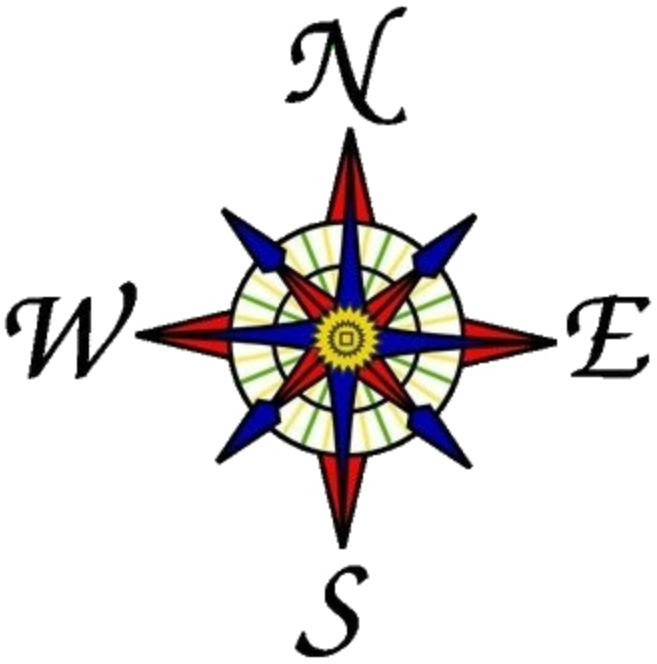
Map Maker



For the
Apple II+ Computer

(Minimum 64 kilobytes of RAM required)

By
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INTRODUCTION

In recent years, there has been a renewed interest in vintage 8-bit computers. A growing number of hobbyists and collectors have found a new appreciation for these machines, some of which are now nearly 40 years old. Despite their limitations as compared to modern technology, computers from the early 1980's in particular have a certain style and charm that is severely lacking in today's computers. In fact, many people find that the challenge and novelty in working within the limitations of an 8-bit machine is exactly what appeals to them. Simply put, these computers are *fun* to use. The purpose is more about the experience than just finishing a task as quickly and easily as possible – people actually enjoy handling floppy disks, feeling and hearing the satisfying clunk of typing on real mechanical keys, hearing the whirl and click of disk drives, and gain a sense of pride in being able to write their own programs and make the computer do exactly what they want it to do.

This version of Map Maker was specifically written for the Apple II+, but should work on any Apple II computer with at least 64 kilobytes of RAM.

USING THE MAP MAKER PROGRAM

As its name suggests, the Map Maker program allows you to make your own maps. You can place streets which either run north-to-south or east-to-west, and you can place locations. You can also add labels, such as to indicate an area or city. Streets, locations, and labels are added by entering the X and Y coordinates on the screen for where you want them to be placed and then entering a name to be displayed. You can remove any of the items by simply entering their name. Seperate maps can be "linked" by their file name, and then you can view an adjacent map by simply pressing "N,"S","E", or "W" on the keyboard to view the next map in a respective direction. The program will automatically load and display the map. You can also enter in the scale of the map (the distance, in miles, between each grid line). After entering the map scale, you can place two "pins" – 2 sets of X and Y coordinates on the map, and the program can calculate the distance in miles between them. There are quite a few interesting features in the program, and you are encouraged to try them all!

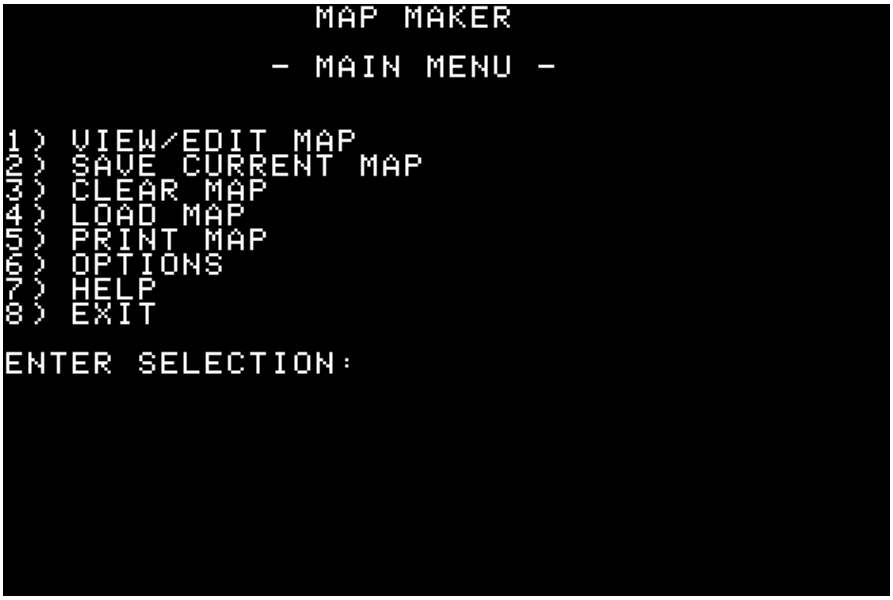
Map Maker is designed to be an interesting and useful program. However, you must also keep your expectations realistic. Due to some of the limitations of the Apple II computer, and in fact most early 8-bit computers, there are things the program simply can't do. The Apple II is capable of displaying graphics, but to display both graphics *and* text simultaneously would require a lot of complicated assembly language code, in a program that is already very large and complex. Therefore, streets and location markers are drawn using text characters instead of graphics. Also, because of memory limitations, you can add only a maximum of 10 streets, 10 locations, and 3 labels to each map. (In practice, this turns out to be plenty). The program can't be realistically expected to map out an entire city, and is intended to only map significant streets and locations. (Although you could split a city up into multiple map files which each show a different neighborhood or area if you wanted). However, despite these limitations, I feel Map Maker is still a fun and useful program. For more serious work, you would obviously use a modern computer and modern mapping software like Google Maps, Google Earth, etc. Map Maker is only intended to be a fun, novel program to run on your Apple II. I doubt you would use it to plan an entire road trip – although you *could* if you were really determined! Please feel free to experiment with the program, and I hope you have as much fun playing around with it as I did writing it.

STARTING MAP MAKER

Early 8-bit computers such as the Apple II typically do not have a hard drive, and so the Map Maker program does not need to be "installed" as you would on a modern computer. It runs entirely from the floppy disk.

First, boot your Apple II with DOS 3.3. Please note that Map Maker will likely not run with PRODOS or other later operating systems. After the computer has finished booting, simply insert the Map Maker disk and enter "RUN MAP MAKER" (without quotes) and press RETURN. Please be patient! The program file is large and will take time to load. (Remember that we're working with 40 year-old technology! But that's why you're here, right?)

Map Maker will start with the main menu. The choices are fairly straight foward and self-explanatory, but we'll discuss each of them.

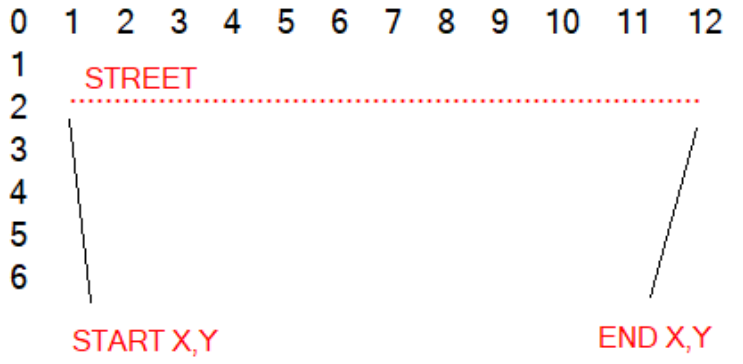


MAP EDITING SCREEN

Enter "1" on the Main Menu and press RETURN to view the map editing screen. This is the main workspace where you create and modify maps. You'll notice that the upper screen is labeled with an X and Y grid. The X axis is horizontal and goes up to 12, the Y axis is vertical and goes up to 6. Note that on the Y axis, the number increases as you go *down*. This is exactly the opposite from what is usually taught in mathematics, where the Y value increases as you go *up.* When working with computers, the upper left corner of the screen is the starting point for text characters and graphics. The X and Y values increase as you move farther away from the starting point. Thus, as you move farther to the right, the X value increases, and as you move down, the Y value increases.

Whenever you add a street or location to a map, these are the coordinates you will use to determine where you want it to be displayed on the screen. The lower part of the screen lists choices for adding items to the map, as well as other options. (Don't forget to select "7" to see more choices!)

Streets each have a starting X and Y point, and an ending X and Y point. When you add a north-to-south or east-to-west street to the map, the program will ask for the Start X, Start Y, End X, and End Y values for where you want the street to be drawn. It will also ask you to enter a name for the street. If you enter an X value or Y value that is out of range for the grid (less than 1 or greater than 12 for the X value, and less than 1 or greater than 6 for the Y value), the computer will beep and prompt you to re-enter the number. Adding locations and labels work in a similar way, except that you will only need to enter a single X and Y value.

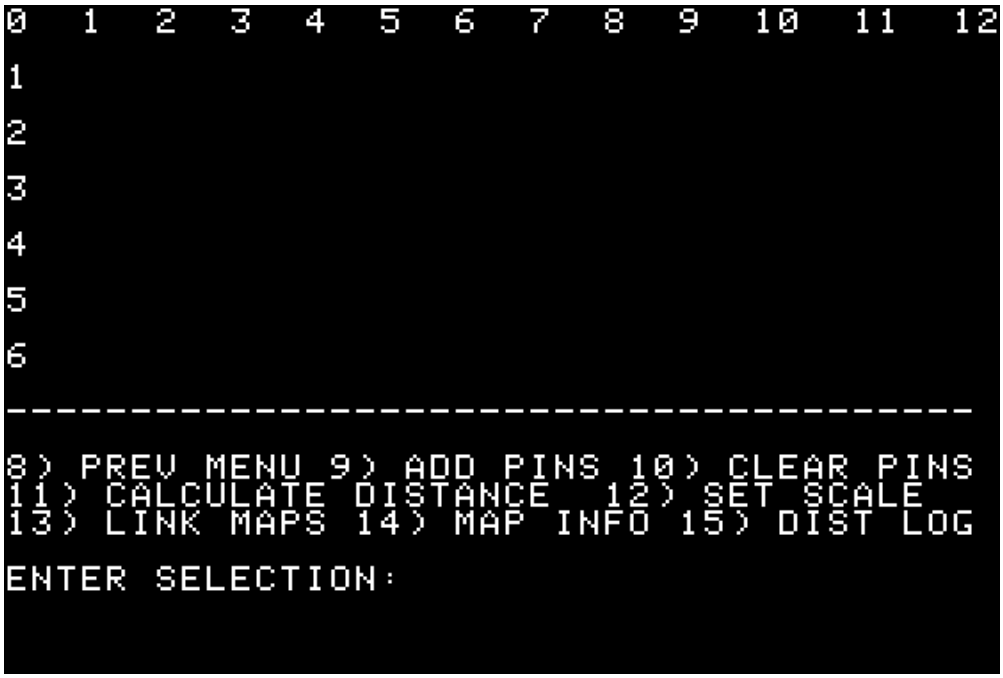


In this example, the starting point for the street is at 1,2.
The end point is at 12,2.

Note that in addition to selecting one of the choices on the map menu, you can also enter "N", "S", "E", or "W," which correspond to the compass directions. If you have "linked" a map, the program will automatically load and display the next map in a respective direction. This allows you to map a larger area than what can be displayed on the screen. We'll discuss map linking a bit later.

You can return to the Main Menu by entering "1" on the map menu. Your map will stay in memory, and you can go back to it at any time by selecting the map editing screen. (Entering "1" on the Main Menu).

If you enter "7" on the map menu to view more options, you will notice several other interesting features. One of which is an option to add "pins" to the map. As you've probably guessed, a "pin" is simply a temporary placeholder to mark a certain point on the map. Pins are used to calculate distance. This can be a particularly useful feature, so we will discuss it in more detail next.



PINS AND CALCULATING DISTANCE

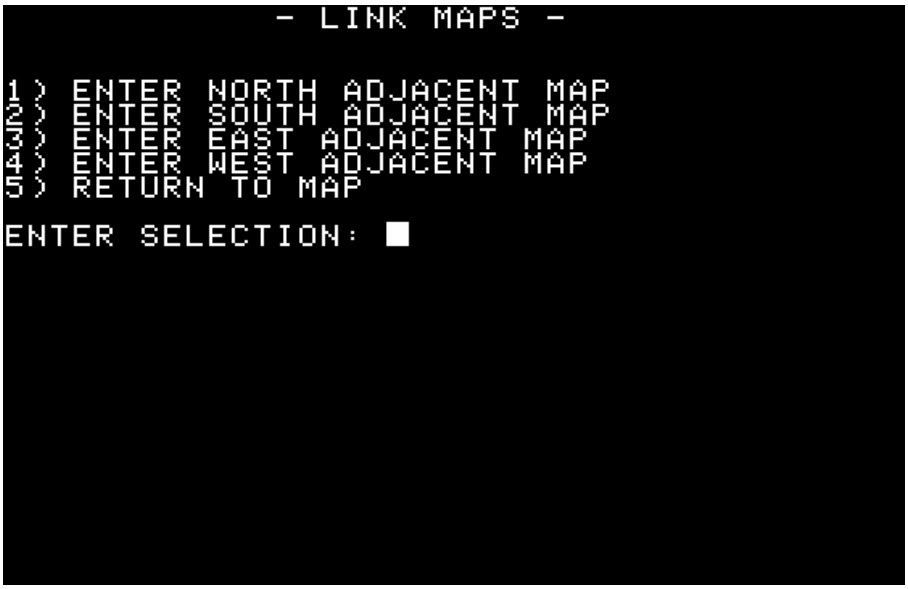
If you want to calculate the distance between 2 points on the map, there are 2 simple steps. These can be done in any order. First, you will need to add 2 pins to the map. Pins are added the same way as other items, by entering the X and Y coordinates where you want the pin to be placed. Enter "9" on the map menu to add pins. Once you have have added Pin 1, the program will ask you for the coordinates for Pin 2 the next time you enter "9" on the menu. The maximum is 2 pins, which is all that is needed to calculate distance. Next, you will need to enter in the map scale – this means the distance, in miles, between each grid line. (The distance can be any number you want, including decimal values if you are using very small distances.) Enter "12" from the menu to input the map scale. After you have have added 2 pins to the map, and entered the map scale, you can select "11" from the menu for the program to automatically calculate the distance between the pins you placed. Note that the distance given is always relative to Pin 1. For example, if you place Pin 2

south of Pin 1, the distance will be how far south Pin 2 is from Pin 1. The program will calcuate distance in both axis – it will tell you how far north or south, and east or west Pin 2 is from Pin 1.

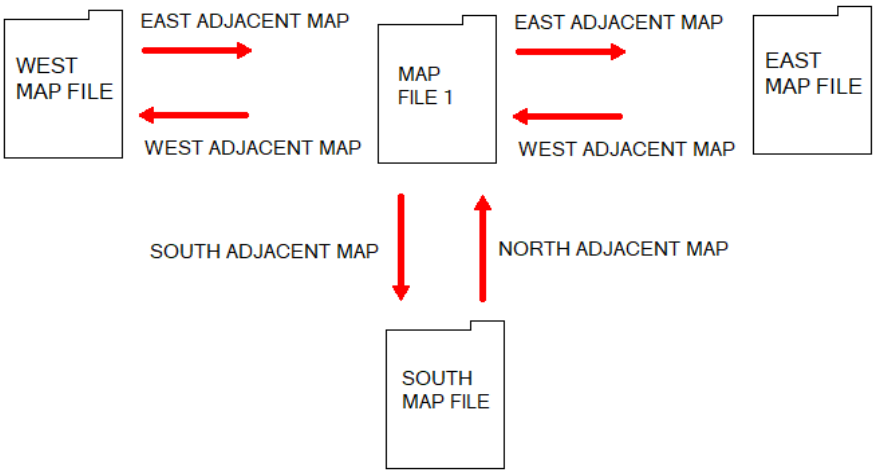
Note that when you place pins, they will temporarily overlap any other items on the map. Don't worry, the other items have not been erased or lost! When you are finished calculating distance, simply enter "10" on the map menu to clear the pins. The screen will be refreshed and the map will be redrawn, with the pins removed. Any items that were covered by the pins will be redrawn.

LINKING MAPS

You'll notice that option 13 on the map menu is to "Link maps." This is where things get interesting! With this feature, you can view an adjacent map that shows an area that is farther north, south, east, or west from the map you are currrently viewing.
There are a few steps to using this feature. First, create and save a map to a floppy disk. (You may want to refer to the section about Saving Maps if you need help with this). You could use the Map Maker program disk, but it's highly recommended that you have a separate disk for your map files. Let's name the map file "Map1.map." Next, create a new map that you want to be linked with the first one. For example, let's say the second map shows an area to the south of the first one. Let's call this second map "South map.map." Enter "13" from the map menu, which will then display the screen to link adjacent maps. You will notice options to enter the north, south, east, or west adjacent maps. Select the option for the north adjacent map, and then enter the file name of your first map, "Map1.map." The second map is now "linked" with the first one. However, we will need to save the map file to the disk. Enter "5" to return to the map. Then return to the Main Menu by entering "1" on the map menu, and save the map as "South map.map" for our example. Then go back to the map editing screen. Now when you enter "N" at the map menu, the program will automatically load and display the first map. If you then load and edit your first map, "Map1.map" you can repeat the process with it, except enter the file name "South map.map" as the south adjacent map. Then, by entering "N" or "S" in the map menu, you can move north or south through your maps.



Essentially, this tells the program which map files to load and display when you enter "N" or "S" from the map menu. You can repeat this process for east and west adjacent maps. If you feel creative, you could make an entire library of maps on a disk and be able to look through all of them just by pressing a key!



Once map files are "linked," one map can load the other. You can have the program load and display the next map simply by entering "N" "S" "E" or "W" in the map menu.

Another feature available on the map menu, called the "Distance Log," is closely related to pins and linked maps, so we will discuss this next.

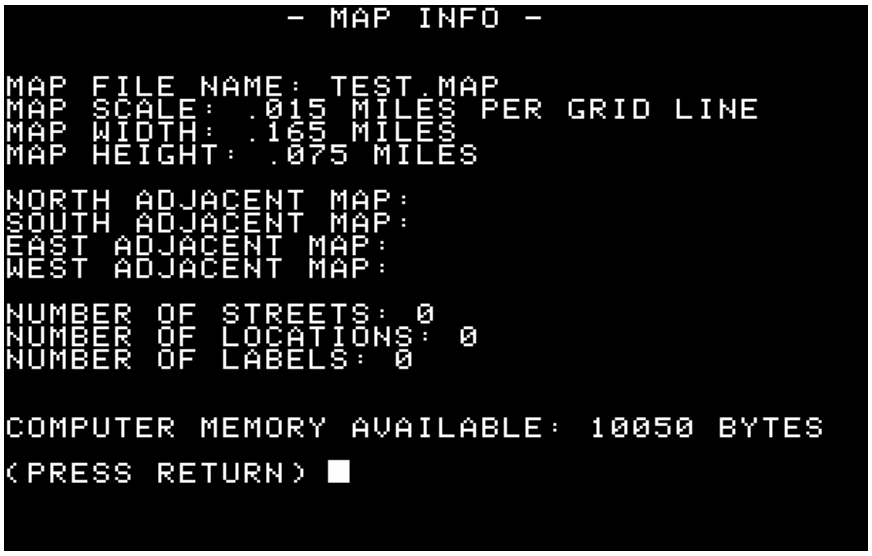
DISTANCE LOG

You may have noticed a strange option on the map menu, called "DIST LOG." This is an abbreviation for "Distance Log." (The whole name wouldn't fit in the menu!) This can be a very useful feature when viewing linked maps. As you are looking through your maps, you might want to find the total distance from a point on one map to another point on a different map. Let's say you have a series of map files for a town, and you want to find the distance from a street in the north end of the town to another point at the south end. Assuming you already have your maps linked so that you can move south from one map to another by entering "S" in the map menu, you can find the total distance by using pins. First, place Pin 1 at the point you want to start at, and then place Pin 2 at the southern most point of your first map. Then select option 11 from the map menu to calculate the distance. Clear the pins, and then load the next map. Place Pin 1 at the northern most point of your map. If the point you want to measure to is on this map, place Pin 2 at that point and then calculate the distance again. Now, enter "15" in the map menu to view the Distance Log screen. This screen will show the total distance you have moved on the X and Y axis. In this case, since you want to know how far south a point is, look at the "LOGGED Y DISTANCE." Each time you calculate the distance between pins, this feature keeps a running total. This way, if you are looking through a series of maps and trying to find how far 2 points are on different maps, you won't have to remember distances between pins. The program will keep track and add them for you.

Note, however, that the distance log doesn't say whether the distance is north, south, east, or west. All it cares about is the total distance you've measured on the X or Y axis. Also, this feature will only work if you have already set the map scale on all the maps you've linked. Otherwise, the calcuated distance and logged distance will show zero!

MAP INFORMATION

If you enter "14" in the map menu, you can view a screen which will show you a lot of helpful information about the map you're currently working on, such as the total number of streets, locations, and labels you've added, the map scale, etc. The Map Info screen will also show the amount of free RAM the computer has available, measured in bytes. With a blank map, there will typically be about 10 kilobytes available, as the program itself uses quite a bit of memory. (Yes, *kilobytes*! Remember, Apple II computers were made in the early 1980's!) However, this should be plenty to create a map.



If you have a lot of streets and locations with long names in your map, you might want to keep an eye on available free memory. But given how small the display area is, it's very unlikely that your map will use much memory anyway.

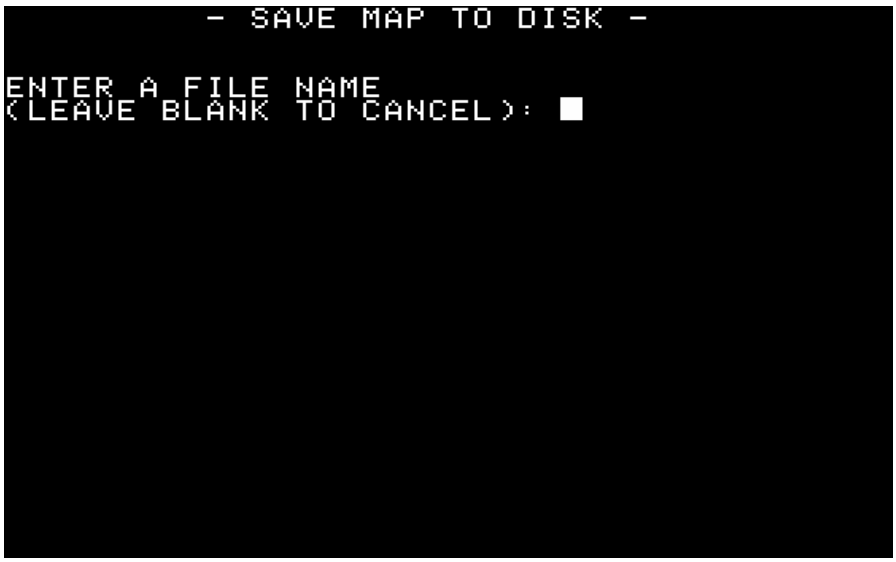
REMOVING MAP ITEMS

Let's say you've made a mistake while making your map – maybe you put in the wrong coordinates for a location, or misspelled a street name. It's very easy to fix this and remove items from the map. Enter "6" in the map menu, and then simply type in the name of the item you want to remove. If you change your mind and decide not to remove the item, just leave this blank and press RETURN. The screen will be refreshed and the map will be redrawn. If you entered the name of an item, the map will be redrawn with the item removed. That's all there is to it! You can remove any item this way, except pins. Use option "10" from the map menu to clear pins instead.

We've essentially discussed all the main features in the map menu. Feel free to experiment and try them all! We'll now go back to the Main Menu and look at some of the options there.

SAVING MAPS

What good would it do to go through all the trouble of making a map if you couldn't save it? Fortunately, this is very easy to do. You *could* use the Map Maker program disk to save your map files, but it's highly recommended that you use a separate disk. Whichever you decide to do, insert a disk and enter "2" in the Main Menu. The program will ask you for a file name. If you change your mind and decide not to save the map, just leave this blank and press RETURN, and the program will go back to the Main Menu. If you want to save your map now, enter a file name. The Apple II computer isn't very picky about file names and ignores file extensions, so you can name the file essentially anything you want. However, it's recommended that you use a ".MAP" extension so it will be easier to tell later which are map files. For eample, "MAP1.MAP". Once the file is successfully saved to the disk, the program will display a message and prompt you to press RETURN to continue, which will then go back to the Main Menu.



Note, however, that the program will NOT warn you if a file name already exists! If you enter a name of a file that is already on the disk, the file will be overwritten.

RESETTING THE MAP

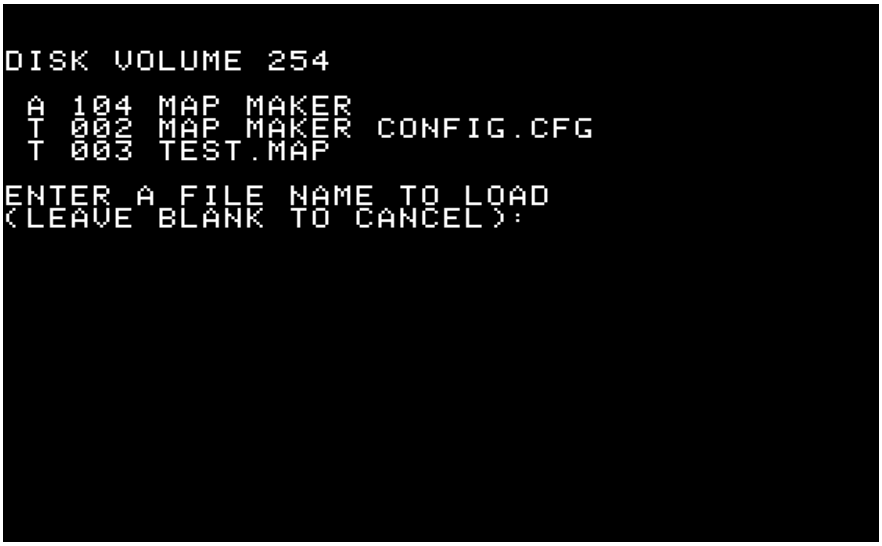
If you decide you want to clear the map and start over with a blank one, enter "3" in the Main Menu. This will clear ALL items from the map and reset ALL the variables. Be careful and be sure you want to do this – it can't be undone! The program will display a warning message and ask if you are sure. If you want to proceed, just enter "Y" and press RETURN. The program will clear and reset the map, and will then display a message with a prompt for you to press RETURN. This will go back to the Main Menu.

Any other response (such as leaving it blank or entering "N") will cancel the reset and go back to the Main Menu.

LOADING MAPS

It's easy to load a map you have saved to a disk. Enter "4" on the Main Menu. A list will be displayed of all the files currently on the disk. Look for the map file you want to load and enter the file name and press RETURN. The program will load the file and will then automatically go to the map editing screen. The map you loaded will be displayed.

If you change your mind and want to cancel loading a map, simply leave the response for the file name blank and press RETURN. The program will go to the Main Menu, without any action being taken on the current map.

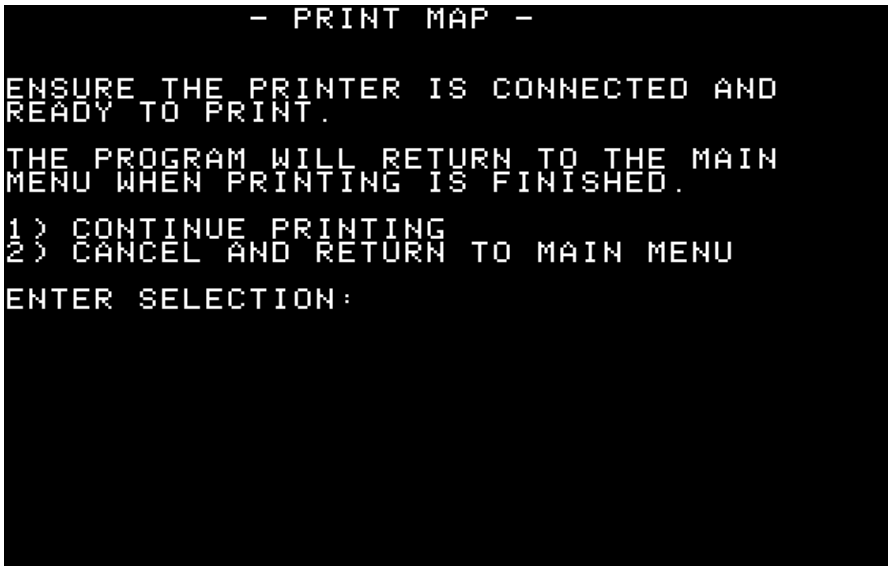


In the screen image shown, 1 map file is listed – "TEST.MAP"

PRINTING MAPS

You can easily print a map that is currently in memory. However, you must have your printer set up correctly beforehand, as the Map Maker program is not able to make any changes to your serial or parallel card settings. You can change the slot number and define whether the printer is serial or parallel in the Options screen (which will be discussed later), but Map Maker is not able to change the Baud rate or any other communication settings. If your printer is set up and working correctly, you can print your map by entering "5" on the Main Menu.

The program will display a message reminding you to ensure that the printer is connected and ready to print. (It's possible that a problem with the connection to the printer *might* cause the computer to freeze up, so it's a good idea to check everything before you proceed with printing). You can either select to continue with printing, or cancel and return to the Main Menu.



If you proceed with printing, the program will then ask if you want to also print the X-Y grid. The default setting is to print the grid, so unless you specifically enter "N", the grid will be printed.

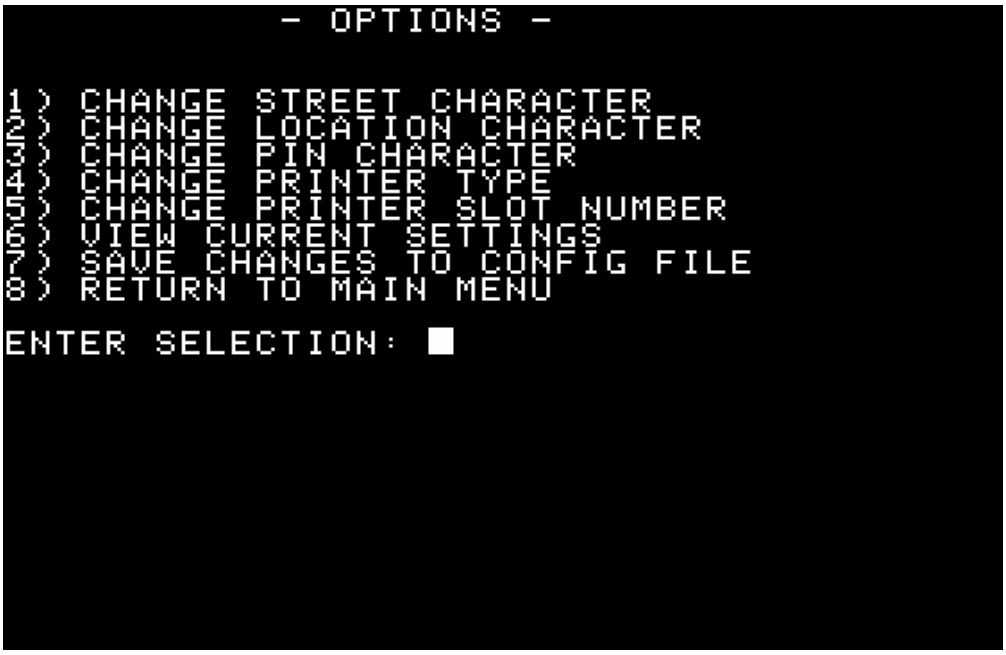
One peculiarity about many early 8-bit computers is that in order to print something from the screen memory, it has to actually be *redrawn* onto the screen. Thus, when you select to continue printing, your map will first be redrawn onto the screen. The contents of the screen memory will then be sent, or "dumped" to the printer. Printing will be a bit slow, so please be patient. Once printing has finished, the program will return to the Main Menu.

The print feature was tested with an Apple II+ computer, using a Super Serial card connected in Slot 1, and an Apple Image Writer II printer.

OPTIONS SCREEN

If you enter "6" on the Main Menu, you can view the Options screen, where you can change some of the program settings. As mentioned earlier, the program uses text characters to draw streets, location markers, and pins. For example, to draw streets, the program displays a character repeatedly on the screen for the length of the street. In the Options screen, you can change these characters to whatever you prefer. Just select which setting you want to change, and the program will ask you to type what you want to use as the character. (It only has to be a valid text character. You don't even necessarily *have* to use symbols, and for example could use the letter "S" to draw streets if you wanted!)

You can also change the printer type (serial or parallel), and enter the slot number where your printer is connected. By default, the program is set up for a serial printer on slot 1. If your printer interface card is in a different slot, or you are using a parallel printer, you will need to change these settings to be able to print maps. Simply enter "4" or "5" for which ever setting you need to change.



Remember to select "7" to save your changes to the configuration file, otherwise the settings will revert back to their old state the next time you start Map Maker.

The Configuration File is simply a plain text file that stores the value of variables. In this case, it stores the characters the program uses to draw map items and information about the printer. Whenever you start the Map Maker program, it loads the configuration file to determine what settings to use. The map files are acutally also plain text files, except that they are much longer and store information about how many streets are on a map, the start and end coordinates for the streets, etc. Modern computers continue to use configuration files to this day – they are often used to store player names and scores in games. Configuration files are simply a list of variables and values assigned to those variables.

CONCLUSION

Hopefully, this manual has helped to give you a better understanding of the main features of the Map Maker program. Although Map Maker is of course not intended to replace modern mapping software, it can be a fun and useful program for people who want to be creative and *make their own maps* from scratch! It has a lot of very novel uses. One of which might be for local history – making maps for locations and streets that no longer exist and are not shown on any modern maps. Or how about mapping a favorite hiking trail and campground? Maybe a map to buried treasure! Use your imagination! But most importantly, have fun.

If you have any questions, please feel free to contact the writer and programmer, Christian Tobar, by email at: gatewaycityca@yahoo.com

APPENDIX I:
TECHNICAL INFORMATION

Map Maker was written entirely in Apple BASIC, or "Applesoft" on an actual Apple II+ computer. No emulators were used here! If you are curious (or feeling particularly brave and adventurous), you can list the program in BASIC and see the code. A word of warning, however – the program is very *long*! For the most part, everything is fairly well commented and much of the program was divided into subroutines. I have tried to make the code as well organized and easy to read as possible, although there are no doubt many ways the program could have been made more efficient. People familiar with programming in BASIC, especially programming early 8-bit computers, will most likely be able to decipher what everything is doing fairly easily.

You are free to make any improvements to the program code you want, with the condition that if you make the program available on the internet or otherwise distribute it you are asked to give credit to Christian Tobar as the original writer and programmer.

The following is a list of all the variables used in the program, and their purpose. This may be helpful if you decide to delve into the BASIC code. If you do, good luck! (No, really, you'll need it!)

Map Maker variables

```
VARIABLE A1$ IS FOR THE MAP FILE NAME
VARIABLE A2 IS FOR THE MAP SCALE
VARIABLE A3 IS FOR THE MAP WIDTH
VARIABLE A4 IS FOR THE MAP HEIGHT
VARIABLE A5$ IS FOR THE STREET CHARACTER
VARIABLE A6$ IS FOR THE LOCATION CHARACTER
VARIABLE A7$ IS FOR THE PIN CHARACTER

VARIABLE A8$ IS FOR THE NORTH ADJACENT MAP
VARIABLE A9$ IS FOR THE SOUTH ADJACENT MAP
VARIABLE B1$ IS FOR THE EAST ADJACENT MAP
VARIABLE B2$ IS FOR THE WEST ADJACENT MAP

VARIABLE B3 DETERMINES THE NUMBER OF STREETS
VARIABLE B4 DETERMINES THE NUMBER OF LOCATIONS
VARIABLE B5 DETERMINES THE NUMBER OF LABELS
VARIABLE B6 DETERMINES THE NUMBER OF PINS

VARIABLE B7 DETERMINES IF STREET1 EXISTS
VARIABLE B8$ DETERMINES STREET1 ALIGNMENT
VARIABLE B9 DETERMINES STREET1 START X
VARIABLE C1 DETERMINES STREET1 START Y
VARIABLE C2 DETERMINES STREET1 END X
VARIABLE C3 DETERMINES STREET1 END Y
VARIABLE C4 DETERMINES STREET1 LENGTH
VARIABLE C5$ DETERMINES STREET1 NAME

VARIABLE C6 DETERMINES IF STREET2 EXISTS
VARIABLE C7$ DETERMINES STREET2 ALIGNMENT
VARIABLE C8 DETERMINES STREET2 START X
VARIABLE C9 DETERMINES STREET2 START Y
```

VARIABLE D1 DETERMINES STREET2 END X
VARIABLE D2 DETERMINES STREET2 END Y
VARIABLE D3 DETERMINES STREET2 LENGTH
VARIABLE D4$ DETERMINES STREET2 NAME

VARIABLE D5 DETERMINES IF STREET3 EXISTS
VARIABLE D6$ DETERMINES STREET3 ALIGNMENT
VARIABLE D7 DETERMINES STREET3 START X
VARIABLE D8 DETERMINES STREET3 START Y
VARIABLE D9 DETERMINES STREET3 END X
VARIABLE E1 DETERMINES STREET3 END Y
VARIABLE E2 DETERMINES STREET3 LENGTH
VARIABLE E3$ DETERMINES STREET3 NAME

VARIABLE E4 DETERMINES IF STREET4 EXISTS
VARIABLE E5$ DETERMINES STREET4 ALIGNMENT
VARIABLE E6 DETERMINES STREET4 START X
VARIABLE E7 DETERMINES STREET4 START Y
VARIABLE E8 DETERMINES STREET4 END X
VARIABLE E9 DETERMINES STREET4 END Y
VARIABLE F1 DETERMINES STREET4 LENGTH
VARIABLE F2$ DETERMINES STREET4 NAME

VARIABLE F3 DETERMINES IF STREET5 EXISTS
VARIABLE F4$ DETERMINES STREET5 ALIGNMENT
VARIABLE F5 DETERMINES STREET5 START X
VARIABLE F6 DETERMINES STREET5 START Y
VARIABLE F7 DETERMINES STREET5 END X
VARIABLE F9 DETERMINES STREET5 END Y
VARIABLE G1 DETERMINES STREET5 LENGTH
VARIABLE G2$ DETERMINES STREET5 NAME

VARIABLE G3 DETERMINES IF STREET6 EXISTS
VARIABLE G4$ DETERMINES STREET6 ALIGNMENT
VARIABLE G5 DETERMINES STREET6 START X
VARIABLE G6 DETERMINES STREET6 START Y
VARIABLE G7 DETERMINES STREET6 END X
VARIABLE G8 DETERMINES STREET6 END Y
VARIABLE G9 DETERMINES STREET6 LENGTH
VARIABLE H1$ DETERMINES STREET6 NAME

VARIABLE H2 DETERMINES IF STREET7 EXISTS
VARIABLE H3$ DETERMINES STREET7 ALIGNMENT
VARIABLE H4 DETERMINES STREET7 START X
VARIABLE H5 DETERMINES STREET7 START Y
VARIABLE H6 DETERMINES STREET7 END X
VARIABLE H7 DETERMINES STREET7 END Y
VARIABLE H8 DETERMINES STREE7 LENGTH
VARIABLE H9$ DETERMINES STREET7 NAME

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VARIABLE I1 DETERMINES IF STREET8 EXISTS
VARIABLE I2$ DETERMINES STREET8 ALIGNMENT
VARIABLE I3 DETERMINES STREET8 START X
VARIABLE I4 DETERMINES STREET8 START Y
VARIABLE I5 DETERMINES STREET8 END X
VARIABLE I6 DETERMINES STREET8 END Y
VARIABLE I7 DETERMINES STREET8 LENGTH
VARIABLE I8$ DETERMINES STREET8 NAME

VARIABLE I9 DETERMINES IF STREET9 EXISTS
VARIABLE J1$ DETERMINES STREET9 ALIGNMENT
VARIABLE J2 DETERMINES STREET9 START X
VARIABLE J3 DETERMINES STREET9 START Y
VARIABLE J4 DETERMINES STREET9 END X
VARIABLE J5 DETERMINES STREET9 END Y
VARIABLE J6 DETERMINES STREET9 LENGTH
VARIABLE J7$ DETERMINES STREET9 NAME

VARIABLE J8 DETERMINES IF STREET10 EXISTS
VARIABLE J9$ DETERMINES STREET10 ALIGNMENT
VARIABLE K1 DETERMINES STREET10 START X
VARIABLE K2 DETERMINES STREET10 START Y
VARIABLE K3 DETERMINES STREET10 END X
VARIABLE K4 DETERMINES STREET10 END Y
VARIABLE K5 DETERMINES STREE10 LENGTH
VARIABLE K6$ DETERMINES STREET10 NAME

VARIABLE K7 DETERMINES IF LOCATION1 EXISTS
VARIABLE K8 DETERMINES LOCATION1 X
VARIABLE K9 DETERMINES LOCATION1 Y
VARIABLE L1$ DETERMINES LOCATION1 NAME

VARIABLE L2 DETERMINES IF LOCATION2 EXISTS
VARIABLE L3 DETERMINES LOCATION2 X
VARIABLE L4 DETERMINES LOCATION2 Y
VARIABLE L5$ DETERMINES LOCATION2 NAME

VARIABLE L6 DETERMINES IF LOCATION3 EXISTS
VARIABLE L7 DETERMINES LOCATION3 X
VARIABLE L8 DETERMINES LOCATION3 Y
VARIABLE L9$ DETERMINES LOCATION3 NAME

VARIABLE M1 DETERMINES IF LOCATION4 EXISTS
VARIABLE M2 DETERMINES LOCATION4 X
VARIABLE M3 DETERMINES LOCATION4 Y
VARIABLE M4$ DETERMINES LOCATION4 NAME

VARIABLE M5 DETERMINES IF LOCATION5 EXISTS
VARIABLE M6 DETERMINES LOCATION5 X
VARIABLE M7 DETERMINES LOCATION5 Y
VARIABLE M8$ DETERMINES LOCATION5 NAME
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VARIABLE M9 DETERMINES IF LOCATION6 EXISTS
VARIABLE N1 DETERMINES LOCATION6 X
VARIABLE N2 DETERMINES LOCATION6 Y
VARIABLE N3$ DETERMINES LOCATION6 NAME

VARIABLE N4 DETERMINES IF LOCATION7 EXISTS
VARIABLE N5 DETERMINES LOCATION7 X
VARIABLE N6 DETERMINES LOCATION7 Y
VARIABLE N7$ DETERMINES LOCATION7 NAME

VARIABLE N8 DETERMINES IF LOCATION8 EXISTS
VARIABLE N9 DETERMINES LOCATION8 X
VARIABLE O1 DETERMINES LOCATION8 Y
VARIABLE O2$ DETERMINES LOCATION8 NAME

VARIABLE O3 DETERMINES IF LOCATION9 EXISTS
VARIABLE O4 DETERMINES LOCATION9 X
VARIABLE O5 DETERMINES LOCATION9 Y
VARIABLE O6$ DETERMINES LOCATION9 NAME

VARIABLE O7 DETERMINES IF LOCATION10 EXISTS
VARIABLE O8 DETERMINES LOCATION10 X
VARIABLE O9 DETERMINES LOCATION10 Y
VARIABLE P1$ DETERMINES LOCATION10 NAME

VARIABLE P2 DETERMINES IF LABEL1 EXISTS
VARIABLE P3 DETERMINES LABEL1 X
VARIABLE P4 DETERMINES LABEL1 Y
VARIABLE P5$ DETERMINES LABEL1 NAME

VARIABLE P6 DETERMINES IF LABEL2 EXISTS
VARIABLE P7 DETERMINES LABEL2 X
VARIABLE P8 DETERMINES LABEL2 Y
VARIABLE P9$ DETERMINES LABEL2 NAME

VARIABLE Q1 DETERMINES IF LABEL3 EXISTS
VARIABLE Q2 DETERMINES LABEL3 X
VARIABLE Q3 DETERMINES LABEL3 Y
VARIABLE Q4$ DETERMINES LABEL3 NAME

VARIABLE Q5 DETERMINES IF PIN1 EXISTS
VARIABLE Q6 DETERMINES PIN1 GRID X
VARIABLE Q7 DETERMINES PIN1 GRID Y
VARIABLE Q8 DETERMINES PIN1 SCREEN X
VARIABLE Q9 DETERMINES PIN1 SCREEN Y

VARIABLE R1 DETERMINES IF PIN2 EXISTS
VARIABLE R2 DETERMINES PIN2 GRID X
VARIABLE R3 DETERMINES PIN2 GRID Y
VARIABLE R4 DETERMINES PIN2 SCREEN X
VARIABLE R5 DETERMINES PIN2 SCREEN Y

VARIABLE R6 DETERMINES PIN GRID X DISTANCE
VARIABLE R7 DETERMINES PIN GRID Y DISTANCE
VARIABLE R8 DETERMINES TOTAL PIN DISTANCE
R9$ IS A TEMPORARY VARIABLE FOR NEW STREET ALIGNMENT
S1 IS A TEMPORARY VARIABLE FOR NEW STREET START X
S2 IS A TEMPORARY VARIABLE FOR NEW STREET START Y
S3 IS A TEMPORARY VARIABLE FOR A NEW STREET END X
S4 IS A TEMPORARY VARIABLE FOR NEW STREET END Y
S5 IS A TEMPORARY VARIABLE FOR NEW STREET LENGTH
S6$ IS A TEMPORARY VARIABLE FOR NEW STREET NAME
S7 IS A TEMPORARY VARIABLE FOR WHICH STREET TO ADD

S8 IS A TEMPORARY VARIABLE FOR NEW LOCATION X
S9 IS A TEMPORARY VARIABLE FOR NEW LOCATION Y
T1$ IS A TEMPORARY VARIABLE FOR NEW LOCATION NAME
T2 IS A TEMPORARY VARIABLE FOR WHICH LOCATION TO ADD

T3 IS A TEMPORARY VARIABLE FOR NEW LABEL X
T4 IS A TEMPORARY VARIABLE FOR NEW LABEL Y
T5$ IS A TEMPORARY VARIABLE FOR NEW LABEL NAME
T6 IS A TEMPORARY VARIABLE FOR WHICH LABEL TO ADD
T7 IS A TEMPORARY VARIABLE FOR PIN SCREEN X
T8 IS A TEMPORARY VARIABLE FOR PIN SCREEN Y
T9 IS A TEMPORARY VARIABLE FOR WHICH PIN TO ADD

VARIABLE U1 IS FOR THE GRID X
VARIABLE U2 IS FOR THE GRID Y
VARIABLE U3 IS FOR THE SCREEN X
VARIABLE U4 IS FOR THE SCREEN Y

VARIABLE U5 IS FOR THE TOTAL LOGGED X DISTANCE
VARIABLE U6 IS FOR THE TOTAL LOGGED Y DISTANCE

VARIABLE U7 DETERMINES WHICH PRINTER TYPE TO USE. 1 FOR SERIAL, 2 FOR PARALLEL

VARIABLE U8 DETERMINES WHICH SLOT THE PRINTER INTERFACE CARD IS USING

CA$-CL$ ARE TEMPORARY VARIABLES USED TO GET THE CHARACTERS FROM N-S STREET NAMES, TO DISPLAY THE NAME VERTICALLY

VARIABLE D$ IS USED FOR DOS COMMANDS

F$ IS A TEMPORARY VARIABLE USED FOR FILE NAMES

P and P$ ARE TEMPORARY VARIABLES USED FOR PROMPTS

PZ IS A TEMPORARY VARIABLE USED FOR PROMPTS

VARIABLE G DETERMINES IF THE X-Y GRID IS PRINTED

VARIABLE Z DETERMINES IF THE MAP IS BEING PRINTED