

# STORM WARNING



# Block Shape Animation Part VII

## STORM WARNING

*In Part VII of the Graphics Workshop, the routines and shapes of the previous installations are combined in the Hi-Res action game, Storm Warning. The sound and fury of an Arkansas storm are captured in block shape animation for your enjoyment.*

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In this issue, I think it would be a good idea to take what we've learned so far, and apply it to a real life Hi-Res program. What we'll look at is a game program called STORM WARNING. Rather than going through the usual "how it works" game program article, we will delve into the program much deeper, looking at just how the shapes are organized in memory, and the methods that are used to animate them.

As a part of the set-up routines, we will patch DOS to make our routines load into memory faster. Our finished program will also "SPEAK," making use of the MOCKINGBOARD SOUND/SPEECH 1 sound generator-voice synthesizer. If you don't have a MOCKINGBOARD, don't worry, as the program will work with or without the board. Without the board, you simply won't have the benefits of the rolls of thunder and the speech output that the program provides. In our preparations for use of the MOCKINGBOARD, we will use a routine that searches through your Apple's seven slots to find the synthesizer, and which automatically modifies the program to work in whatever slot the board is found.

**Author Note:** The main machine language program for STORM WARNING is rather long, as are the Shape Tables used by the program. We've provided as much information as possible to help you detect any entry errors; however, if you feel the task is too large, you can purchase the completed program on disk from NIBBLE. The disk version will be a little bit different as there will be two additional files, R.R.D-T and SW-T, which are Hi-Res title pages that begin the program. They're not included here, as they would entail an additional entry of roughly 16,400 bytes.

The shapes in our program are rather large — bigger than the tiny spaceships and other "critters" that we see so often; however, you will notice that the program still runs rather quickly and smoothly.

### STORM WARNING — THE GAME

If you haven't noticed yet, I live in the state of Arkansas, the TORNADO capital of the world. More people have been killed by tornadoes in Arkansas than anywhere else in the world. It is this weather phenomenon, along with violent lightning storms, which is the setting for the game.

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**"... the funnel comes down further and further into the house..."**

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In our game, there is a town which includes eight homes, a general store, a building supply store, and a storm shelter. A very unfriendly storm cloud is hovering above the town, with random bolts of lightning and lots of thunder threatening destruction. Occasionally the lightning will strike, burning one of the homes to the ground. Since the setting for the game is Arkansas, there will also appear random tornadoes from within the cloud which will literally tear houses apart and completely destroy them. Of course, every town needs inhabitants, so people will randomly appear at the doors of their homes.

Your job will be to drive a truck around the town, picking up the people who appear in the doorways of the houses, and deliver them safely to the storm shelter before their home is destroyed and they are killed. Your truck can hold only two passengers per load. You will receive 10 points for every person that you safely deliver to the storm shelter. When you have allowed three townspeople to be hit by lightning, the game is over.

Now it wouldn't be much of a town if all the houses where the people lived were destroyed, so in between your chores of saving people, you must also rebuild the houses that have been destroyed by the storm. If you allow all eight houses to be completely destroyed, the game ends.

To rebuild houses, you must drive to the building supply store to pick up a load of materials, then drive to a destroyed house to rebuild it. Two trips are required to rebuild a house. The first trip builds the

house frame, and the second completes reconstruction. You will receive 10 points for each stage of reconstruction. If you're the unlucky sort, a tornado may come along and destroy even your partially rebuilt houses, and you'll need to start rebuilding all over.

Rebuilding isn't quite as easy as it may seem, because saving lives is always more important than rebuilding houses. If you try to drive past a house with a load of rebuilding materials while that house is occupied, you will automatically lose your load of materials and pick up the occupant. To pick up people or rebuild a house, you must always drive from left to right under the house, with the exception of house #1 (the leftmost), which is approached by driving from right to left.

The object of the game is to continue playing as long as possible, and achieve the highest possible score. When the game begins, it's rather easy going; however, as your score gets higher and higher, people will appear at the doors more often and the houses will be destroyed more frequently. When you have four or less houses remaining, the storm cloud will **tend** to stay to the left side of the screen, which is where the remaining houses are most likely to be. You may recognize the truck that is used in the game as the Arkansas "Good Ole Boy" pickup truck that we played around with earlier in the series.

### ENTERING THE PROGRAMS

The entire system is made up of several parts which need to be entered separately. There are two reasons why you need to deal with so many parts: first, because I added some of the parts as patches to the completed program and didn't want to reorganize everything; and second, because several of the parts (OILER, SPEAK/SOUND, and SLOTFINDER) are stand-alone routines that you may want to use in other programs that you create yourself.

### THE APPLESOFT SET-UP PROGRAM

The first program to enter is the Apple-soft program (Listing 1). This program loads all the other files that are needed, and runs the program demonstration. There are no special tricks involved, just enter it as listed. Once you're done, save the program to disk with **SAVE STORM WARNING**.

### THE OILER PROGRAM

The next file that you should enter is the OILER listing (Listing 2). This is the same routine that appeared in *Nibble* Vol. 3/No. 5, which is where you can look to get details on how it works. The function of OILER is to speed up the way files are loaded into memory from disk. **BE EXTRA CAREFUL WHEN ENTERING OILER, AS THIS ROUTINE MODIFIES DOS.** You don't want to take a chance of blowing your disk the first time you execute OILER. Once entered, save it to disk with **BSAVE OILER,AS2DE,LD5S.**

### THE SPEAK/SOUND PROGRAM

These are the routines that cause a MOCKINGBOARD SOUND/SPEECH 1 to create speech and predefined sounds. As listed (Listing 3), it will only work for a MOCKINGBOARD that is located in slot 4.

Save it to disk with **BSAVE SPEAK/SOUND,AS300,LS96.**

### THE SLOTFINDER PROGRAM

This routine will search through each of your Apple's seven slots looking for a MOCKINGBOARD. If it finds one it will auto-

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**"The entire destruction sequence is accomplished with the DRAW routine alone."**

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matically modify the SPEAK/SOUND routines to work in the slot where the MOCKINGBOARD was found. SLOTFINDER (Listing 4) will take no action if no card is found. If no card is found, memory address \$6 will contain a zero upon exit from the routine. Our Applesoft program will test this flag to determine what actions, if any, SLOTFINDER took.

One additional note on SLOTFINDER. There are several MOCKINGBOARD models: SOUND I, SOUND II SPEECH I, and SOUND/SPEECH I. If I understand their specifications correctly, SLOTFINDER will detect **ANY** MOCKINGBOARD. I give no guarantees that SPEAK/SOUND will work with the other models other than SOUND/SPEECH 1. You may need to modify the access addresses for SPEAK or PLAY, or disable one or both of these routines if you have a different model.

Save SLOTFINDER to disk with **BSAVE SLOTFINDER,AS9000,LS7F.**

### THE SW-M PROGRAM

This is the main machine language program which plays the game (Listing 5). It is the last program that is loaded before the game begins. Extra care in entering this program is the only thing that will ensure proper operation of the game. Save it to disk with **BSAVE SW-M,AS800,LSF0E.**

### THE SHAPES ROUTINE

This is the longest of the files that you will need to enter. It would be a good idea to save it to disk in blocks, just in case you have some sort of disaster midway through entering it.

At the end of this article, under "ADDITIONAL TIPS ON ENTERING SHAPES," you will find some suggestions that can cut the efforts of entering this file almost in half. The first part of the file contains all of the Shape Tables that will be used, and the later parts are made up of the YTABLE and all the graphics routines that our main CALLING programs will use.

If you refer to Figure A you will see a detail of how SHAPES is organized. Note that parts of the table are routines that you should already have from our earlier discussions, so it would be easy to simply

BLOAD them from your disks rather than re-enter them. If you make any errors entering the Shape Tables, you will probably detect them when running the program. At that point you could identify which shape doesn't seem right, then refer to Figure A to find out where it is located within SHAPES and dump just that part of memory to find your error. Figure A shows where each Shape Table starts as well as the number of bytes that it occupies. Remember that the first byte in a Block Shape Table will represent VB, HR, and the last byte in the table will represent VT, HL.

As you go through the tables in SHAPES, you will notice that various "Speech Tables" and some array type variables are stored in the unused areas at the end of some memory pages that are not filled up with block shapes. There is a VECTOR Shape Table at the end of page \$84, and a 16-byte Sound Table appears along with a truck shape on page \$81. Pages \$53 and \$83 contain multiple block shapes for the scoreboard numbers, as well as our program's hero, Melvin Bonner. The completed SHAPES listing (Listing 6) should be saved to disk with **BSAVE SHAPES,AS5000,\$4600.**

### THE STORM WARNING APPLESOFT PROGRAM ... HOW IT WORKS

The first thing that happens when STORM WARNING starts to RUN (line 100) is that the OILER routine is loaded into the page 3 area of memory, and the routine is executed. This modifies DOS to load files directly from disk into memory without going through the DOS buffer. It makes file loading very fast, and is well worth the small amount of time it takes to load and execute. By the way, this routine kills the DOS INIT command, so you'll need to reboot if you want to INIT a disk. For more details on OILER, see Vol. 3/No. 5.

The next thing that's done (line 110) is that the SPEAK/SOUND routines are loaded on top of the OILER routines which are no longer needed, and the SLOTFINDER routines are loaded and executed. If SLOTFINDER finds a MOCKINGBOARD, it will modify SPEAK/SOUND to work in the proper slot where the board was found.

Line 120 checks to see if SLOTFINDER found a MOCKINGBOARD by testing \$6 to see if it is a zero. If it is zero (no board found), then the first byte of the SPEAK and SOUND routines are changed to 96 (\$60), which is a machine language RETURN, effectively disabling the routines. We no longer need to worry about the SPEAK or SOUND routines, as any CALL or JSR to them will simply RETURN without anything happening.

Line 130 INITIALIZES the MOCKINGBOARD sound generator.

Line 140 sets HIMEM to protect the shapes and gets the graphics screen ready to go.

Line 150 BLOADS all our shapes and graphics routines, then initializes YTABLE.

Line 160 draws the STORM WARNING shape onto the screen.

Line 170 speaks our first line of words by POKING the starting and ending addresses of our Speech Table into memory. The starting address goes into 28 (\$1C) and 29 (\$1D), and the ending address goes into 26 (\$1A) and 27 (\$1B). The POKE 1022,25 (\$19) and POKE 1023,3 (\$03) put the address of our IRQ (Interrupt ReQuest) in memory locations \$EFE and \$EFF. This only needs to be done once in our program and it is used by the MOCKINGBOARD to set the BUSYFLAG to zero when it is finished speaking.

This is the way it works: when the SPEAK routine starts the synthesizer talking, it sets a BUSYFLAG (\$19) to 255 and prepares your Apple for an Interrupt to occur. When

the board is finished speaking, it causes an Interrupt by changing the voltage to two board pins, which stops your program (it happens so fast that you'll never know about it), and your Apple jumps to memory locations \$EFE and \$EFF to find out what it

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**"The activities of the storm cloud are always determined by the random generator ..."**

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should do next. Since we've set \$EFE and \$EFF to point to \$0319 (the second half of the SPEAK routine), execution will jump there to reset the BUSYFLAG to zero so that we know that the board is finished speaking.

The last instruction in SPEAK is RTI, which means ReTurn from Interrupt. The RTI sends us back to our main program at the exact point where we left and tells your Apple that the Interrupt is now complete. The SPEAK Interrupt has also protected and restored the contents of all registers, so no harm is done by the break.

Line 180 uses SHIFTR to move the words STORM WARNING rightward across the screen. You should make note of how we INCREMENT HR and HL every seven shifts.

Line 190 DRAWS the truck on the screen.

Line 200 DRAWS two houses. This is where we should begin looking at what is happening. Note that we have used two different shape numbers for our houses, shapes 97 and 98; however, when you RUN the program, both shapes appear to be the same. The reason for this has to do with the fact that our house has a RED chimney. Let's start out by reviewing the Hi-Res screen and see how we've laid it out.

As you know by now, the Hi-Res screen is 40 bytes wide, and each byte can display 7 horizontal dots, with the eighth bit (bit 7) being used to set the color. We have divided the screen into 8 blocks of 5 bytes each, thus each of our 8 houses is 5 bytes wide. House #1 is bytes 0-4, house #2 bytes 5-9, house #3 bytes 10-14, and so on. The first X-coordinate of house #1 is 0 (even), the first X-coordinate of house #2 is 35 (odd), and the first X-coordinate of house #3 is 70 (even). In other words, the first X-coordinate of houses 1, 3, 5, and 7 is even, and the first X-coordinate of houses 2, 4, 6, and 8 is odd. For us to display a RED dot on the screen, we must have a 1 bit on an odd X-coordinate with the color bit set to 1, so every other house needs to be shifted over one bit to achieve the proper colors.

For this reason, and because we are using colors in all of our houses, fire routines, and tornado destruction sequences, it was necessary to have two sets of all our shapes — one set for even houses and another set for odd houses, with all dots shifted right one point.

Line 210 DRAWS the sun.

Lines 220-250 scroll the beginning message from Melvin Bonner across the screen and animate Melvin. If you have a MOCKINGBOARD, the message will also be spoken as the printed message scrolls. Since it is a long message, it is broken down into two Speech Tables. The first table is CALLED in line 225. Line 235 checks the BUSYFLAG and as soon as it is zero, it knows that the first table has been spoken, so it then continues the message with the second Speech Table. The effect is that it sounds like one continuous flow of speech because the BUSYFLAG makes the timing perfect for starting the second Speech Table.



**Line 260** DRAWS the storm cloud to wipe out the sun.

**Line 265** POKES the location of our Sound Table and creates the sound of thunder. We need to enter these POKES every time we use the Sound Table, as \$8 and \$9 are also used by our shift routines as bit flags.

**Line 280** DRAWS the lightning bolt. The method used to get the shaking effect as with real lightning is by first DRAWing the lightning bolt, making a sound, then immediately using the REVDIR routine to flip the lightning over. This makes things happen so quickly that you never really get to properly focus on the lightning bolt in either position before it is ERASEd from the screen. The GOSUB 420 resets the EOR function in DRAW so that the bolt can be ERASEd, and then kills the EOR again.

**Line 290** sets up to begin tornado destruction of house #1 by DRAWing the tornado funnel that extends downward from the storm cloud. There are four different funnels used in the game, one each for odd and even houses, and special funnels for houses 1 and 8.

**Line 300** steps through the eight separate Shape Tables that make up the tornado destruction sequence, with a break for making sound between Shape Tables. In each of the eight steps of the sequence, the house is shown more and more damaged, the funnel comes down further and further into the house, and the debris is shown moving higher upward into the funnel. For a complete description of how the cloud, funnel, destruction, and house shapes fit together, refer to Figure B.

Notice that the method of animation used here is completely different from what we have discussed so far in the GRAPHICS WORKSHOP series. Here we are not moving our shapes in any way to achieve the desired effect. Instead, what we're doing is rapidly changing shapes at the same VT, VB, HL, and HI, similar to the way in which cartoons are created. The entire destruction sequence is accomplished with the DRAW routine alone.

**Line 310** resets shape #113 (the last destruction sequence shape that we just drew), then GOSUBs line 420 to use the EOR to erase the remains of the destruction sequence.

**Line 320** DRAWS the rubble that remains after the house is destroyed.

**Line 330** resets shape #119 (the left funnel) and GOSUBs line 420 which ERASEs the left funnel, again using the EOR method. You should note from referring to Figure A that shape #82 is all 0's and can be used to ERASE anything. If we had wanted to, we could have simply used this shape number for much of our ERASEing work to avoid the enabling and disabling of the EOR function of DRAW every time we needed to ERASE. This shape is used by the SW-M program, but is not used here.

**Line 340** reDRAWS the cloud. The reason that it is necessary to redraw the cloud is that the lower lines of the cloud and the upper lines of each funnel overlap. (See Figure B.) When we ERASE the funnel, we also erase a small part of the cloud; thus we must reDRAW the cloud to replace those lines.

You can tell by the VT and VB that were set that we have reDRAWn the entire cloud, which frankly wasn't necessary. We could just as well have set VB=39 and VT=36 to accomplish our aims. (Remember, you don't need to draw your entire block shape if you don't want to.) Here, however, I wanted to slow things down a bit, so I let the program waste a little time.

Once the cloud is repaired, it is shifted right three bytes using SHIFTR so that it is centered over house #2.

**Line 350** repeats the lightning strike sequence of line 260, again using REVDIR to achieve the shaking effect.

**Line 355** again creates the sounds of thunder.

**Lines 360 and 370** quickly switch back and forth between shapes 94 and 95 to give the effect of flames licking out of the top of house #2 as the house burns from the lightning strike.

**Line 380** DRAWS the rubble that is left after the house is destroyed.

**Line 390** — This destruction demonstration is done twice. J is checked to see if we're done and can bypass the next lines.

**Line 400** shifts the cloud left three bytes using SHIFTL.

**Line 410** ERASEs our rubble and returns to line 260 to go through the destruction demonstration again.

**Line 430** ERASEs Melvin in his present position.

**Lines 440-460** make Melvin run downward on the screen. (The shapes are switched each time to give the effect of running.) This isn't the best demonstration of this effect, but since it's not an important part of the program, I did the chore sort of "quick-n-dirty." Since we set shape #131 in line 430, we don't need to do it again. (All the Melvin Bonner shapes have the same value hi-byte \$83.)

Since the shapes that we are now using don't begin at the start of page 131 (\$83), we need to do things differently here to change shapes. If you look at your DRAW routine, you will note that we begin at \$932F with LDA #500 (put \$00 in the accumulator), and then STA BASL (now transfer the \$00 into BASL — shape address low byte), which is the low byte of our Shape Table address. The #500 part of the LDA #500 instruction is located at memory address \$9330 (37680 dec.). Since all of our Melvin Bonner shapes have the same high byte (131), the only thing we need to change for different shapes is the low byte, which is done by directly changing our DRAW routine to read LDA (shape low address byte). The last instruction in line 460 resets our DRAW routine back to LDA #500 so that it works properly when we leave the area.

## “... frankly I get a kick out of watching the cloud go wild...”

**Line 465** speaks the word OOPS using the MOCKINGBOARD.

**Line 470** again kills the EOR function of DRAW by POKEng NOPs there.

**Line 480** reDRAWS the truck with Melvin Bonner in the driver's seat, and uses SHIFTR to drive the truck completely off the screen. While we can never DRAW or SHIFT a shape off the left side of the screen, we can shift a few bytes off the right side without problems. This is because you can't POKE negative numbers which would be required for moving off the left side. Note how we move the truck right 30 bytes (FOR X=1 TO 30), and how we need to INCrement HR and HL every seven shifts (FOR Y=1 TO 7).

**Line 490** clears the screen and sets Hi-Res page 1 with full screen graphics.

**Line 500** — Now that everything is loaded and set up, line 500 runs the main program.

At this point, the only programs left in memory intact are SPEAK/SOUND,

SHAPES, and SW-M, which was just loaded. All the other routines that we used have been overwritten and destroyed, including the Applesoft program that we just finished executing.

## A FEW IDEAS ON SHAPE TABLE DEVELOPMENT

The only graphics routines that we make use of in STORM WARNING are SHIFTL, SHIFTR, REVDIR, DRAW, and SCAN, which all use YADDR to retrieve screen addresses from YTABLE. Because we are using just the routines that we need, and sticking them at the top of memory, Block Shape Table development is easy.

When you're developing shapes, simply BLOAD your routines into memory and treat them as though they were a permanent part of your Apple. Once in memory, you can BLOAD Hi-Res graphics screens, run Applesoft development programs or whatever, without damage to the driver routines or your shapes as long as you protect them from strings by first setting HIMEM.

I simply used the SHAPES listing to help develop the necessary shapes. Once it was on board, I would write a short Applesoft program with lots of HPLOTS to draw my shapes, then use the same program to SCAN a shape into the next available page below what had previously been used, and use the other routines on board for test animation. Once the shape was the way I wanted it, the growing SHAPES listing could be BSAVED to include the new shapes, and the Applesoft routines that created the shape could be either saved or erased as desired. After a time, the SHAPES listing became longer and longer until all the needed shapes had been developed.

SHAPES was actually created by dozens of different Applesoft development programs that SCANNed the results of their work into the table. In fact, every shape didn't require a different program. For example, the only truck shapes that I created were right-facing, while all the left-facing versions were created by REVDIR-ing and SCANNing the right-facing shapes that had already been created. The same is true of the odd and even versions of all the other shapes. All the shapes I created were EVEN versions which were simply SHIFTRed over one bit and SCANNed into the needed ODD versions.

## HOW THE MAIN PROGRAM GRAPHICS WORK

Now let's take a look at how we've handled the other game graphics, beginning at the bottom of the screen and working upward.

The lower part of the screen is all drawn as one single Shape Table. It's shape #85 which is 1440 bytes long with VT, VB, HR, and HL being 155, 190, 39, and 0, respectively. The scoreboard reads 00000 for both Hi-Score and Score. The area where the tombstones are shown is blank. For those who are curious, the general store is not related to the game and is shown purely because it makes the main street look better.

Each of the numbers on the scoreboard is one byte wide and eight bytes high. Each of the numbers is also a block shape. Bear in mind that once a block shape is DRAWn on the screen, it is no longer a block shape, but simply some graphics that happen to appear on the screen. What this means is that we can then DRAW other BLOCK, HPLLOT, or VECTOR shapes on top of it to modify what it looks like, which is what we do to change the scoreboard reading.



After each person is struck by lightning or a tornado, a tombstone is placed in the area between the general store and the storm shelter, and the voice synthesizer says a few words of condolence. This is the only area of the program where we have reverted to vector shapes because this seemed the most effective way to place the shapes in just the precise locations that I wanted, as the horizontal bytes didn't line up quite right to position the three tombstones.

Directly above the stores is the street where the truck moves back and forth. It is the same truck that you've seen before if you've been working through this series. The truck is six bytes wide and has a VT and VB of 130 and 144, respectively.

When I began the program, I intended to use the REVDIR routine to change the direction in which the truck was moving, as we did in our earlier tests; however, in this case I did not. Here we need several versions of the truck shape: first, we need it empty with the driver only; then we need versions with one passenger and two passengers; and finally, we need a version that is loaded with building materials. Had I used REVDIR, it would have been necessary to change every truck version every time the truck's direction changed so that we wouldn't end up with the truck appearing to move backwards, so I simply made right and left versions of all the trucks.

Above the truck's area of influence, we draw the houses in their odd or even versions to keep the colors right. Each house is 5 bytes wide, takes up 200 bytes, and has a VT and VB of 87 and 126, respectively.

Moving to the top of the screen, we come to the storm cloud which moves randomly back and forth, wreaking destruction upon the town below. The cloud is 10 bytes wide, covers a rather large 400 bytes, and has a VT and VB of 0 and 39.

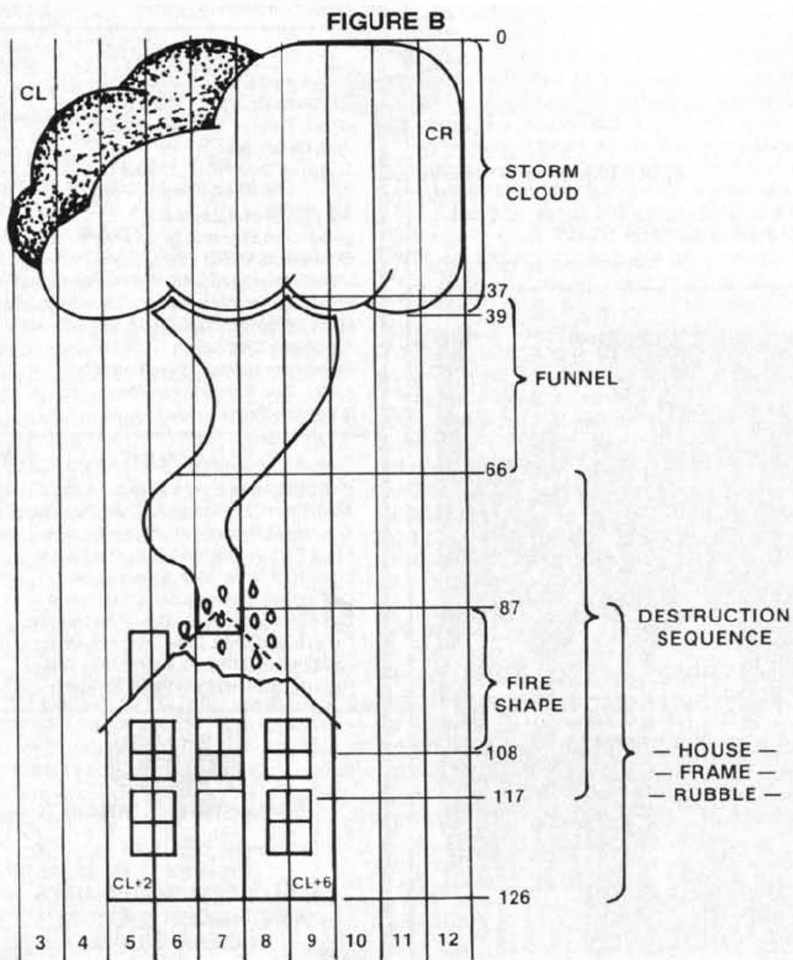
The cloud is of the basic white variety; however, some parts of the cloud have alternating horizontal lines of white and red. As the cloud shifts from side to side, these parts of the cloud will have partial color changes from red to blue to red, as the 1-bits move from odd to even to odd X-coordinates. This helps to give us the effect of storminess in the cloud.

The speed relationship between the cloud is 1 to 14, which means that for every one left or right shift that the cloud makes, the truck will be allowed to move 14 shifts. This relationship makes certain that the truck is always completely shifted through its current byte when we enter or leave the truck movement routines.

Hanging below the cloud is the troublesome lightning bolt which is 5 bytes wide and has a VT and VB of 40 and 86. Whenever the lightning strikes, it has the same HR and HL as the house that it destroys, with the usual exception of houses 1 and 8, which are always special cases.

The most complex system of shapes are those that are involved in the tornado destruction sequence, where the house or the house frame is connected to the cloud by way of the tornado funnel. Here we have four separate shapes that cover roughly 850 bytes (more than 10% of the Hi-Res screen), and which must all properly interact with each other. To make this a bit easier to describe, let's look at a picture of the system as a whole.

Figure B represents all the parts that make up our tornado destruction sequence. The only variations that occur in the game are when houses 1 or 8 are being destroyed. With those two houses, the cloud isn't centered over the house as we see here, so different funnels are used which reach over to properly line up with the tornado tube destruction graphics.



#### STORM WARNING ACTION

Here's a step-by-step description of what happens ...

After every seven shifts of the cloud, the program tests to see if the cloud is directly over a house. If it is, a test is made to determine if the house is already destroyed. If not, the random generator decides whether or not we want to destroy the house. If destruction is indicated, the following sequence begins:

1. The proper funnel is selected and DRAWn at VT=37, VB=66.
2. Execution jumps to the truck movement routines to let the truck do its thing (move, pick up people, rebuild, etc.).

3. The program then steps through the eight individual destruction graphics shapes, making a sound and jumping again to the truck movement routines between each of the eight shapes. Each ensuing destruction shape shows the tornado tube lower into the house, and the house in a greater degree of destruction with more and more debris moving upward. Destruction graphics are drawn at VT=67, and VB=117. The destruction sequence for a frame only is the same, except that the sequence is only five shapes long and uses different rubble graphics.

4. The truck routine is again executed.
5. The last shape from the destruction sequence is ERASEd at VT=67, VB=117.
6. The rubble from the house is drawn at VT=87, VB=126.
7. The truck is moved again.
8. The funnel which was used in this sequence is ERASEd at VT=37, VB=66.
9. You will notice that the funnel actually ERASEd a few lines at the bottom of the cloud, so these are now redrawn at VT=36, VB=39.
10. The routine is now complete and the cloud begins to move again.

When going through the fire destruction sequence, we simply flip back and forth between two different shapes at VT=87, VB=108, which show flames in two different positions for the flickering effect. In between each of these exchanges, we jump to the truck movement routines to keep the action going.

You might also note that no new people appear at doorways during fire or tornado destruction, as this test occurs only while the cloud is moving.

### ERASING SHAPES

There are one or two things that we should look at before we close out things for this issue. The first topic has to do with how we ERASE shapes. As you should remember from our previous discussions, the EOR function in our DRAW routine will effectively ERASE by setting to 0 any matching bits that are **both** found to be 1's.

In our program, we have ERASEd several ways. The first and most commonly used method has been to simply DRAW a new shape over an old one with the EOR function disabled. When we do this, it makes no difference what the background was, as the result will be an exact duplicate of the shape bytes drawn.

The second method used has been to enable the EOR function and then by DRAWing an exact duplicate of what is already on the screen, ERASE what is presently there. This works, but it makes it necessary to go through the hassle of enabling and disabling the EOR function every time you want to use it.

The third and final method, which we haven't discussed, is also used in the program. In this method we establish a Shape Table which is all 0's, and will ERASE anything. If you'll refer to the Figure A breakdown of SHAPES, you will see that shape #82 is a blank shape. This shape is also used in the program for ERASEing and avoids the hassle with EOR statements.

### PROGRAM INPUT

You've probably already noticed that the only program input is through game paddle 0. The activities of the storm cloud are always determined by the random generator, while the movements of the truck are controlled by PDL(0). What actions the truck takes are determined by the location of the truck on the screen (in relation to individual houses), the status of the truck (empty, loaded, etc.), the status of the house that the truck is presently under, and the direction in which the truck is traveling. If you have a MOCKINGBOARD, the program will tell you to PRESS PADDLE BUTTON TO START A NEW GAME

### PROGRAM SPEED-UP

As you play the game, you will notice that none of the sounds generated by the MOCKINGBOARD affect program speed. The program continues uninterrupted as the sounds are generated. If, however, you leave the truck parked on either side of the screen, the game moves along much faster. Remember, there is a 1:14 movement relationship between the cloud and the truck. With the truck stopped, all the execution time is used by the cloud, which can completely destroy the town in no time flat.

I suppose that it might have been better to install a delay loop to maintain the normal speed when this occurs, but frankly I get a kick out of watching the cloud go wild, wreaking havoc upon the town.

### ADDITIONAL TIPS ON ENTERING SHAPES

If you use a little creative thinking, you can cut the efforts involved in entering SHAPES almost in half!!!

If you've been following the series, you already have SHIFTL, SHIFTR, REVDIR, DRAW, SCAN, YADDR, YTABLE, and our other block routines already on disk. Start out by BLOADing them into your Apple. **Be sure that those routines** that we'll use in STORM WARNING each **begin at the addresses shown in Figure A.**

Once they're on board, CALL 37799 to set up YTABLE and you're ready to go. Remember that you're dealing with a computer and it should work for you, not the other way around.

Now let's get into the Monitor with CALL-151 and enter the shape bytes for shape #131, which is the TRUCK-W/DRIVER-LEFT and starts at \$8300. Now that you've got a truck with driver in memory, why bother entering the RIGHT-facing version? Try this instead. Reenter Applesoft with 3D0G, then enter HGR. Now enter the

proper POKEs to look at the truck, which you can tell from Figure A would be 131, 130, 144, 5, and 0 for SHNUM, VT, VB, HR, and HL, respectively.

Next CALL the DRAW routine to look at the shape. Look okay? Good, now POKE 251, 126, which is the shape number for the other facing version. Now CALL SCAN, which will also place the shape in memory as shape #126. Finally, CALL REVDIR which flips the shape over and automatically reSCANS the reversed shape into shape #126.

Now you have both versions of the truck in your Shape Table, even though you only entered it once. You can use the same technique to enter all of the left- and right-facing versions of the truck shapes, which in truth is the same way I did it.

Now we come to the odd and even versions that are required for many of our shapes. You can make use of the same sort of tricks here as well.

To start out, enter the shape for the COMPLETE HOUSE-EVEN, which is shape #97 and begins at address \$6100. Now that it's in memory, enter the proper POKEs to place the house on the screen as house #1. The reason that I've called it an EVEN house is because the bytes in which it will reside are 0-4, and as we all know, 0 and 4 are even numbers.

Now CALL DRAW to display the house, and if all looks well, move on to the next step. Using the same shape number, re-DRAW the house with HR and HL equal to 9 and 5, respectively. The house should look the same as before, except that this time the chimney should be blue. To correct this problem, CALL SHIFTR and the house will move right one dot, whereupon the chimney will change to RED as it should be.

We now have the shape as it should be for an odd house, so POKE 251,98 and CALL SCAN to put it into your Shape Table to take care of shape #98, COMPLETE HOUSE-ODD. Using this same approach to enter the rest of your even and odd shapes can greatly cut down on your work. You can later go back through SHAPES and enter the in-between shapes, Speech Tables, etc. If, when you run the program, you find that some of your RED shape parts are BLUE, or your GREEN shape parts are PURPLE, it will mean that you've shifted the wrong shape in the wrong direction at which time you can reshift and reSCAN the shape until it's correct.

That's all folks... See you next issue.

## FIGURE A

ADDR	SHNUM	VT	VB	HL	HR	BYTES	DESCRIPTION
\$5000	80	58	97	12	23	500	STORM WARNING
\$5200	82						ERASING BLANKS
\$5300	83					80	SCOREBOARD NUMBERS 0-9
\$5400	84	132	149	13	26	252	'GAME OVER'
\$5500	85	155	190	0	39	1440	BUILDINGS-SCOREBOARD READS 00000
\$5B00	91	40	86	CL+2	CL+6	235	LIGHTNING
\$5C00	92	87	108	CL+2	CL+6	200	FIRE-EVEN STAGE 1
\$5D00	93	87	108	CL+2	CL+6	200	FIRE-EVEN STAGE 2
\$5E00	94	87	108	CL+2	CL+6	200	FIRE-ODD STAGE 1
\$5F00	95	87	108	CL+2	CL+6	200	FIRE-ODD STAGE 2
\$6000	96	87	126	HL	HL+4	200	BUILDING FRAME
\$6100	97	87	126	HL	HL+4	200	COMPLETE HOUSE-EVEN
\$6200	98	87	126	HL	HL+4	200	COMPLETE HOUSE-ODD
\$6300	99	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 1
\$6400	100	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 1
\$6500	101	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 2
\$6600	102	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 2
\$6700	103	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 3
\$6800	104	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 3
\$6900	105	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 4
\$6A00	106	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 4
\$6B00	107	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 5
\$6C00	108	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 5
\$6D00	109	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 6
\$6E00	110	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 6
\$6F00	111	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 7
\$7000	112	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 7
\$7100	113	67	117	CL+2	CL+6	255	TORNADO DAMAGE-EVEN STAGE 8
\$7200	114	67	117	CL+2	CL+6	255	TORNADO DAMAGE-ODD STAGE 8
\$7300	115	87	126	CL+2	CL+6	255	HOUSE RUBBLE-EVEN
\$7400	116	87	126	CL+2	CL+6	255	HOUSE RUBBLE-ODD
\$7500	117	0	39	CL	CL+9	400	STORM CLOUD
\$76A0		HS(X) STATUS TABLE				8	
\$76B0		BS(X) STATUS TABLE				8	
\$76C0		RB(X) DATA TABLE				8	
\$76D0		LB(X) DATA TABLE				8	
\$76E0		DD(X) STATUS TABLE				8	
\$7700	119	37	66	1	5	150	FUNNEL-LEFT
\$7800	120	37	66	33	38	180	FUNNEL-RIGHT
\$78B8		SPEECH TABLE				47	THIS IS MELVIN BONNER ...
\$78E8		SPEECH TABLE				24	WARNING
\$7900	121	37	66	CL+2	CL+6	150	FUNNEL-EVEN
\$7998		SPEECH TABLE				41	R.I.P. 1 DEAD ...
\$79C8		SPEECH TABLE				47	R.I.P. 2 DEAD ...
\$7A00	122	37	66	CL+2	CL+6	150	FUNNEL-ODD
\$7A98		SPEECH TABLE				40	GAME OVER-PRESS BUTTON ..
\$7AC0		SPEECH TABLE				34	TURN DIAL RIGHT ...
\$7AE4		SPEECH TABLE				28	GREAT YOU BEAT HI SCORE ...
\$7B00	123	87	126	HL	HL+4	255	HOUSE-OCCUPIED-EVEN
\$7C00	124	87	126	HL	HL+4	255	HOUSE-OCCUPIED-ODD
\$7D00	125	130	144	TL	TL+5	90	TRUCK-EMPTY-RIGHT
\$7E00	126	130	144	TL	TL+5	90	TRUCK-W/DRIVER-RIGHT
\$7F00	127	130	144	TL	TL+5	90	TRUCK-1/PASSENGER-RIGHT
\$8000	128	130	144	TL	TL+5	90	TRUCK-2/PASSENGERS-RIGHT
\$8100	129	130	144	TL	TL+5	90	TRUCK-LOADED-RIGHT
\$8170		SOUND TABLE				16	THUNDER
\$8200	130	0	39	HL	HL+5	240	SUN
\$8300	131	130	144	TL	TL+5	90	TRUCK-W/DRIVER-LEFT
\$8360	131A					30	MELVIN BONNER-POSITION 1
\$8380	131B					30	MELVIN BONNER-POSITION 2
\$83E0	131C					30	MELVIN BONNER-POSITION 3
\$83A0	131D					30	MELVIN BONNER-POSITION 4
\$83C0	131E					30	MELVIN BONNER-POSITION 5
\$8400	132	130	144	TL	TL+5	90	TRUCK-1/PASSENGER-LEFT
\$8490		VECTOR SHAPE				78	TOMBSTONE
\$8500	133	130	144	TL	TL+5	90	TRUCK-2/PASSENGERS-LEFT
\$8560		SPEECH TABLE				106	SUNNY AND WARM ...
\$85D0		SPEECH TABLE				6	OOPS
\$8600	134	130	144	TL	TL+5	90	TRUCK-LOADED-LEFT
\$8660		SPEECH TABLE				70	STORM WARNING-COPYRIGHT ...



\$8700	135	67	117	CL+2	CL+6	255	FRAME DAMAGE-ODD STAGE 1
\$8800	136	67	117	CL+2	CL+6	255	FRAME DAMAGE-ODD STAGE 2
\$8900	137	67	117	CL+2	CL+6	255	FRAME DAMAGE-ODD STAGE 3
\$8A00	138	67	117	CL+2	CL+6	255	FRAME DAMAGE-ODD STAGE 4
\$8B00	139	67	117	CL+2	CL+6	255	FRAME DAMAGE-ODD STAGE 5
\$8C00	140	67	117	CL+2	CL+6	255	FRAME DAMAGE-EVEN STAGE 1
\$8D00	141	67	117	CL+2	CL+6	255	FRAME DAMAGE-EVEN STAGE 2
\$8E00	142	67	117	CL+2	CL+6	255	FRAME DAMAGE-EVEN STAGE 3
\$8F00	143	67	117	CL+2	CL+6	255	FRAME DAMAGE-EVEN STAGE 4
\$9000	144	67	117	CL+2	CL+6	255	FRAME DAMAGE-EVEN STAGE 5
\$9100	145	87	126	CL+2	CL+6	255	FRAME RUBBLE
\$9228							
\$923D		SOUND ROUTINES					
\$9296		SHIFT LEFT ROUTINE		NOTE:			
\$92E6		SHIFT RIGHT ROUTINE		CL = CLOUD -			
\$932F		REVDIR ROUTINE		LEFTMOST BYTE			
\$9361		DRAW ROUTINE		TL = TRUCK -			
\$9391		SCAN ROUTINE		LEFTMOST BYTE			
\$93A7		YADDR ROUTINE					
\$93C0		YTABLE SETUP ROUTINE					
		YTABLE					

### LISTING 1

```

10 REM *****
11 REM * STORM WARNING *
12 REM * BY ROBERT DEVINE *
13 REM * COPYRIGHT (C) 1983 *
14 REM * BY MICROSPARC, INC *
15 REM * LINCOLN, MA. 01773 *
16 REM *****
100 TEXT : HOME : PRINT CHR$ (4)"BLOOD OILER": CALL
    734: REM SET DOS FAST LOAD
110 PRINT CHR$ (4)"BLOOD SPEAK/SOUND": PRINT CHR$ (
    4)"BLOOD SLOTFINDER": CALL 36864: REM LOAD SPEE
    CH ROUTINE/TEST FOR MOCKINGBOARD
120 IF PEEK (6) = 0 THEN POKE 768,96: POKE 846,96: GOTO
    140: REM DISABLE SPEECH & SOUND ROUTINES
130 CALL 874: REM INITIALIZE SOUND GENERATOR
140 HIMEM: 20480: HOME : HGR
150 PRINT CHR$ (4)"BLOOD SHAPES": CALL 37799
160 HGR : POKE 251,80: POKE 252,58: POKE 253,97: POKE
    254,23: POKE 255,12: CALL 37679: VTBAB 21: HTAB 13
    : PRINT "COPYRIGHT 1983": HTAB 12: PRINT "ROBERT
    R. DEVINE"
170 POKE 26,165: POKE 27,134: POKE 28,96: POKE 29,134
    : POKE 1022,25: POKE 1023,3: CALL 768
180 POKE 252,50: POKE 253,140: POKE 255,8: POKE 254,3
    2: FOR Y = 1 TO 7: FOR X = 1 TO 7: CALL 37526: NEXT
    X: POKE 254, PEEK (254) + 1: POKE 255, PEEK (255)
    + 1: NEXT Y
190 POKE 251,125: POKE 252,145: POKE 253,159: POKE 25
    4,15: POKE 255,10: CALL 37679: REM DRAW TRUCK
200 POKE 251,97: POKE 252,87: POKE 253,126: POKE 254,
    4: POKE 255,0: CALL 37679: POKE 251,98: POKE 254,
    9: POKE 255,5: CALL 37679: REM DRAW 2 HOUSES
210 POKE 251,130: POKE 252,0: POKE 253,39: POKE 254,9
    : POKE 255,4: CALL 37679: HOME : REM DRAW SUN
220 X = PEEK (49235): A$ = "
    .....THIS IS MELVIN BONNER WITH TODAY'S
    WEATHER FORECAST -- SUNNY AND WARM -- JUST BEAUTIF
    UL -- NOT A CLOUD TO BE SEEN ANYWHERE -- A GREAT
    DAY FOR OUTDOOR FUN"
225 POKE 26,238: POKE 27,120: POKE 28,104: POKE 29,12
    0: CALL 768: REM THIS IS MELVIN BONNER .....
230 POKE 252,90: POKE 253,104: POKE 254,13: POKE 255,
    12: POKE 251,131: L = LEN (A$): FOR X = 1 TO L: POKE
    37680,96: IF X / 2 = INT (X / 2) THEN POKE 3768
    0,128
235 IF PEEK (25) = 0 AND T < > 99 THEN POKE 26,201
    : POKE 27,133: POKE 28,96: POKE 29,133: CALL 768:
    T = 99: REM SUNNY AND WARM....
240 CALL 37679: S = L - X: VTBAB 22: PRINT MID$ (A$,X,
    40): IF S < 40 THEN PRINT MID$ (A$,1,39 - S)
250 NEXT X: HOME : POKE 37680,0
260 FOR J = 1 TO 2: POKE 251,117: POKE 252,0: POKE 25
    3,39: POKE 254,9: POKE 255,8: CALL 37679: REM D
    RAW CLOUD
265 POKE 0,112: POKE 9,129: CALL 846: REM THUNDER

270 POKE 251,97: POKE 252,87: POKE 253,126: POKE 254,
    4: POKE 255,0: CALL 37679: POKE 251,98: POKE 254,
    9: POKE 255,5: CALL 37679: REM DRAW 2 HOUSES
280 POKE 251,91: POKE 252,40: POKE 253,86: POKE 254,7
    : POKE 255,3: CALL 37679: POKE 6,3: POKE 7,20: CALL
    37416: CALL 37686: POKE 6,3: POKE 7,20: CALL 3741
    6: GOSUB 420: REM LIGHTNING STRIKE
290 POKE 251,119: POKE 252,37: POKE 253,66: POKE 254,
    5: POKE 255,1: CALL 37679: REM LEFT FUNNEL
300 POKE 252,67: POKE 253,117: POKE 254,4: POKE 255,0
    : FOR X = 99 TO 113 STEP 2: POKE 251,X: CALL 3767
    9: POKE 6,3: POKE 7,20: CALL 37416: NEXT X: REM
    DESTROY LEFT HOUSE
310 POKE 251,113: GOSUB 420: REM ERASE #113
320 POKE 251,115: POKE 252,87: POKE 253,126: CALL 376
    79: REM LEFT RUBBLE
330 POKE 251,119: POKE 252,37: POKE 253,66: POKE 254,
    5: POKE 255,1: GOSUB 420: REM ERASE LEFT FUNNEL
340 POKE 251,117: POKE 252,0: POKE 253,39: POKE 254,9
    : POKE 255,0: CALL 37679: POKE 254,10: FOR Y = 1 TO
    3: FOR X = 1 TO 7: CALL 37526: NEXT X: POKE 254, PEEK
    (254) + 1: POKE 255, PEEK (255) + 1: NEXT Y: REM
    MOVE CLOUD RIGHT 3 BYTES
350 POKE 251,91: POKE 252,40: POKE 253,86: POKE 254,1
    0: POKE 255,6: CALL 37679: POKE 6,3: POKE 7,20: CALL
    37416: CALL 37686: POKE 6,3: POKE 7,20: CALL 3741
    6: GOSUB 420: REM LIGHTNING STRIKE
355 POKE 0,112: POKE 9,129: CALL 846: REM THUNDER

360 POKE 252,87: POKE 253,108: POKE 254,9: POKE 255,5
    : FOR X = 1 TO 40: POKE 251,94: IF X / 2 = INT (
    X / 2) THEN POKE 251,95
370 CALL 37679: POKE 6,2: POKE 7,2: CALL 37416: NEXT
    X: REM BURN HOUSE #2
380 POKE 251,116: POKE 253,126: CALL 37679: FOR X = 1
    TO 100: NEXT X: REM RUBBLE
390 IF J = 2 THEN HOME : GOTO 430
400 POKE 251,117: POKE 252,0: POKE 253,39: POKE 254,1
    2: POKE 255,2: FOR Y = 1 TO 2: FOR X = 1 TO 7: CALL
    37437: NEXT X: POKE 254, PEEK (254) - 1: POKE 255
    , PEEK (255) - 1: NEXT Y: POKE 254, PEEK (254) +
    1: FOR X = 1 TO 7: CALL 37437: NEXT
410 POKE 251,116: POKE 252,87: POKE 253,126: POKE 254
    ,9: POKE 255,5: GOSUB 420: NEXT J: REM ERASE RUB
    BLE
420 POKE 37696,81: POKE 37697,38: CALL 37679: POKE 37
    696,234: POKE 37697,234: RETURN
430 POKE 251,131: POKE 254,13: POKE 255,12: POKE 3769
    6,81: POKE 37697,38: POKE 252,90: POKE 253,104: POKE
    37680,120: CALL 37679: REM ERASE MAN
440 POKE 37680,160: CALL 37679: FOR X = 90 TO 130 STEP
    2: CALL 37679: POKE 252,X: POKE 253,X + 14: IF PEEK
    (37680) = 160 THEN POKE 37680,192: GOTO 460
450 POKE 37680,160
460 CALL 37679: FOR T = 1 TO 40: NEXT T,X: CALL 37679
    : X = PEEK (49235): VTBAB 23: HTAB 15: FLASH : PRINT
    " OOPS !! ": NORMAL : POKE 37680,0
465 POKE 26,213: POKE 27,133: POKE 28,208: POKE 29,13
    3: CALL 768: REM OPSS !!!
470 POKE 37696,234: POKE 37697,234
480 POKE 251,126: POKE 252,145: POKE 253,159: POKE 25
    4,15: POKE 255,10: CALL 37679: POKE 254,16: FOR X
    = 1 TO 30: FOR Y = 1 TO 7: CALL 37526: NEXT Y: POKE
    254, PEEK (254) + 1: POKE 255, PEEK (255) + 1: NEXT
    X
490 HOME : HGR : X = PEEK (49234)
500 PRINT CHR$ (4)"BRUN SW-M"

```

KEY PERFECT 4.0  
RUN ON  
STORM WARNING

CODE	LINE#	-	LINE#
A49E	10	-	120
0157B6	130	-	220
01414E	225	-	290
014531	300	-	380
011D59	390	-	470
4869	480	-	500

TOTAL PROGRAM CHECK IS : 0C73

KEY PERFECT 4.0  
RUN ON  
OILER

CODE	ADDR#	-	ADDR#
2794	02DE	-	032D
2B05	032E	-	037D
1AFC	037E	-	03B2

TOTAL PROGRAM CHECK IS : D5

CHECK CODE 3.0

ON: SPEAK/SOUND  
TYPE: B

LENGTH: 0096  
CHECKSUM: 30

## LISTING 2: OILER

\*2DE.383

```

02DE- AD 84
02E0- A8 C9 49 D0 05 A9 20 8D
02E8- 84 A8 A9 00 8D 8C A3 A9
02F0- B7 8D 8D A3 A0 B3 B9 FF
02F8- 02 99 FF B6 88 D0 F7 60
0300- AD 61 AA F0 04 C9 79 90
0308- 03 4C 71 A4 A2 05 B5 00
0310- 48 BD C9 B5 95 00 CA 10
0318- F5 AD 72 AA 18 69 FC 85
0320- 04 8D F0 B7 A9 00 8D EB
0328- B7 6D 73 AA 85 05 C6 05
0330- 8D F1 B7 A0 FF B1 02 91
0338- 04 88 C0 03 D0 F7 AD 60
0340- AA C9 FD AD 61 AA 69 00
0348- 85 04 A9 0E 85 05 A4 05
0350- B1 00 8D EC B7 C8 B1 00
0358- 8D ED B7 C8 84 05 C6 04
0360- F0 0E A0 E8 A9 B7 20 B5
0368- B7 EE F1 B7 90 E0 B0 2C
0370- AD F0 B7 85 04 AD F1 B7
0378- 85 05 A5 02 8D F0 B7 A5
0380- 03 8D F1 B7 A0 E8 A9 B7
0388- 20 B5 B7 B0 0F AD 60 AA
0390- 69 04 A8 18 88 B1 02 91
0398- 04 98 D0 F8 A0 05 A2 00
03A0- 86 48 68 95 00 E8 88 10
03A8- F9 B0 03 4C EA A2 A9 08
03B0- 4C D2 A6 26

```

## LISTING 3: SPEAK/SOUND

\*300.396

```

0300- 78 A9 FF 85 19 8D 02 C4
0308- A9 B0 8D 0C C4 A9 90 8D
0310- 0E C4 A9 03 8D 00 C4 58
0318- 60 8A 48 98 48 A0 00 A5
0320- 1A C5 1C D0 1B A5 1B C5
0328- 1D D0 15 A9 10 8D 0E C4
0330- A9 3F 8D 00 C4 A9 00 85
0338- 19 68 A8 68 AA A5 45 40
0340- B1 1C 8D 00 C4 E6 1C D0
0348- F0 E6 1D 4C 39 03 20 8B
0350- 03 A0 00 8C 81 C4 20 75
0358- 03 B1 08 8D 81 C4 20 80
0360- 03 C0 0F F0 04 C8 4C 53
0368- 03 60 A9 FF 8D 83 C4 A9
0370- 07 8D 82 C4 60 A9 07 8D
0378- 80 C4 A9 04 8D 80 C4 60
0380- A9 06 8D 80 C4 A9 04 8D
0388- 80 C4 60 A9 00 8D 80 C4
0390- A9 04 8D 80 C4 60 02

```

```

KEY PERFECT 4.0
RUN ON
SPEAK/SOUND

```

```

-----
CODE          ADDR# - ADDR#

```

```

25BA          02DE - 032D

```

```

27B4          032E - 0373

```

```

TOTAL PROGRAM CHECK IS : 96

```

## LISTING 4: SLOT FINDER

\*9000.907F

```

9000- 78 A9 00 85 08 A9 38 8D
9008- FE 03 A9 98 8D FF 03 A9
9010- C1 85 09 A0 0B A9 00 91
9018- 00 A0 0E A9 C0 91 08 A0
9020- 04 A9 01 91 08 C9 A9 00
9028- 91 08 58 A5 06 D0 0B A5
9030- 09 C9 C7 F0 05 E6 09 4C
9038- 13 90 60 8A 48 98 48 38
9040- A5 09 E9 C0 85 06 A0 0E
9048- A9 04 91 08 68 A8 68 AA
9050- A5 45 A5 06 F0 1C 09 C0
9058- A2 03 86 09 A0 10 0E 68
9060- 90 86 08 A2 00 81 08 88
9068- 10 F4 40 07 0C 11 16 2F
9070- 34 44 55 5D 6E 73 79 7E
9078- 84 89 BF 94 00 00 00 00

```

```

KEY PERFECT 4.0
RUN ON
SLOTFINDER

```

```

-----
CODE          ADDR# - ADDR#

```

```

2741          02DE - 032D

```

```

176C          032E - 035C

```

```

TOTAL PROGRAM CHECK IS : 7F

```

```

CHECK CODE 3.0

```

```

ON: SLOTFINDER
TYPE: B

```

```

LENGTH: 007F
CHECKSUM: 39

```

LISTING 5:

0800-	A7	08	80	97	03	80	98	03	0A08-	0A	C8	08	98	0C	C0	12	98	0D08-	1E	A5	1E	85	FF	20	2F	93	
0808-	A9	7A	85	10	85	18	A9	C0	0AE0-	0E	B0	10	C9	1E	90	D7	90	0D0B-	E6	ED	A5	ED	85	FE	A9	81	
0816-	85	1C	A9	E1	85	1A	28	00	0AE8-	0A	C9	14	90	D1	B0	04	C9	0D0C-	85	EC	A4	52	0C	09	07	90	
0818-	03	20	A7	93	A9	EA	8D	40	0AF0-	0A	90	C8	A6	22	C9	C8	80	0D0D-	21	A5	1E	D0	1D	A5	ED	85	
0820-	93	80	41	93	A9	7E	85	FB	0AF8-	06	20	25	0F	4C	BE	0A	20	0D0E-	FE	C6	FE	A9	7E	18	65	40	
0822-	A9	82	85	FC	A9	90	85	FD	0B00-	27	14	A2	08	86	22	8D	A0	0D0F-	05	B5	20	2F	93	E6	FE	A9	
0830-	A9	85	93	FE	A9	00	85	FF	0B08-	76	F8	B3	A9	00	85	D6	20	0D10-	01	85	EC	A9	00	85	EB	4C	
0838-	20	2F	85	E6	FE	A9	81	85	0B10-	D8	14	4C	BE	0A	20	3D	92	0D11-	52	0C	A5	EB	C9	07	90	84	
0846-	EC	A9	06	85	ED	A9	00	85	0B18-	E6	78	A5	78	C9	07	80	03	0D12-	A5	1E	F0	28	20	3D	92	E6	
0848-	EB	85	1E	85	20	A9	75	85	0B20-	4C	F9	08	A5	24	D8	03	04	0D13-	EB	A5	EB	C9	07	90	1D	A5	
0858-	FB	A9	00	85	FC	85	FF	A9	0B28-	FF	08	20	AE	EF	A5	9F	C9	0E00-	1E	F0	19	C6	1E	A5	1E	C9	
0858-	27	85	FD	A9	09	85	FE	20	0B30-	96	90	03	20	27	14	20	AE	0E08-	FF	D0	05	E6	1E	4C	1C	8E	
0868-	2F	93	A9	0A	85	FE	85	2C	0B38-	EF	A5	9F	A6	4A	E0	04	B0	0E10-	85	FF	C6	ED	A5	ED	85	FE	
0868-	A9	81	85	2B	A9	00	85	E8	0B40-	07	C9	14	B0	12	4C	04	B0	0E18-	A9	00	85	EB	E6	20	A5	20	
0870-	85	E9	85	24	85	78	85	4C	0B48-	C9	0A	80	08	A9	00	85	7C	0E20-	C9	0E	F0	03	4C	52	0C	A9	
0878-	85	40	85	4A	85	23	AA	A9	0B50-	A9	01	85	2B	4C	C0	08	07	0E28-	00	85	20	60	A9	57	85	FC	
0880-	63	90	AD	76	A2	01	A9	01	0B58-	2C	A5	2C	85	FE	C6	24	A5	0E30-	A9	7E	85	FD	A2	01	BD	C0	
0888-	9D	AD	76	A9	00	9D	80	76	0B60-	24	85	FF	A9	00	85	78	A5	0E38-	74	85	FE	BD	00	76	85	FF	
0890-	9D	0E	76	EA	00	89	90	EE	0B68-	2C	F9	08	00	04	A2	02	D0	0E40-	8A	4A	B0	04	A9	62	D0	02	
0898-	42	01	80	BA	08	9D	D0	76	0B70-	0E	C9	15	D0	04	A2	04	D0	0E48-	A9	61	85	EB	F0	86	E3	20	2F
08A0-	BD	C3	08	9D	C0	76	E8	E0	0B78-	06	C9	1F	D0	7C	A2	06	86	0E50-	93	A6	E3	E8	00	89	90	DE	
08A8-	09	9E	FB	20	2C	0E	A2	00	0B80-	22	20	AE	EF	A6	22	A5	9F	0E58-	A9	55	85	FB	A9	27	85	FC	
08B0-	20	1E	FB	20	7C	90	F7	4C	0B88-	44	EB	C0	04	90	0A	C0	80	0E60-	A9	BE	05	FD	A9	27	85	FE	
08B8-	CC	00	00	00	05	0A	0F	14	0B90-	98	0C	C0	12	90	8E	B0	18	0E68-	A9	00	85	FF	20	2F	93	A9	
08C0-	19	1E	23	00	04	09	0E	13	0B98-	C9	1E	90	50	80	0A	C9	14	0E70-	A4	85	FC	A9	AB	85	FD	AD	
08C8-	18	10	22	27	A5	4A	C9	80	0BA0-	08	90	57	B0	04	C9	0A	90	0E78-	97	03	85	EB	AD	98	03	85	
08D0-	90	83	4C	40	15	A5	4C	C9	0BA8-	A6	22	C9	C8	90	12	BD	A0	0E80-	E9	20	71	15	A9	00	85	EB	
08D8-	03	98	03	4C	40	15	20	AE	0BB0-	76	F0	46	20	27	14	A9	01	0E88-	85	E9	A4	22	60	A9	00	85	
08E0-	EF	A5	9F	C9	10	80	0E	A0	0BB8-	85	D6	20	D8	14	4C	F9	08	0E90-	25	A2	01	8A	9D	E0	76	BD	
08E8-	70	84	08	A0	81	84	09	20	0BC0-	A9	08	85	25	BD	B0	76	F0	0E98-	80	76	F0	80	E6	25	DE	80	
08F0-	4E	03	A6	E8	0E	02	90	1A	0BC8-	0B	E6	25	DE	B0	76	20	C0	0EAB-	04	9D	0E	76	60	BD	A0	76	
08FB-	0E	04	90	1C	E0	06	90	1E	0BD0-	0F	4C	F9	08	BD	A0	76	F0	0EB0-	C9	02	00	06	E6	4C	A9	91	
0900-	E0	00	90	20	E0	10	90	22	0BE8-	01	85	23	A9	00	9D	A0	76	0EB8-	85	23	A9	00	9D	A0	76	9D	
0908-	0E	12	90	24	E0	14	90	26	0BF0-	A5	23	F0	05	20	95	16	C6	0EC0-	B0	76	E6	4A	20	F8	16	A9	
0910-	80	2A	C9	E6	90	2C	80	20	0BF8-	23	20	52	0C	4C	0C	00	A9	0EC8-	77	85	FB	A9	25	85	FC	A9	
0918-	C9	D0	90	26	80	27	C9	D2	0C00-	00	8A	85	2C	A9	01	85	2B	0ED0-	42	85	FD	A9	25	85	FE	A9	
0920-	90	20	80	21	C9	C8	90	1A	0C08-	00	85	78	20	AE	EF	A5	9F	0ED8-	01	85	FF	20	0F	93	A9	01	
0928-	80	1B	C9	BE	90	14	B0	15	0C10-	A4	EB	C0	04	90	0A	C0	80	0EE0-	85	06	A9	0A	85	07	20	28	
0930-	C9	84	90	0E	80	0F	C9	9A	0C18-	90	0C	C0	12	90	8E	B0	18	0EE8-	92	A9	04	85	FE	A9	00	85	
0938-	90	08	80	09	C9	A0	90	02	0C20-	C9	1E	90	05	80	0A	C9	14	0EF0-	FF	85	D6	28	E3	10	A9	51	
0940-	80	83	4C	00	89	20	AE	0F	0C28-	C9	1E	90	05	80	0A	C9	14	0EF8-	8D	40	93	A9	26	8D	41	93	
0948-	A5	9F	C9	20	80	04	A2	01	0C30-	A6	22	C9	C8	80	86	20	80	0F00-	A9	77	85	FB	A9	25	85	FC	
0950-	D0	32	C9	40	80	04	A2	02	0C38-	0E	4C	F9	08	20	27	14	A2	0F08-	A9	42	85	FD	A9	85	85	FE	
0958-	D0	2A	C9	60	80	04	A2	03	0C40-	01	86	22	8D	A0	76	F0	B1	0F10-	A9	01	85	FD	20	A0	10	A9	
0960-	D0	22	C9	80	80	04	A2	04	0C48-	A9	00	85	20	70	14	4C	A0	0F18-	09	85	FE	A9	00	85	FF	20	
0968-	D0	1A	C9	00	80	04	A2	05	0C50-	F9	08	A9	82	85	FC	A9	90	0F20-	2F	93	A9	01	9D	E0	76		
0970-	D0	12	C9	00	80	04	A2	06	0C58-	85	FD	A5	ED	85	CE	A5	1E	0F28-	25	A2	08	A9	01	9D	E0	76	
0978-	D0	0A	C9	00	80	04	A2	07	0C60-	85	FF	A9	00	85	CD	AA	20	0F30-	BD	80	76	F0	08	E6	25	DE	
0980-	D0	02	A2	08	86	22	BD	A0	0C68-	0E	FC	00	7F	90	02	E6	CD	0F38-	80	76	4C	5D	0F	BD	A0	76	
0988-	76	F8	35	C9	02	F0	31	A9	0C70-	1E	FB	C0	7F	90	02	E6	CD	0F40-	D8	04	9D	0E	76	60	BD	A0	
0990-	82	90	AD	76	A9	57	85	FC	0C78-	A5	EC	D0	03	4C	79	0D	A5	0F48-	76	C9	02	00	06	E6	4C	A9	
0998-	A9	7E	85	FD	BD	C0	76	85	0C80-	1E	D0	1F	A5	4D	08	1B	A5	0F50-	01	85	23	A9	00	9D	A0	76	
1000-	FE	BD	D0	76	85	FF	0A	04	0C88-	0C	80	17	A9	81	85	FB	A9	0F58-	9D	78	76	E6	4A	20	F8	16	
1008-	0A	06	A9	7C	85	FB	D0	04	0C90-	05	85	FE	20	2F	93	E6	FE	0F60-	A9	00	85	FF	A9	25	85	FC	
1010-	A9	7B	85	FB	20	2F	93	A9	0C98-	A9	00	85	EB	A9	03	85	4D	0F68-	A9	42	85	FD	A9	26	85	FE	
1018-	88	85	06	85	07	20	28	92	0CA0-	D8	80	85	A5	EB	C9	07	D8	0F70-	A9	21	85	FD	20	2F	93	A9	
1020-	88	85	06	85	07	20	28	92	0CA8-	A5	ED	C9	27	D8	27	A5	CD	0F78-	01	85	06	A9	0A	85	07	20	
1028-	A9	00	85	FC	A9	27	85	FD	0CB0-	C8	F0	23	A9	80	85	4B	AA	0F80-	80	85	FF	A9	00	85	D6	20	5E
1030-	A9	00	85	FC	A9	27	85	FD	0CB8-	A0	76	C9	82	08	03	20	B3	0F90-	11	A9	51	8D	40	93	A9	26	
1038-	A5	20	85	FE	A5	24	85	FF	0CB8-	12	BD	A0	76	D0	03	20	09	0F98-	8D	41	93	A9	76	85	FB	A9	
1040-	A5	20	85	FE	A5	24	85	FF	0CC0-	11	A5	40	F0	07	C9	03	D0	0FA0-	25	85	FC	A9	42	85	FD	A9	
1048-	A5	20	85	FE	A5	24	85	FF	0CC8-	03	20	3A	13	60	A5	03	F0	0FA8-	26	85	FE	A9	21	85	FF	20	
1050-	A5	20	85	FE	A5	24	85	FF	0CD0-	4E	A5	EB	D0	24	A5	1E	65	0FB0-	A0	18	A9	27	85	FE	A9	1E	
1058-	A5	20	85	FE	A5	24	85	FF	0CD8-	03	4C	52	0C	A9	83	18	65	0FB8-	A0	18	A9	27	85	FE	A9	1E	
1060-	A5	20	85	FE	A5	24	85	FF	0CE0-	FE	20	2F	93	C6	1E	A5											



1348- 85 E8 CA D0 F0 D8 A9 B7  
 1358- 85 FC A9 BE 85 F0 20 71  
 1368- 15 A6 22 A9 00 85 40 A9  
 1368- 7E 85 FB A9 82 85 FC A9  
 1368- 98 85 FD A9 27 85 FE A9  
 1378- 22 85 FF 20 2F 93 C4 FF  
 1378- 48 A9 8C 85 E3 85 FB A9  
 1388- 43 85 FC A9 75 85 FD A5  
 1388- 06 F0 06 20 4F 11 4C 94  
 1398- 13 20 46 11 20 2F 93 A9  
 1398- 81 85 06 A9 0A 85 07 20  
 13A8- 28 92 20 52 0C E6 E3 A5  
 13A8- E3 C9 91 90 08 A9 98 85  
 13B8- FB A9 43 85 FC A9 75 85  
 13B8- FD A5 D6 08 06 20 46 11  
 13C8- 4C C6 13 20 4F 11 20 C1  
 13C8- 10 A9 91 85 FB 4C D7 18  
 13D8- A9 87 85 E3 85 FB A9 43  
 13D8- 85 FC A9 75 85 FD A5 D6  
 13E8- F0 06 20 CA 11 4C EB 13  
 13E8- 20 C1 11 20 2F 93 A9 01  
 13F8- 85 06 A9 0A 85 07 20 28  
 13F8- 92 20 52 0C E6 E3 A5 E3  
 1408- C9 8C 90 08 A9 8B 85 FB  
 1408- A9 43 85 FC A9 75 85 FD  
 1418- A5 D6 F0 06 20 CA 11 4C  
 1418- 10 14 28 22 08 20 C1 18  
 1428- A9 91 85 FB 4C D7 18 20  
 1428- 55 14 20 2F 93 A9 02 85  
 1438- 06 A9 0F 85 07 20 28 92  
 1438- 20 52 0C 20 55 14 20 E6  
 1448- 92 A9 02 85 06 A9 0F 85  
 1448- 07 20 28 92 20 52 0C 20  
 1458- 55 14 4C C1 10 A9 5B 05  
 1458- FB A9 28 85 FC A9 56 85  
 1468- FD A5 2C 38 E9 03 85 FE  
 1468- A5 24 18 69 03 85 FF 68  
 1478- A6 22 A9 01 9D E0 76 8D  
 1478- A0 76 C9 02 D0 86 E6 4C  
 1488- A9 01 85 23 A9 00 9D A0  
 1488- 76 9D 80 76 E6 4A A9 1C  
 1498- 85 E3 4A 98 04 A9 5C D0  
 1498- 82 A9 50 85 FB 28 C6 14  
 14A8- 20 2F 93 A9 83 85 06 05  
 14A8- 07 20 28 92 20 52 0C C6  
 14B8- E3 A5 E3 D8 DD A9 73 85  
 14B8- FB 28 C6 14 A9 7E 85 FD  
 14C8- 20 2F 93 4C 9F 12 A9 57  
 14C8- 85 FC A9 6C 85 FD A5 D6  
 14D8- F0 03 4C 4F 11 4C 46 11  
 14D8- A6 22 A9 01 9D E0 76 8D  
 14E8- A0 76 C9 02 D0 86 E6 4C  
 14E8- A9 01 85 23 A9 00 9D A0  
 14F8- 76 9D 80 76 E6 4A A9 1C  
 14F8- 85 E3 4A 98 04 A9 5C D0  
 1508- 82 A9 5F 85 FB 28 2E 15  
 1508- 20 2F 93 A9 83 85 06 05  
 1518- 07 20 28 92 20 52 0C C6  
 1518- E3 A5 E3 D8 DD A9 74 85  
 1528- FB 20 2E 15 A9 7E 85 FD  
 1528- 20 2F 93 4C 9F 12 A9 57  
 1538- 85 FC A9 6C 85 FD A5 D6  
 1538- F0 03 4C CA 11 4C C1 11  
 1548- A9 52 85 FB A9 82 85 FC  
 1548- A9 98 85 FD A5 ED 85 FE  
 1558- A5 1E 85 FF 20 2F 93 A9  
 1558- 84 85 FC A9 95 85 FD A9  
 1568- 1A 85 FE A9 20 2F 93 A9  
 1568- 54 85 FB 20 2F 93 4C 30  
 1578- 16 A5 E8 29 F8 85 07 A9  
 1578- 05 85 FE 85 FF A9 53 85  
 1588- FB 20 81 15 A5 E8 29 0F  
 1588- 85 07 E6 FE E6 FF 20 81  
 1598- 15 A5 E9 29 F8 85 07 E6

1598- FE E6 FF 20 81 15 A5 E9  
 15A8- 29 0F 85 07 E6 FE E6 FF  
 15A8- 20 81 15 A9 00 8D 30 93  
 15B8- 68 A5 07 D8 07 A9 48 8D  
 15B8- 38 93 D8 7D C9 01 8F 84  
 15C8- C9 10 D8 07 A9 08 8D 30  
 15C8- 93 F8 4E C9 02 F8 04 C9  
 15D8- 20 D8 07 A9 08 8D 30 93  
 15D8- D8 3F C9 03 F8 04 C9 30  
 15E8- D8 07 A9 10 8D 38 93 D8  
 15E8- 50 C9 04 F8 04 C9 40 D8

15F8- 07 A9 18 8D 30 93 D0 41  
 15F8- C9 85 F8 04 C9 50 D8 07  
 1608- A9 20 8D 30 93 D0 32 C9  
 1608- 06 F8 04 C9 08 D0 07 A9  
 1618- 28 8D 30 93 D0 23 C9 07  
 1618- F8 04 C9 70 D0 07 A9 38  
 1628- 8D 30 93 D0 14 C9 08 F8  
 1628- 04 C9 8D 08 07 A9 38 8D  
 1638- 30 93 D0 05 A9 40 8D 30  
 1638- 93 28 2F 93 68 A9 7A 85  
 1648- 18 85 1D A9 98 85 1C A9  
 1648- BF 85 1A A5 19 D8 FC 20  
 1658- 98 03 A5 19 D8 FC AD 61  
 1658- C0 C9 80 98 F9 20 E2 F3  
 1668- AD 52 C0 A5 E8 C0 97 03  
 1668- 90 20 D8 07 A5 E9 C0 98  
 1678- 03 90 1F A5 E8 8D 97 03  
 1678- A5 E9 8D 98 03 A9 7A 85  
 1688- 18 85 1D A9 E4 85 1C A9  
 1688- FF 85 1A A5 19 D8 FC 20  
 1698- 06 03 4C 19 08 A2 63 28  
 1698- EC F6 A5 4C C9 01 D0 06  
 16A8- A9 98 A2 C4 D8 0E C9 82  
 16A8- D8 86 A9 AC A2 87 08 84  
 16B8- A9 AC A2 CF A8 08 20 11  
 16B8- F4 A8 84 A2 98 A9 81 85  
 16C8- E7 A9 08 20 81 F6 A5 4C  
 16C8- C9 83 F8 1B A9 79 85 1D  
 16D8- 85 1B A5 4C C9 01 D0 10  
 16D8- A9 98 85 1C A9 C0 85 1A  
 16E8- A5 19 08 03 20 06 03 60  
 16E8- A9 C8 85 1C A9 F6 85 1A  
 16F8- A5 19 D8 F3 20 08 03 60  
 16F8- A5 19 D8 11 A9 78 85 1D  
 1708- 85 1B A9 E8 85 1C A9 F4  
 1708- 85 1A 20 08 03 60 80

LISTING 6: SHAPES

\*5000.9600

5000- 00 00 00 00 00 00 00 00  
 5000- 00 00 00 00 00 00 00 00  
 5010- 00 00 00 00 00 00 00 00  
 5010- 00 00 00 00 00 00 00 00  
 5020- 00 00 00 00 00 00 00 00  
 5020- 00 00 00 00 00 00 00 00  
 5030- 00 00 00 00 00 00 00 00  
 5030- 00 00 00 00 00 00 00 00  
 5038- 1F 46 0C 30 63 0C 06 4C  
 5048- 00 3F 06 0C 1F 46 0C 38  
 5058- 63 0C 1D 60 00 73 46 0C  
 5058- 06 06 0C 1B 63 0C 1D 60  
 5068- 00 61 47 0C 06 07 0C 8C  
 5068- 63 0C 3F 70 00 61 47 4C  
 5078- 06 07 4C 6C 06 61 47 37 30  
 5078- 00 79 47 6C 06 61 47 4C  
 5088- 63 7C 32 30 00 79 46 6C  
 5088- 06 06 0C 1F 63 0C 32 38  
 5098- 00 01 46 3C 06 06 46 3C  
 5098- 63 0C 38 30 00 81 46 3C  
 50A8- 06 06 3C 30 63 0C 30 38  
 50A8- 00 61 46 1C 06 06 1C 30  
 50B8- 63 5C 30 30 00 73 46 0C  
 50B8- 06 06 0C 38 61 78 06 30  
 50C8- 00 3F 06 0C 1F 46 0C 1F  
 50C8- 60 70 38 30 00 1E 86 0C  
 50D8- 1F 46 0C 0F 60 20 30 38  
 50D8- 00 00 00 00 00 00 00 00  
 50E8- 00 00 00 00 00 00 00 00  
 50E8- 00 00 00 00 00 00 00 00  
 50F8- 00 00 00 00 00 00 00 00  
 50F8- 00 00 00 00 00 00 00 00  
 5108- 00 00 00 00 00 00 00 00  
 5108- 00 00 00 00 00 00 00 00  
 5118- 00 00 00 00 00 00 00 00  
 5118- 00 00 00 00 00 00 00 00  
 5128- 00 00 00 00 00 00 00 00  
 5128- 00 00 00 00 00 00 00 00

KEY PERFECT 4.0  
 RUN ON  
 SW-M

CODE	ADDR#	ADDR#
29E9	#02E	#032
2A2E	#032E	#037E
2B37	#037E	#03CE
2AF2	#03CE	#0410
2B94	#041E	#044E
2319	#044E	#0480
234D	#048E	#0500
2A8A	#050E	#0520
29E9	#052E	#0540
2AB6	#054E	#05F0
28FD	#05FE	#0640
27C7	#064E	#0690
2819	#069E	#06ED
2432	#06EE	#0730
27E1	#073E	#0780
2E8C	#078E	#0820
2A3E	#082E	#0850
2971	#082E	#0870
248E	#087E	#08CD
2A83	#08CE	#091D
2A96	#091E	#0950
2798	#094C	#0980
2492	#098E	#0A00
2A6A	#0A0E	#0A50
2852	#0A5E	#0A80
2AD9	#0A8E	#0AFO
2454	#0AFE	#0B40
2A89	#0B4E	#0B90
2859	#0B9E	#0BED
248E	#0BCE	#0C30
2813	#0C3E	#0C80
2A87	#0C8E	#0CDD
2A56	#0CDE	#0D20
29C5	#0D2E	#0D70
2FAD	#0D7E	#0DCC
268F	#0DCE	#0E1D
25AD	#0E1E	#0E60
2A54	#0E6E	#0EB0
2684	#0EBE	#0F80
2217	#0F8C	#0F50
269A	#0F5E	#0FAD
27EA	#0FAE	#0FED
2D4C	#0FFE	#1040
2578	#104E	#1090
2849	#109E	#10ED
2332	#10EE	#1130
288F	#113E	#1180
3145	#118E	#11DD
053E	#11DE	#11EB

TOTAL PROGRAM CHECK IS : #FVE

5138- 30 60 78 06 01 70 00 00  
 5138- 00 00 0C 0C 38 61 7C 0C  
 5148- 03 78 06 00 00 00 00 0C  
 5148- 18 63 4E 06 07 1C 00 00  
 5158- 00 00 0C 0C 63 06 06 00  
 5158- 06 0C 00 00 00 00 00 0C  
 5168- 0C 43 04 06 06 00 00 00  
 5168- 00 00 0C 4C 0F 63 06 06  
 5178- 07 00 00 00 00 00 0C 4C  
 5178- 1F 43 06 06 03 78 00 00  
 5188- 00 00 0D 6C 38 63 06 06  
 5188- 00 7C 00 00 00 00 0D 6C  
 5198- 30 63 06 3C 00 00 0C 00  
 5198- 00 00 0F 3C 30 63 06 06  
 51A8- 06 0C 00 00 00 00 0F 3C  
 51A8- 38 63 4E 06 07 1C 00 00  
 51B8- 00 00 0C 0C 1F 61 7C 3F  
 51B8- 63 78 00 00 00 00 0C 0C  
 51C8- 0F 60 78 3F 61 70 00 00  
 51C8- 00 00 00 00 00 00 00 00  
 51D8- 00 00 00 00 00 00 00 00  
 51D8- 00 00 00 00 00 00 00 00  
 51E8- EF EF EF EF EF EF EF EF  
 51E8- EF EF EF EF EF EF EF EF  
 51F8- EF EF EF EF EF EF EF EF  
 51F8- EF EF EF EF EF EF EF EF  
 5208- 00 00 00 00 00 00 00 00  
 5208- 00 00 00 00 00 00 00 00  
 5218- 00 00 00 00 00 00 00 00  
 5218- 00 00 00 00 00 00 00 00  
 5228- 00 00 00 00 00 00 00 00  
 5228- 00 00 00 00 00 00 00 00  
 5238- 00 00 00 00 00 00 00 00  
 5238- 00 00 00 00 00 00 00 00  
 5248- 00 00 00 00 00 00 00 00  
 5248- 00 00 00 00 00 00 00 00  
 5258- 00 00 00 00 00 00 00 00  
 5260- 00 00 00 00 00 00 00 00  
 5260- 00 00 00 00 00 00 00 00  
 5278- 00 00 00 00 00 00 00 00

CHK. SW-M  
 TYPE: B  
 CHECK CODE: 3.0  
 LENGTH: #FVE  
 CHECKSUM: BF

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