and constants used in an Atari BASIC program you've already saved on cassette by typing SAVE"C:. We'd like to see QUICKREF run as quickly as doing a LOAD"C:. Simply follow these steps:

1. Insert your BASIC cassette into your cassette recorder.

2. Press the [START] key to display the screen/printer menu. (Please see Figure 4.)

3. The display contains the message "Ready to reference..." Press the [START] key to run QUICKREF.

4. Press [SPACE BAR] to view each successive page of your results until the summary page appears. (Please see Figures 6, 7 and 8.)

5. Press [OPTION] key if you wish to return to page one to review your results again.

6. Finally, press [START] key to prepare to run your next BASIC program.

That's it. You've now used the cassette version of QUICKREF once with all the default options. You're invited to read the rest of the manual to find out how to use the other options. Or, if you wish, you may now treat this utility program as you would an adventure game and try to learn all its tricks on your own. But it won't be much of an adventure. The prompt line and option line give everything away.

SAMPLE APPLICATION USING DISKETTE

Let's go through a sample application of QUICKREF. We'd like to see if it really is quick. Let's assume you want to see all the variables and constants used in an Atari BASIC program named EXAMPLE1.BAS, for lack of a more clever name. Please follow these steps quickly (to help this program live up to its name):

1. Insert your BASIC disk into drive one.

2. Press [OPTION] key to display disk directory. (Please see Figure 3.)

3. Press [SPACE BAR] to display each successive page of the disk directory until EXAMPLE1.BAS appears.

4. Press [SELECT] key to move the cursor to EXAMPLE1.BAS.

5. Press [START] key to load EXAMPLE1.BAS into computer memory.

6. The screen/printer menu displays after your program loads. The display contains the message "Ready to reference EXAMPLE1.BAS". Press [START] key to run.

7. Press [SPACE BAR] to view each successive page of your results until the summary page appears. (Please see Figures 6, 7 and 8.)

8. Press [OPTION] key if you wish to return to page one to review your results again.

9. Finally, press [START] key to prepare to run your next BASIC program.

LOADING A BASIC PROGRAM FROM CASSETTE

Saving BASIC program using SAVE"C:

Before you can use QUICKREF with a cassette recorder, you must type SAVE"C: to save your program. Atari BASIC programmers usually prefer CSAVE and CLOAD over SAVE"C: and LOAD"C: because they're faster. CSAVE uses one quarter second gaps between the 128 byte records, which can be heard as one quarter second of silence between the buzz made by each record. SAVE"C: uses three second gaps between each record and allows the cassette motor to stop briefly while the computer is working with the cassette data. QUICKREF uses these gaps to reference your program. This way, as soon as your program is completely loaded, results will appear almost instantly on your TV screen or printer.

Loading Your SAVE"C:'d Program

The Initial Display should appear on your TV screen as shown in Figure 1A. Set your cassette recorder to the start of your SAVE"C:'d program and press your recorder's PLAY button. Then press the computer console [START] key. The Screen/Printer Menu will appear on your TV screen as shown in Figure 4. At this point let's use the default options by simply pressing the [START] key once more. The console speaker will beep once and the cassette recorder will start automatically. You need not press the [RETURN] key. After your entire BASIC program has loaded the cassette recorder will stop automatically. Then results will appear on your TV screen.

Cancelling request for a program

If at any time you decide not to run QUICKREF on a BASIC program you've already selected, press the [SYSTEM RESET] key. The computer will immediately stop whatever it's doing and return you to the initial display (Figure 1A).

LOADING A BASIC PROGRAM FROM DISKETTE

Setting Disk Drive Number

QUICKREF will use disk drive number one unless you request that another drive be used. To use disk drive number two (or three or four), follow these steps:

QUICKREF

1. While the initial display appears on the TV screen (as shown in Figure 1B) press the [SELECT] key. The "Type in name..." screen display will appear as shown here:

Figure 2

```
 ___ QUICKREF ___

 Type in name of ATARI BASIC
 saved program and press RETURN.
```

2. Type in the three characters "D2:" (or "D3:" or "D4:") without entering any filename and press [RETURN].

3. Ignore the "ILLEGAL FILENAME" message which appears on the screen. We purposely neglected to type in a legal filename at this time.

4. Press [RETURN] once more without typing in any filename. The disk drive you selected will start running and within three seconds your disk's directory will appear. All filenames will appear in alphabetic order.

If disk drive two (or three or four) is properly connected to your computer and is turned on, QUICKREF will continue to use that drive unless one of two things happens:

1. If you type in a new drive number, then QUICKREF will start to use that new drive number.

2. If a disk cannot be read in drive two (or three or four) for any reason, then QUICKREF starts to use drive one. For example, if you initially try to switch QUICKREF from drive one to drive two, but drive two is not turned on, then QUICKREF automatically switches back to drive one. This automatic switching is intended to prevent the computer from waiting needlessly to load a BASIC program from a drive which isn't ready to be used.

If you know the exact filename of your BASIC saved program and want to change to a different disk drive number, you need only follow these two steps:

1. While the initial display appears on the TV screen (as shown in Figure 1B) press the [SELECT] key. The "Type in name..." screen display will appear on the TV screen.

2. Type in "D2:" (or "D:", "D1:", "D3:" or "D4:") followed by your BASIC program's filename (example: D2:MYPROG.BAS) and press [RETURN].

Loading program from directory

If the initial display appears on the TV screen (as shown in Figure 1B) you may press the [OPTION] key to display your disk's directory. On the other hand, even if the "Type in name..." display (Figure 2) is on your TV screen, you might prefer using the directory over typing in your filename. You may do so by pressing the [RETURN] key if you haven't typed anything else. The disk directory looks like this:

Figure 3

```
___ QUICKREF ___
SEL=cur | SPACE=pag | STR=load RST=quit
          DIRECTORY
       -------------
       EXAMPLE1.BAS
       FILEONE .BAS
       MYPROG  .BAS
             .
             .
             .
Screen/Printer | Variables/Constants
```
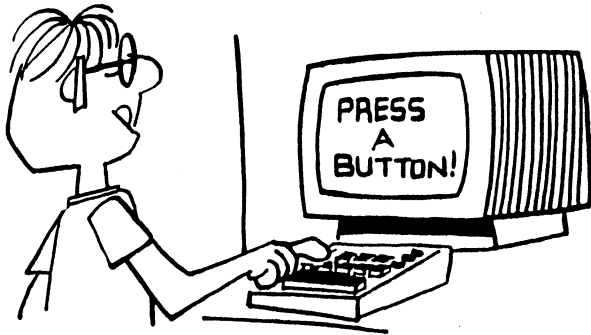

Next, to select a program and then load it into computer memory, follow these steps:

1. Program filenames are presented in pages, with each page holding a maximum of 16 filenames. A disk can hold up to 64 filenames, so you may need to review up to four different pages before you find your desired BASIC program's filename. If your program doesn't appear on the first page of the directory, press the [SPACE BAR] to display each successive page of the directory until your program appears. If you hold down the [SPACE BAR] you will rapidly page through the four pages. After you see page four displayed, you return to page one.

2. While viewing the directory page which contains your BASIC program, press the [SELECT] key to move the cursor down to your program. If you accidentally move the cursor past your program, keep holding the [SELECT] key down until the cursor moves off the bottom of the program filenames, reappears at the top of the filenames, and again moves down to your program. When the cursor rests beside your program, you are ready to load your program into computer memory.

3. Press [START] to load your program into computer memory. After your program loads into computer memory, the Screen/Printer Menu will display on the TV screen as shown in Figure 4. If your program is 32 sectors or shorter, your whole program will load into computer memory. If your program is longer than that, only the first part of your program will load now. The rest of your program will load after you start the referencing part of QUICKREF. Long programs may require several partial loads at that later time, but the loading process is automatic and fast. What is important is that most of your computer memory is saved for the variable and constant reference results.

Typing a BASIC program filename

If you wish to choose a BASIC program by directly typing in the program's filename, and the initial display is on the TV screen (Figure 1B), press the [SELECT] key. The "Type in name..." display will appear as shown in Figure 2. Then type in the exact filename and extension of your program (example: "EXAMPLE1.BAS"). QUICKREF does not allow the use of "?" and "*" wildcards as allowed by Atari DOS 2.0 due to memory saving steps taken in QUICKREF. The disk directory option should eliminate the need for the wildcard feature.

Typing the disk drive number is optional. You may type the two characters "D:" or the three characters "D1:" before your filename to specify drive one. You may type "D2:", "D3:", or "D4:" before your filename to specify drive two, three, or four respectively. As noted earlier, if the disk in the specified drive cannot be read for any reason, then QUICKREF will automatically switch back to using drive one. This automatic switching is intended to keep the computer from needlessly trying to use a disk drive which may be turned off or disconnected. Presumably drive one will always be turned on and connected.

QUICKREF

Cancelling request for a program

If at any time you decide not to run QUICKREF on a BASIC program you've already selected, press the [SYSTEM RESET] key. The computer will immediately stop whatever it's doing and return you to the initial display (Figure 1B). All options will be reset to default values except the disk drive number. However, because the computer memory used for storing results is cleared, you should press [SYSTEM RESET] only if you don't mind losing any results that you have already collected. Fortunately, this program is fast enough that most BASIC programs can be referenced in less than two minutes, excluding the time to print results or display results on the TV screen.

SELECTING WHERE TO SEND RESULTS

Selecting screen or printer

You can send the variable and constant results to either the screen or a printer. QUICKREF will send results to the TV screen unless you specify using a printer instead. If you haven't yet loaded your BASIC program into computer memory, follow the directions under **Loading Your SAVE"C:'d Program** or **Loading program from directory**. After your BASIC program is loaded, the following display will be on your TV screen:

Figure 4

```
Ready to reference EXAMPLE1.BAS

        SEND RESULTS TO:
    ---------------------
    Screen   (default)
    40 column printer
    80 column printer
    132 column printer

this screen  |variables & constants
```

To print results on a printer instead of displaying results on the TV screen, follow these steps:

1. Press the [SELECT] key to choose your printer width in characters. If you have a 40 column printer, you should select the 40 column printer option. If you are using the normal character set on an 80 column printer, you may select the 80 column printer option. However, if you previously set up your 80 column printer to use the condensed character set, which allows 132 characters per 8 inch wide line, you may select the 132 column printer option. If you have a wide 132 or 136 column printer such as an Epson MX-100 and are using 15 inch wide paper, you may select the 132 column printer option. Release the [SELECT] key when the cursor is beside the screen or printer option you want.

2. You may now press the [OPTION] key to choose between referencing variables and constants. This option will be described in more detail under "SELECTING DATA TO GATHER" on the next page. Instead, you may press the [START] key to start running QUICKREF. Also, you may press the [SYSTEM RESET] key to quit running QUICKREF on this BASIC program and return to the initial display (Figure 1A or 1B).

Setting up printer

QUICKREF assumes that you are using fanfold or roll paper and that each page is 11 inches long. QUICKREF provides the filename of your BASIC program and the page number at the top of each page. Top, bottom, and right margins are also provided on each page. QUICKREF starts printing on the paper without first advancing it. Therefore, you should allow a two thirds inch top margin (four lines) between the print head and the top of the paper when you align your paper. QUICKREF provides no left hand margin. You may position your paper to allow for a left hand margin as you would do for a BASIC program listing.

QUICKREF

Gathering variables and constants

When referencing small and medium size BASIC programs, you may want to gather data on both variables and constants at the same time. The default option will do this. Gathering both types of data at the same time is almost as fast as gathering either type of data separately. In fact, the only time you'll be prevented from accumulating information on variables and constants at the same time will be when your BASIC program is too large. All the reference data might not fit in computer memory at one time. If you're in doubt, use this default option anyway. The worst thing that can happen is that you'll get an error message and you'll have to run QUICKREF two more times to get variables and constants separately.

If you want to run QUICKREF using this default option, you can press the [START] key. It doesn't matter whether the Screen/Printer Menu (Figure 4) or the Variables/Constants Menu shown in Figure 5 is being displayed. Of course, cassette users will not see a filename following the words "Ready to reference...". Remember that the blue option line at the bottom of the screen shows you the current options. This line shows "variables & constants" unless you've selected another option.

```
┌─────────────────────────────────────────────┐
│           ___ QUICKREF ___                   │
│   OPT=menu SEL=cursor│ STR=run RST=quit       │
│                                               │
│      Ready to reference EXAMPLE1.BAS          │
│                                               │
│         GATHER DATA ON:                       │
│         ─────────────────                     │
│                                               │
│         variables & constants                 │
│         variables only                        │
│         constants only                        │
│                                               │
│   this screen  │variables & constants         │
└─────────────────────────────────────────────┘
```

Figure 5

Gathering variables only or constants only

When you reference a very large BASIC program, you may need to gather data separately on variables and constants. By running QUICKREF once for variables only and once for constants only, you stand less chance of completely filling computer memory than if you run QUICKREF for variables and constants at the same time. Fortunately, only exceptionally large BASIC programs are likely to require separate runs for variables and constants.

A 16K cassette system usually has room for at least 500 variable reference line numbers or 250 different numeric constants. A 24K RAM diskette system has room for at least 2000 line numbers or for 1000 different constants. Larger systems have room for more line numbers or constants. As you might expect, the BASIC program size you can reference depends solely on:

1. How many times variables are used in the program.
2. How many different constants are used.
3. For cassette users, the variable name lengths.

Nothing else matters. That's refreshing, isn't it?

You might also want to run QUICKREF on only variables or constants not because you need to, but because you want to. Use the variables only or constants only options to save a little time, or paper, or both.

To gather data on variables only or constants only, follow these steps:

1. While the Screen/Printer Menu (Figure 4) is being displayed on the TV screen, press the [OPTION] key to display a new menu of choices. The Variables/ Constants Menu will display as shown in Figure 5.

2. Press the [SELECT] key to choose variables, constants, or both together. Release the [SELECT] key when the cursor is beside the variables or constants option you want. Then the blue option line at the bottom of the TV screen will show your newly selected option as "variables only" or "constants only". The line will instead show "variables & constants" if you return to the default option.

3. If for any reason you would now like to change the screen/printer option, which is shown in the blue option line, press [OPTION] to return to the Screen/Printer Menu (Figure 4). Follow the directions under "SELECTING WHERE TO SEND RESULTS" presented earlier in this manual.

4. If all your options are set properly, press [START] to start running QUICKREF on your BASIC program. If your program is saved on cassette using SAVE"C:, the console speaker will buzz once. Then the cassette will automatically load into computer memory. After the entire program has been loaded, QUICKREF will start sending results to the TV screen or printer.

QUICKREF

If your program is saved on diskette and occupies no
more than 32 sectors, QUICKREF will start sending results to
the TV screen or printer in a few seconds. If your program
is longer than that, your disk drive will start running.
Your BASIC program will load into computer memory a portion
at a time. As mentioned earlier, the process of loading
only portions of a program at a time is important. It saves
most of your computer memory for the variable and constant
reference results.

STARTING QUICKREF

You can start running QUICKREF from either the Screen/
Printer Menu (Figure 4) or the Variables/Constants Menu
(Figure 5). Before you start to run QUICKREF, check the
blue option line at the bottom of the TV screen. If it
doesn't show the options you want, press the [OPTION] key to
choose the menu which holds the options you want to change.
Also, you may press the [SYSTEM RESET] key to quit running
QUICKREF on this BASIC program and return to the initial
display (Figure 1).

If the option line shows the screen/printer and
variables/constants options you want, press the [START] key.
Results for the BASIC program should appear after the entire
program loads from your cassette recorder or disk drive into
computer memory. Figure 6 shows the first page of sample
variable results on the TV screen for the program named
EXAMPLE1.BAS:

Figure 6

```
┌─────────────────────────────────────────┐
│          ___ QUICKREF ___                │
│EXAMPLE1.BAS                   Page 001   │
│                                          │
│             Variable ACCOUNT             │
│                                          │
│                                          │
│       was found on lines:                │
│          100     100     300    1000     │
│       It had 4 references                │
│                                          │
│       Variable ARR2                      │
│       an array, was found on lines:      │
│          100     300                     │
│       It had 2 references                │
│                                          │
│                                          │
│       Variable ARTIST$                   │
│        was found on lines:               │
│            0                             │
│       It had no references               │
│          Press SPACE BAR to continue     │
└─────────────────────────────────────────┘
```

-23-

Note that variable ACCOUNT is a "scalar", meaning it has a single value. ACCOUNT is used twice on line number 100 and once on two other lines. Variable ARR2 is an array and is used on two different lines. Variable ARTIST$ is a string. It was used at one time in "EXAMPLE1.BAS" but is no longer being used. However, it's using up one of the 128 variable locations available in the system tables. An easy way to get rid of unused variables is to load a program, list it to cassette or disk (Examples: LIST"C: or LIST "D:EXAMPLE1.LST), type "NEW", and enter it into computer memory (Example: ENTER"C: or ENTER "D:EXAMPLE1.LST).

When both variable and constant results are requested, constants appear after all variables are displayed. Figure 7 shows sample constant results on the TV screen for the program "EXAMPLE1.BAS":

Figure 7

```
           ___ QUICKREF ___
EXAMPLE1.BAS                    Page 009
_____
               Constants
_____
         CONSTANT      TIMES USED
            1              26    .
            0              18
            .              .
            .              .
            .              .
       Press SPACE BAR to continue
```

Note that the numeric constant "1" is used 26 times in EXAMPLE1.BAS. It appears first because it's the most frequently used constant in the program. The constant "0" is the next most used constant, and so on.
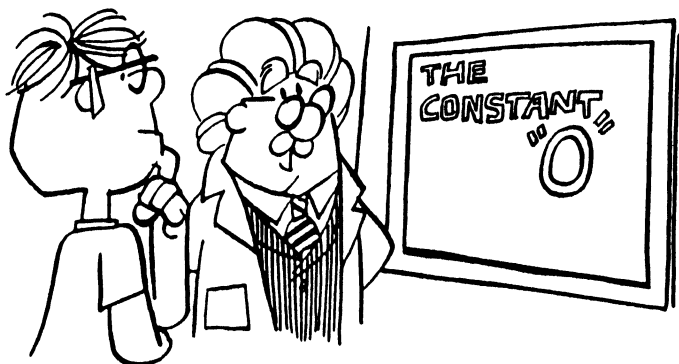
QUICKREF

Results sent to screen

When variable references and numeric constants are sent to
the screen, you should press the [SPACE BAR] each time you
want to see the next page of results. You may quickly page
through the results by holding down the [SPACE BAR]. You
may page forward but not backward. The last page displayed
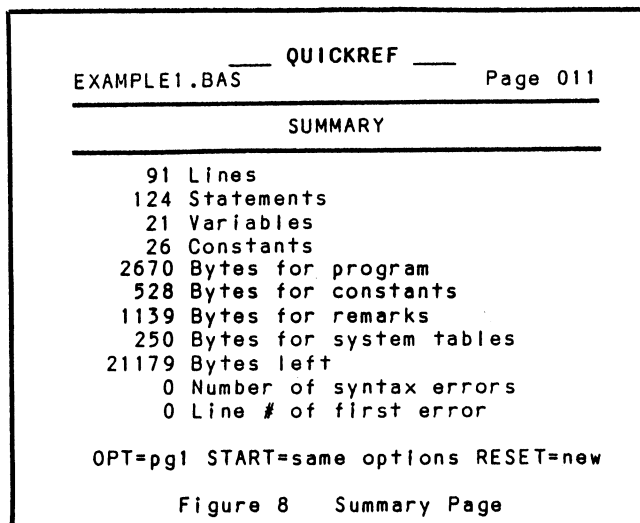is the Summary Page as shown in Figure 8:

```
┌─────────────────────────────────────────────────────┐
│                  ___ QUICKREF ___                    │
│    EXAMPLE1.BAS                      Page 011        │
│    ─────────────────────────────────────────────     │
│                      SUMMARY                         │
│    ─────────────────────────────────────────────     │
│                                                      │
│       91 Lines                                       │
│      124 Statements                                  │
│       21 Variables                                   │
│       26 Constants                                   │
│     2670 Bytes for program                           │
│      528 Bytes for constants                         │
│     1139 Bytes for remarks                           │
│      250 Bytes for system tables                     │
│    21179 Bytes left                                  │
│        0 Number of syntax errors                     │
│        0 Line # of first error                       │
│                                                      │
│      OPT=pg1 START=same options RESET=new            │
│                                                      │
│          Figure 8    Summary Page                    │
└─────────────────────────────────────────────────────┘
```

The summary page contains information useful to BASIC
programmers. The first two lines give the total number of
lines and statements used in your program. The third line
gives the total number of defined variables. Some of the
variables may not be referenced because they were deleted,
but their names and values still take up space. The fourth
line gives the total number of different constants. The
fifth line gives the total number of bytes used by all the
lines in the program.

The following two lines show how many of the program bytes
are used for constants and for remarks. The 91 lines in the
program EXAMPLE1.BAS use 2670 bytes. Of those bytes, 528
are used for constants. If all the constants could be
replaced with variables, which is unlikely, the program
could be reduced to 2142 bytes. If all remarks were
removed, the program could be further reduced to only 1003
bytes.

The next line gives the number of bytes used for the two system tables. One table contains each defined variable name. The other table contains values of all scalar variables and pointers to all string constants and array values.

The following line gives the number of bytes left for free memory plus memory for the string data and array values you set aside when you dimensioned your strings and arrays. QUICKREF calculates the number of bytes left assuming you use DOS 2.0S and either one or two ATARI 810 disk drives. The FRE(0) BASIC function gives the exact number of bytes of memory free for your use. This number will generally be smaller than the number of bytes left shown by QUICKREF due to the memory needed for string and array dimensions.

The last two lines show the number of syntax errors contained in your program and the line number of the first syntax error. If a program contains more than one syntax error, you can first correct the line number shown by QUICKREF. Then you can run QUICKREF again to find the line containing the second syntax error, correct it, and so on.

Finally, if you want to see a page which was previously displayed, you may press the [OPTION] key after the summary page has been displayed. You will then return to the first page of the results. From there you may page through the results again.

Results sent to printer

When variable references and numeric constants are sent to your printer, you can press the [SPACE BAR] each time you want to either stop or restart the printer. Otherwise the printer will keep printing until all results have been printed. The [SPACE BAR] allows you to adjust the paper in the printer if necessary or to feed single sheets if desired. The printer will stop only at the end of a line or while advancing paper between pages. It won't stop while the summary page is printing. While the printer is printing, the following message appears on the TV screen:

                Outputting to printer
                Press SPACE BAR to pause

While the printer is stopped, the following additional message appears on the TV screen:

                Printer stopped
   Press SPACE BAR to restart

In certain cases another method may allow a printer to be stopped and restarted, but this method is not recommended. The "on-line/off-line" switch provided on some printers, such as the EPSON MX-80 and FX-80 printers, can be used to stop and restart printing. However, you might lose a line of output. QUICKREF waits 30 seconds while the printer is off-line before showing an error message on the TV screen.

Finally, if you want to print the results again, realign your paper in your printer after the summary page is printed. Then press the [OPTION] key. The printer will reprint all results starting with the first page.

SELECTING NEW BASIC PROGRAM

After the SUMMARY page is printed, you may want to select another BASIC program to reference. If so, press the [START] key to retain your previous options or press the [SYSTEM RESET] key to reset the default options.

Pressing either key redisplays the initial display (Figure 1). Pressing either key also lets QUICKREF keep using the same disk drive it has been using. However, pressing the [SYSTEM RESET] key makes QUICKREF return to the default options of sending results to the TV screen and gathering data on both variables and constants.
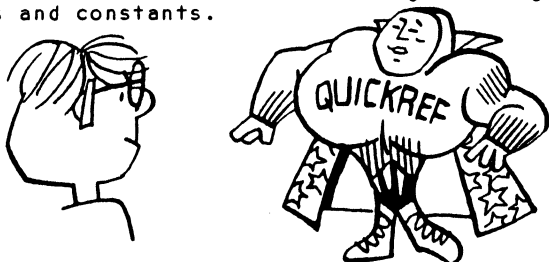
QUITTING QUICKREF

Press the [SYSTEM RESET] key to quit whatever QUICKREF is doing and return to the initial display. You can press this key at any time. The [SYSTEM RESET] key is handy for stopping QUICKREF after it has already started referencing a BASIC program. Use it if you change your mind and decide you don't want or need the reference information. All data gathered to that point is lost, but QUICKREF can easily gather new data.

When you're finished using QUICKREF simply turn off the computer.

LISTER
by

Gordon Banks

USER INSTRUCTIONS

LISTER is a program designed to provide the user with greater control in producing printed program listings. LISTER will allow the printing of any standard ATARI character, to include control characters, graphics characters, and the inverse video characters. LISTER will read and print any untokenized file (i.e., those LISTed or PRINTed to the disk or cassette).

Using LISTER, you'll have various options to control the physical layout of your printed listing. Using the normal procedure of loading your program into memory and the using the command LIST "P:" is admittedly faster and simpler than using LISTER. Likewise, a bicycle is simpler than your car, and an airplane is faster, but they are not practical for most uses, so you use your car. The normal method of printing a program listing is likewise impractical if your program contains graphics and/or control characters. The printer won't print them. Also, the printer sees certain ATARI graphics characters as 'printer control characters', and when the printer receives these codes it executes certain functions or actions that are not desirable. For example, if your program contains the graphics character produced by CTRL-N, the printer will start printing enlarged characters for the rest of that line. A CTRL-L will force the printer to feed another sheet of paper through. LISTER defines these characters in terms that the printer understands as 'print them, don't read them'. So, LISTER will allow you to print listings that may be otherwise unprintable! The printer is controlled through the program by you, the user.

Program listings printed with LISTER offer several other advantages also. You have options available to you that will make your listings easier to read and easier to make notes and/or corrections on. Since all characters are printed, these printed listings are excellent for magazine articles, newsletters, etc. You even have the option of marking the blank spaces within strings. How many times have you been typing in a program from a printed listing, found a long string of spaces, and couldn't figure out just how many there were supposed to be. LISTER will, if you so choose, mark each space making them easily counted. You also control how many characters will be printed in each line.

LISTER

If you have an Epson printer, we include a special version
of LISTER, called EPSNLSTR. To print the normally
non-printing characters, EPSNLSTR takes direct advantage of
the graphics capability of the EPSON graphics-capable
printers (if you don't have an Epson, LISTER prints a
textual abbreviation for the non-printing characters). Most
of the 'special characters are printed in the
high-resolution mode, while some require the
super-high-resolution mode. Because of the time required to
print characters in these modes, certain short-cuts have
been taken in order to speed things up, but all characters
are easily distinguishable, and you may even elect to
include a list of the 15 control characters and the 'blank
space mark' at the end of your program listing.

Preparation for LISTER is quite simple. First of all, you
need to insure that the program to be printed is stored on
your disk or cassette in the 'untokenized' format. Using the
command LIST "D:filename.ext" (or LIST "C:" for cassette)
it'll store your program in it's untokenized format.   SAVE
"D:filename.ext" (or CSAVE) tokenizes the listing in a
special way that LISTER cannot read. If you're not sure
about this, just load your program into the computer. Then
use the command LIST "D:filename.ext" (or ...)to store it
back onto the disk. You can use a different filename if you
wish, but remember that to load the untokenized version back
into the Atari, you'll need to use the command
ENTER"D:filename.ext"(one more time, or ENTER"C:"). This
will also rid your program of any variables that were used
when you were developing it, but that are no longer
necessary.

Secondly, insure that the top edge of the next sheet of
paper is aligned with the upper edge of the aluminum bar the
printer head prints against. This insures that the paper
advance function will operate correctly.

Finally, unless you select otherwise, the printing will
begin at printer position '0' (see the numbered rail). You
may wish to adjust the horizontal position of the paper to
allow extra margin space at one side or the other. Some
folks like a wide left margin to allow room to punch holes
for a three-ring binder.

Now you are ready to go....WHOOPS! Did you turn on the
printer and prepare the interface module or cable?
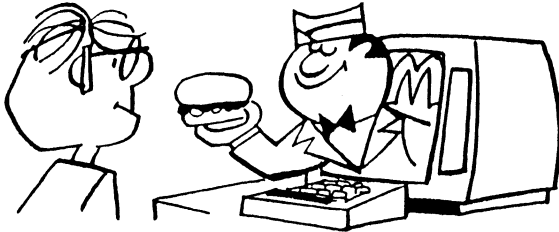
LISTER

USING LISTER

Okay, your program is stored on the disk/cassette in the untokenized form, your printer is adjusted and turned on, and your interface is ready. What's next?

RUN "D:LISTER" (or D:EPSNLSTR)

If you're using cassette, position the tape to the beginning of the version you want to use and press the PLAY key. Type "CLOAD", press RETURN, and press RETURN again after the Atari beeps. When the READY prompt appears on the screen again, type "RUN" and press RETURN.

The first screen you'll see is just our advertisement. You really should study this screen for a few hours, or until you're sure you know who we are. There may be a quiz later! Once you are confident, press the START key.

The next screen is just to remind you to insert the disk or cassette with the program to be printed. Once this is done, press the START key again.

THE MAIN MENU....AT LAST! This is a screenful, but don't let it scare you. Let's start at the top. That's just the name of the program, PROGRAM LISTER. Then come a few lines telling you what LISTER does. The line of control characters is just a sample of what we can now print on paper. Next we have the list of options, with their 'default condition' stated. The default condition is how that option will be handled unless you choose differently. Now let's discuss each of the options before we proceed.

(1) NO LIST OF CONTROL CHARACTERS... Since we are not accustomed to seeing the control characters on paper, you may wish to include a list of them, with their meanings, right after your program listing. After you've used LISTER a few times though, you'll no longer need the list, so the default condition for this option is NOT to print the control characters list.

(2) FORMATTED LISTING... When you type a program line onto
the screen, and again when you LIST it on the screen, all of
the statements in that line appear one right after the
other, seperated by a colon. This is fine on the screen
where the editing function will allow you to delete and
insert characters and lines, but you can't do that on
printed paper. A normal printed listing will print your
program lines the same way. LISTER, however, is not
satisfied with 'normal', so you have another choice. If you
choose the FORMATTED LISTING option, your printed listing
will print every statement on a separate line. This does
produce a longer printout, but the program is oh so much
easier to read, and easier to make pen and pencil changes
and notes on. If you use your listing to look for program
bugs, you will really appreciate this option. For example,
the program line...

        100 GRAPHICS 0:SETCOLOR 2,9,4:GOSUB 500:GOTO 10

will appear just like that on the screen, and in a normal
printed listing. LISTER, though, will allow you to format
the listed lines to appear as...

        100 GRAPHICS 0
            :SETCOLOR 2,9,4
            :GOSUB 500
            :GOTO 10

...leaving you with plenty of room beside each statement to
make notes and/or changes. The changes, of course, would be
'improvements'. You and I do not make 'mistakes' and
therefore need no 'corrections' (some folks do, however). I
like the FORMATTED LISTING feature so much, I have made the
default for this option to print using the FORMATTED
LISTING. You, of course, may change this. Note too that you
MUST select this option if you wish to use the LINE
INDENTATION option later.

(3) NO LINE SKIPOVER AT END OF PAGE... Unless you change it, the printer will leave two blank lines at the bottom of each sheet. You may choose, however, to leave from 0 to 9 blank lines as a 'bottom of page margin'.

(4) 72 CHARACTERS PER PRINTER LINE... Unless you elect to change this, your printed listing will print no more than 72 characters on one line. This allows the use of the less expensive narrow paper, and automatically allows the use of wider margins for those using the wide paper. By adjusting the horizontal position of the paper in the printer, you can easily provide for a wide margin on either side of the listing. Just remember, unless you change it with the LINE INDENTATION option, the printing will begin at the '0' position. If you wish, you may select any line width from 10 to 80 characters per line. For magazine and newsletter articles, they usually prefer a 38 character line length. You should check with the intended publication first.

(5) NO LINE INDENTATION... The printing will start at the printer's position '0' unless you choose to have each line indented. If so, you may select an indentation of 0 to 9 spaces.

(6) NORMAL (not compressed) PRINT... LISTER will print your listing in the normal print size, unless you choose the compressed print. While not all of the special characters will print compressed, the greater part of your listing will compress just fine. While this may take longer to print, it does produce a smaller listing.

(7) MARK BLANK SPACES WITHIN STRINGS... This feature will print a mark similar to a raised squiggly character (I), instead of blank spaces, when blank spaces occur within strings, to enable the listing reader to easily determine just how many blank spaces there are. Blank spaces between commands and keywords are not marked. For example;

        100 GOSUB 500
        110 A$="HOW ARE YOU?"

The spaces on each side of the GOSUB will not be marked as they are not inside a string. The spaces on each side of ARE will be marked, as they are within A$. Since the marks are very handy when you need them, and are no trouble when you don't need them, the default value for this option is to mark the blank spaces within strings. You may, of course, elect not to have them marked.

LISTER

(8) PRINT INVERSE VIDEO IN INVERSE... If you used the Atari
key while you were programming to get inverse characters,
you'll probably want them to appear in inverse in your
listing. But, in case you don't, this option lets you print
them as normal characters also.

(9) PRINT ALL LINE NUMBERS... In case you only want part of
your program listed, this option let's you pick the range of
line numbers that you want. Since the lowest possible line
number is 0, and the highest is 32267, the range 0-32267
will insure that the whole program gets listed.

SELECTING YOUR OPTIONS VALUES

Read the list of the options as shown on the screen. Each
option describes it's default value. If you decide to accept
ALL of the options just as they are then press the 'P' key
to continue. If, however, you wish to change one or more of
the options, press the 'C' key. If you decide to change an
option, you will get the following prompt;

Change which option (1-9)?

Simply press the number of the option you want changed. If
it is a YES/NO option, it will be changed automatically for
you. If it is an option that requires a number, you will be
asked for a new number, and shown the acceptable range for
that number (0-9 for example). Type in the number you want
and the computer will automatically change the option for
you. Notice that you never have to press RETURN; we do it
for you!

Once you've made all your changes, press the 'P' key to go
on to the next step.

Now you'll get the prompt;

WHICH DISK DRIVE (1-4)?

(If you're using disk of course). Answer by pressing the
appropriate number key. Next you'll see;

ENTER FILENAME ?

Don't type in quote marks, just the filename, and then press
RETURN.

LISTER

Now if you have forgotten the filename already, all is not lost. Type in some crazy filename that you know is NOT on that disk and try to print it. LISTER won't be able to find it, of course, and because LISTER wants to prove to you that it isn't on the disk, you will be shown a listing of the disk directory, or at least as much of it as will fit before it scrolls off the top of the screen. Then you can find the name you want.

Once you've entered your filename you'll be given a chance to pick a title for the listing. You can use the filename, pick something else, or print no title at all.

Anyway, assuming that everything is now how you want it, go ahead and pick one of the two print options so you can finally get your listing!

If you try to print a listing from a program that is stored on the disk or cassette in the tokenized form, you will be told.
If you give an illegal filename, you will be informed.
If the drive you indicated is not functioning, you will be told.
If the printer is not operating, you will be told.
If it is raining outside, you may get wet, but LISTER couldn't care less about that.
If you do something else wrong, LISTER will inform you of the error code, and then give up on you until you get it fixed.

IF, however, you have done everything correctly, the screen will show;

PRINTING
D:filename.ext (or C:)

Note the bottom of the screen. There's a note there that says "PRESS ESCAPE TO STOP." So, if the phone rings, or the cat get's his tail caught in the printer, or for whatever reason, you may temporarily halt the printing by pressing the ESCape key. The note at the bottom of the screen will change to;

OK, I STOPPED. NOW WHAT ?
PRESS 'Y' TO CONTINUE, 'N' TO QUIT.

Pressing the 'N' key will end the program altogether. Pressing the 'Y' key will resume the printing right where it left off, and the note to "PRESS ESCAPE TO STOP" will return.

YOU'RE FINISHED!

BASIC PROGRAMMING TOOLS

by
Gordon Banks,
Don Wahrmund,
Gary Hewer,
and Justin Wilder

Everyone needs a little BASIC help, so here it is. Programs to make programming in ATARI BASIC easy!

First we add several new commands to the Basic language, RENUMBER, DELETE, and TRACE. They allow you to delete or renumber portions of your program and go through it step by step during the de-bugging process. QUICKREF tells you where all of your variables are in the program and exactly how much of the memory you are using. These MACHINE LANGUAGE utilities are FAST!

Next comes EXPAND to take all those programs in your closet that were written with many statements per line, and make them easy to read again. Finally for those with printers, we have LISTER in two versions. On Epson printers, the first version will list your programs exactly as they appear on your screen, including all of the special characters. Other printers use version two to list your program with any inverse video and special characters noted.

REQUIRES:
BASIC Cartridge
16K Tape or 32K Disk
Some programming experience

OPTIONAL:
Printer

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