

MY ATARI PRIMER

by

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This primer is dedicated to my family who gave me a love for learning.
May it also inspire you.

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Foreword

This book is dedicated to computer enthusiasts
who love to explore and learn from the past.

Introduction

Welcome reader.

If you're reading this most likely you've inherited my Atari computer. Hopefully it also came with the many peripherals, devices, software, magazines, books, notes, and other documentation I collected over the years I owned it. You've probably asked yourself, "Why do I want this thing?", "What am I supposed to do with this?" or maybe, "This thing is so old. Is it even useful still?" In this primer I will answer these questions, and suggest you read it completely before deciding what you want to do. There are a lot of things to read on the Atari, but this was written with the intent of it being the first thing you read concerning this computer and all of the other pieces it came with.

The purpose of this primer is to give you a very basic understanding of the Atari computer to get you started using it. This does not cover basic computer architecture and terminology, and assumes the reader has a basic understanding of that subject matter. If you're unfamiliar with acronyms such as I/O, RAM, ROM, KB and others, you should first read some very basic books on computer architecture. Such acronyms will be used in this primer and it's assumed you will understand their meaning. Please read this guide completely before turning on any of the equipment to avoid potential damage.

The Atari is a very basic computer, but the system is quite capable of a lot of variation and modification. When I first started to use the Atari 400 computer, I just had the computer without any peripherals and a display. As the system I owned grew in complexity, I realized it would be difficult for anyone else to setup the system and utilize it. Much of the knowledge about how to operate the system had become second nature to me, but a new user would have to hunt through the materials I owned to do something as simple as boot from a cassette. It was this realization that prompted me to write this primer. I also wanted to provide some background on this particular computer, what modifications I had made, and why someone such as yourself might want still want to use it.

This computer has brought me many years of joy and ultimately led to a rewarding career. Through it I learned the basics of programming, circuit design, computer architecture, logical problem solving and more. Because the Atari was so flexible, I've found there was always something to learn from it or develop for it. I've compared learning to use computers and learning about the Atari to unravelling a sweater by pulling on a thread. You first start to wonder what's possible or how something works, only to find years later you're still pulling on that thread and the sweater is still unravelling. It's my hope this device will provide you as much joy as it has for me and that you'll care for my old friend as it continues to age.

History

It seemed proper to provide some background on the Atari and the times in which the Atari computer was created. Some of the software titles in my collection will make a little more sense if you understand what was happening during the time the Atari computer was popular. I also wanted to provide some history of this particular computer, for posterity and because it has a unique configuration.

At one time computers were people, mathematicians who did computation for a living. When we started to tackle the problem of sending man to the moon, hardware computers were in use but were very limited in capability. The phone you have in your hand today is a computer with greater capability and capacity than the computers that sent man to the moon. In 1975 hobbyists started to tinker with solid state CPUs. These hobbyists would gather to share their information with each other, help solve problems and grew as a community. Homebrew computing became a reality, but wasn't something most people would do. In 1976 Apple introduced the first Apple I computer you could buy as a kit. It came without a case or display. The hobbyist would supply those. It was very bare bones and not made for the masses. Apple and some others began to think perhaps there was a mass market for computers, but they needed to be more user friendly.

When I grew up, it was an analog world. We had rotary phones. Touch tone dialing wasn't even a thing. There was no cable TV. We had three analog television stations to choose from (ABC, NBC, CBS) and at some point we got a fourth (PBS). Television was broadcast on two bands, very high frequency (VHF) and ultra high frequency (UHF). Citizen Band radio (CBs) became popular for a time and allowed people at home to communicate via radio signals mostly with truckers and other hobbyists who got into CB radios. Home computers started to have mass appeal in the late 1970s. Apple introduced the Apple II computer in 1977 which included a case and was one of the first in the home market. Atari introduced the Atari 400 in 1979. And there were others such as Commodore, Amiga, and RadioShack's TRS-80 to name a few. Each one had its own unique operating systems and software. A game that worked on your Commodore computer wouldn't work on your friend's Apple II unless they got the Apple II version of it.

Before the internet, there were Bulletin Board Systems people could connect to. You would use a modem and dial into a "board" where if you were lucky you could text chat with the system operator (sysop) who would grant you access to files you could download shared by them or others members of the board. There was no cost for membership, but depending on the location of the board you might be charged for a long distance call. The first modems were 300 baud and then gradually increased in speed. At 300 baud, you could literally read the text on the screen as it was transmitted from the computer at the other end. File transfers over the phone at 300 baud took a while and people welcomed the increase in speed from 1200 baud and later 2400. However, the faster the modem, the more you'd pay for the device and the computer you would connect to would also require a modem equally as fast or faster because your connection was only as fast as the slower device on either end. This was one of only 4 ways you could obtain software for your computer. The other ways were to purchase it from a computer store, copy software from a friend if you could overcome any copy protection that might be on the software, or programming it yourself.

My grandfather was a self taught broadcast engineer who worked for NBC. He had taught himself several languages and to play a variety of musical instruments. When I was a kid, it seemed like there

wasn't anything he didn't know. One year my grandmother decided to get my grandfather a computer for his birthday thinking it would be the sort of gift he would enjoy. It was an Atari 400, the very same one you now have. I was 14 or 15 at the time. My grandfather connected it to the TV in the den where he often sat, but I never saw him use it much. I asked if I could use it and he said it was fine. I got a book on BASIC and started to teach myself how to make this computer do things. At some point I was in a book store and saw a magazine called ANTIC. It was an Atari magazine and had programs you could type in. Here all I had to do was type in this program from the magazine and viola! I had a game. My grandfather gave me money to buy the magazine. It was the March 1983 issue of Antic Magazine.

At night after my grandfather stopped watching television and went to bed, I would get on the computer and type in the programs from the magazine. I learned more about BASIC this way seeing how programs were written, the commands being used, and what those commands did. I also learned how to debug my work because if something didn't work after I typed it in, the assumption was the magazine was correct so I knew I made a mistake somewhere. One morning as my grandfather was waking up, I was getting ready to go to bed after a long night of typing in a program, debugging and finally getting to play the game I worked so hard to enter. I said to my grandfather, "Please don't turn off the computer." There was a switch-box so he could watch TV instead of what was on the computer. He asked why and I told him because the moment the computer was switched off, the program would be lost. I showed him what I had entered and the game I was able to play. After I got some sleep, we went out that day and he got an Atari 410 cassette recorder so I could save my work and be able to reload it when I wanted to edit or play. That was my first peripheral for the Atari and the very one you still have now.

The rest of the peripherals came later. The Atari had only RF output to a television and I saw in one of my magazines I could create a circuit board, connect it to spots on the computer's motherboard, and have color composite out. Color composite monitors offered a better picture quality than a standard television. The silver topped box with a DB-25 connector is the composite video out box I made with a custom cable to connect to a color composite monitor. I also added more memory to it. Originally it had 16K of memory, but I installed a MOSIAC memory board which bumped it up to 48K. Later in my twenties I made a custom pull out keyboard for the Atari 400 using a keyboard from a later model Atari 1200XL and modified a case for it from the body of the same type. This connects via a DB-25 ribbon cable to the left side of the computer, and both the original membrane keyboard and the custom pull out keyboard will both operate at the same time.

One final word. When these computers were first made they were a nice light beige color, but over time they would become darker. People used to think this was due to having the computer in an environment where people smoked cigarettes. The actual reason was due to bromine that was used in the plastic. When the plastic with bromine was exposed to sunlight, it would darken. This is why there are computer covers and why you should try to avoid exposing the plastic to sunlight. At one time I found a recipe for something called RetrObright which was a recipe you could use to brighten the plastic. It consisted of hydrogen peroxide, Oxyclean detergent, xantham gum, and glycerine. I discovered it worked, but the issue was being able to spread the mixture on evenly and the even exposure to sunlight required. The results I got weren't as good as I had hoped. The color correction seemed a bit blotchy and uneven and I worried it may have made the plastic more brittle. I decided against a second attempt.

Now that you have some history of this particular computer. Let's dive into the next sections where I'll discuss the setup and operation so you can start using it.

Setup

The Atari uses a daisy-chain method of connecting peripherals. The native connection is serial and not parallel although you can connect a parallel printer with a special parallel adaptor, the ATR8000 which has a parallel out option, or the Atari 850. The connection port for peripherals is called the SIO connector and is located on the right side of the Atari. This connection is “keyed” via a trapezoid design so you can only connect the cable one way. Most peripherals have two SIO connections so you can connect the Atari to the device and then chain the next device to the first device. You can do this as many times as you like. Some devices such as the Atari 410 cassette recorder only have one connection and so devices like this must be last in the chain.

Disk drives use a numbering system which supports 4 drives, drives 1 to 4. Drive 1 is always the boot drive. Each drive that’s active must have a unique number. The method for setting the drive number is unique to each drive, and you will need to find the proper reference material for the drive to know how to change it. Currently the Atari 1050 is set to drive 1 and the Indus GT drive is set for drive 2. The standalone standard drive that connects to the ATR8000 is also drive 1. This drive will also boot Atari files as well as the ATR8000 disks and CP/M disks. Because of this, you should not have the Atari 1050 drive and the standard drive powered on at the same time when using the computer.

For the most part, a peripheral must be on before the computer is turned on for the computer to recognize the device. If the device is turned on after the computer is turned on, it may not be seen. Therefore the normal order of operation is to turn on all of the peripherals you’ll use first and turn the computer on last. Likewise everything is powered off in reverse order with the computer being turned off first. This is very important - NEVER insert a cartridge into the Atari computer when the device is powered on. Always turn off the computer, insert the cartridge, and then turn on the computer. Failing to do this might severely damage the computer. Also, don’t remove a cartridge while the computer is still powered on. Shut off the computer before removing a cartridge. This goes for joysticks, trackballs and other devices that plug into the joystick ports on the front, make sure they’re plugged in before you turn on the computer and the computer is off before you disconnect them.

You can use the principle of “the peripheral must be on first” to selectively configure the system. For example, I already mentioned how the standard drive and the Atari 1050 drive are both set to drive 1. When using the Atari you might power on the Atari 1050 drive and the Indus GT drive, but leave the standard drive powered off. When you then power on the computer, only the two Atari drives will be seen by the system. Likewise, when using the ATR8000 to boot CP/M, you would leave the Atari 1050 drive and the Indus GT drive off, but power on the standard drive, the ATR8000 and then the computer. In this way, only the standard drive is seen so there’s no conflict between it and the Atari 1050 drive.

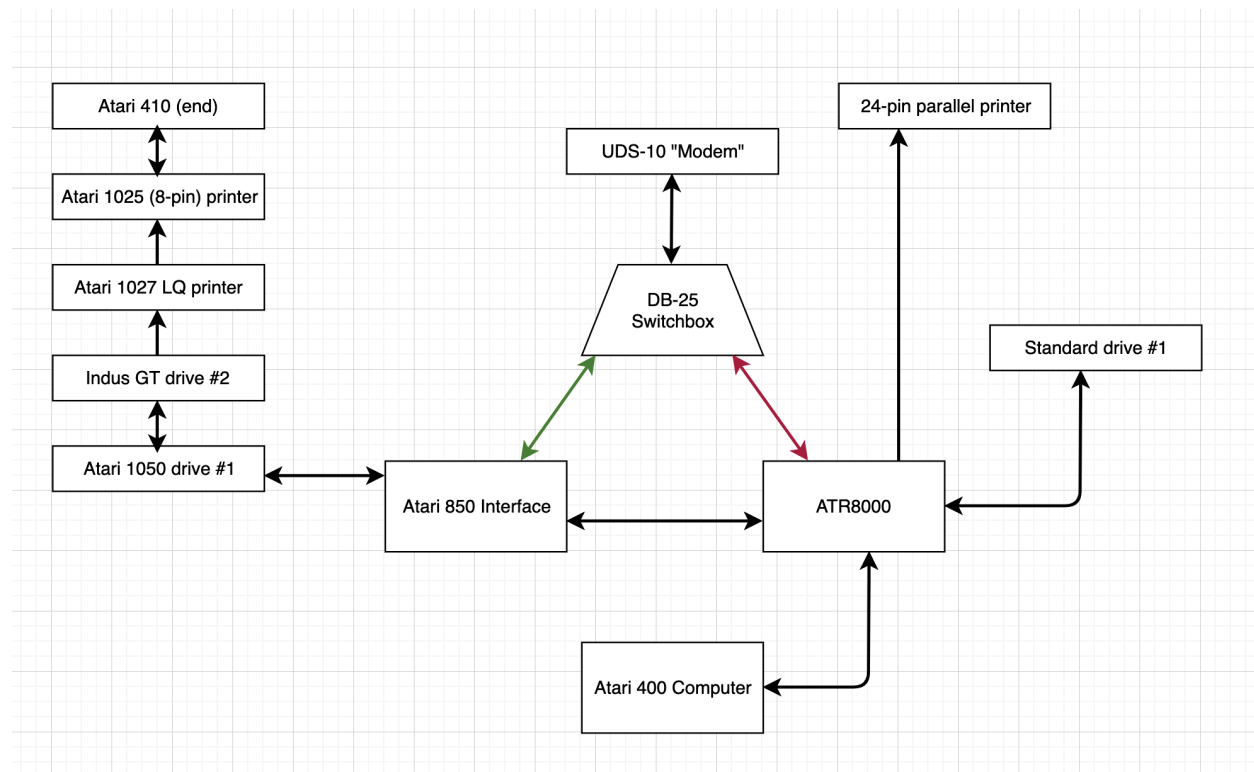
The peripherals have power switches in a variety of locations. Some have it on the right side, some on the left, some in the back, and some like the cassette drive have no power-on switch at all. To make it easier to selectively power on and off devices, I used a rack mounted bank of power switches. The devices are all plugged into this bank of switches which have individual labels and the power switches on each of these devices is then turned on. The power can then be controlled from the bank of switches. Here’s a screenshot of the switchbank:

* * *



Power switch-bank close-up.

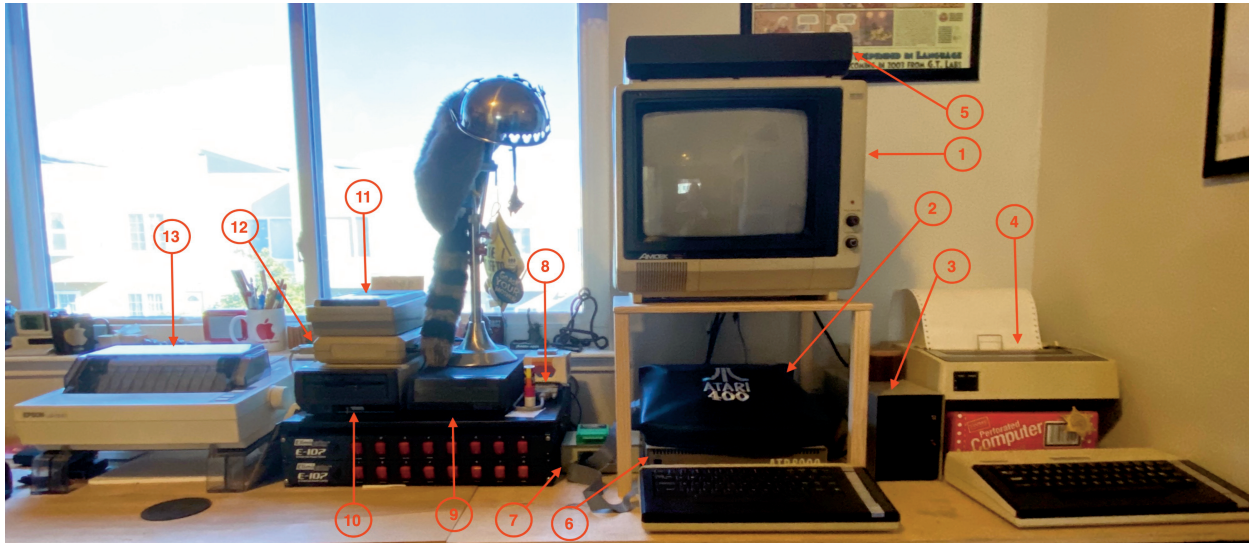
This is an overview diagram of the way the Atari computer and peripherals are connected and how they interact.



You'll notice in this diagram that some arrows are one way. This indicates that the data flow. For example, data flows to a printer, but not from a printer to the computer. However, the devices are daisy chained so the data from the last device, the Atari 410 cassette drive, does flow back to the computer. This isn't a strict ordering for connecting the peripherals. Because they're daisy chained, you have flexibility with the connection order. Having the Indus GT drive before the Atari 410 and the printers after the Atari 850 Interface will work the same way.

The ATR8000 and the Atari 850 compete with each other for parallel output. To avoid this, don't power on

the Atari 850 interface when powering on the ATR8000. The Atari 850 will still act as a data passthrough if it is off. This means if you're using the ATR8000, you will also need to not power on the Atari 1050 drive so it doesn't compete with the standard drive used by the ATR8000. You can print to the 24-pin parallel printer from the Atari even if the ATR8000 is off as it too will act as a passthrough for this device. Here's a picture of the setup, but feel free to organize the components however best suits your needs. Note the Atari 800XL on the right. It's not connected. It is used for some software that only runs on a 64K machine such as The Eidolon.



As numbered in the picture above, the components are:

1. Amdek Color Composite Monitor
2. Atari 410 Computer
3. Standard Drive
4. Atari 1025 Printer (8-pin dot matrix)
5. Atari 1027 Printer (letter quality)
6. ATR8000
7. A/B Switchbox for modem
8. Lantronix UDS-10 (modem)
9. Indus GT Disk Drive
10. Atari 1050 Disk Drive
11. Atari 410 Cassette Recorder
12. Atari 850 Interface
13. Epson LQ-500 Printer (24-pin near letter quality)

You don't need to connect all of the devices show. You can operate the computer with only a display and the computer. If you're limited on space, feel free to connect the display, the Atari and one device such as the Atari 1050 drive or the Atari 410 to get familiar with the system before you connect other peripherals.

Operation

Now that you've got the computer setup, it's time to do something with it. This section covers some basics of operation you will need to know to get you started.

1) Booting from a diskette

This is a very common operation and you'll do it a lot while using the system. Power on the monitor, the disk drive, insert the disk into the drive and close the drive door, then power on the computer. The disk will boot the software. If you're booting a DOS disk, you'll be presented with a menu of choices.

2) Booting from a cartridge

This might be the second most common thing you'll do. To boot from a cartridge simply insert the cartridge while the computer is off, then power on the computer. The cartridge will load instantly because it is hardware based.

Some disk or cassette based software requires BASIC to run. For those instances, insert the BASIC cartridge while the computer is off, turn on the disk drive and insert the disk or the cassette, close the drive door or push play for the cassette drive, and then power on the computer. If the computer is loading DOS from the disk, you will need to RUN the cartridge and in BASIC load the program. Here's how you do this. Before selecting RUN CARTRIDGE, get a listing of the software on the disk by selecting DISK DIRECTORY. Remember the name of the software you wish to run. Generally, it will end with a .BAS suffix to let you know it's a BASIC program. Then RUN CARTRIDGE and when in BASIC type:

```
LOAD "D1:<Program Name>.BAS"
```

DOS will accept wildcards so you don't need to type the entire name of the program. For example, you could type:

```
LOAD "D1:BOB*.*"
```

for software named BOBBYSOX.BAS and assuming it's the only software on the disk that starts with BOB, it should work.

3) Booting from a cassette

Occasionally you'll encounter a cassette that doesn't use BASIC, but contains a binary you'll need to boot much like a diskette. To do this, insert the cassette into the Atari 400, press the PLAY button on the cassette drive and then press and hold the START key on the Atari when you power on the computer. Once the computer is powered on, you can release the START key. Because this is a bootable binary cassette, you won't need the BASIC cartridge in the computer, and it should be removed.

4) Using the modem

One of the coolest aspects of the Atari (or older systems) is using the modem. For the Atari you'll need to have the Atari 850 powered on as well as the modem. In the collection you'll find a

diskette with software called BobTerm that has an RS232 handler. You'll need this to connect. With the disk in the drive, and the modem and Atari 850 powered on, power on the computer. As BobTerm is booting up, you'll here a long beep. This tells you it has loaded the RS232 handler to communicate with the modem through the Atari 850. Once the software is loaded you'll need to set the baud rate to 2400, the translation to ASCII (to start), and duplex to half. Then enter Term mode, Here you'll enter "ATDL <IP Number>, <Port>" and hit return to "dial". If there's no port (some sites don't use one), don't worry. Just enter the "ATDL <IP>" and hit return. Unfortunately you'll need to look up the IP for the site you're connecting to because the software doesn't support DNS lookup. Once you're connected to a site, you'll need to switch to full duplex and if it supports Atari graphics switch the translation to ATASCII. You can toggle between the BobTerm software menu and Term mode with Start and Return keys.



Next Steps

You've hopefully gotten the computer setup and know how to boot a cassette, a diskette or a cartridge. So now what?

If the Atari computer came to you with my software collection, magazine collection and library of books, you'll have a plethora of resources. In the collection you'll find games, programming languages (BASIC, Pascal, C, Assembly, and Pilot), utilities, operating systems (various versions of DOS as well as CP/M), etc. There are even Atari Lab kits which allow you to do things like sample the environmental temperature. There are interactive language cassette courses to teach you German or Spanish (Atari made course for Italian and French, but I didn't get those). The Print Shop program allows you to print cards, banners, and fliers with graphics.

Using the manuals and magazines, you can learn to program simply by re-typing in programs from them. After typing in enough of them, you'll start to see patterns and code that is re-used. But that's not the only way to learn. The books in my collection will teach you how to program in BASIC or Assembly Language. The hardware manuals in the collection will teach you everything there is to know about how the Atari is designed and more importantly, how to interface with it. Using these guides you could design your own hardware such as game controllers, data input devices (like the light pen I made), or even a color composite interface such as the one I built to connect the Atari 400 to the Amdek color monitor. If you want to know what's going over all of those SIO pins from one device to another, the information is there.

The Atari computer uses the Motorola 6502 microprocessor. The Apple IIe used the same microprocessor. With only an 8-bit processor and a very limited amount of memory, computer programmers had to use every trick in the book to get the most performance and make software which would push the limits. The way they achieved spectacular results was in part due to specialized chips in the Atari which would handle graphics. In short, it's amazing what they were able to achieve on such a limited system. You're only limited by your desire to learn and have all you need to start "pulling that a thread" as I mentioned earlier whether it be with software or hardware.

And you're not limited by the Atari itself. There's also the ATR8000. This is a self contained computer with a Z80 microprocessor, the precursor to the 8080 microprocessor which ran Microsoft DOS. This device uses the Atari as a "dumb terminal" for output and input. It uses CP/M for its operating system and has 80 column display (the Atari is only 40 columns). I've copied a program called Dumb Term to a cartridge which you can insert into the Atari before booting CP/M on the ATR8000 to give you that 80 column native display. CP/M was the precursor to Microsoft DOS and will teach you the roots of the Windows PC. It's able to use the modem that's shared with the Atari so you can connect to Bulletin Board Systems with CP/M.

Resources

At the moment you might be a bit overwhelmed. You know how to boot a cassette, a diskette, use a cartridge and have an idea of the capability of the system. However, there's a difference between being a user and being a power user or a developer. You could happily play cartridge games on this Atari and be content, but wouldn't you rather develop some software or a game? Wouldn't you like to make your own hardware to interface with the system? There are a lot of books and materials in my collection so understandably it would be hard to know where to start. This section will point you in the right direction.

Programming -

If you've never programmed before I suggest you use the BASIC cartridge and use the book, **BASIC by Bob Albrecht, LeRoy Finkel and Jerald R. Brown**. This will get you started. When you've read this book and experimented with the concepts, I suggest you look at the **Atari 400/800 Basic Reference Manual by Atari**. This will give you other commands you can use and more in-depth information.

BASIC isn't the only language you can program in. Two others you might want to check out are PILOT and Assembler. There is a PILOT cartridge. For PILOT there is the **Student Pilot Reference Guide by Atari**. This will get you going. There is also an Assembler cartridge. For Assembler, I recommend **the Atari Assembler by Don Inman and Kurt Inman**. Assembler is a very low level computer language where you're literally programming at the processor level. If you become more advanced at Assembler there is the MAC/65 with DDT cartridge which is a macro-assembler. The instructions for this are found in a yellow binder and is called **a reference manual for MAC/65 by Optimized Systems Software, Inc.**

When it's time to take it to the next level, there's **De Re Atari from Atari**. This will really get into such topics as display list interrupts, player missile graphics, color registers and more. Don't worry if you're unfamiliar with all of those terms now. As you get into programming for the Atari, these are things you'll learn.

Hardware -

In the Atari Service Field Service binder you'll find the **Atari 400/800 Atari Home Computer System Hardware Manual by Atari**. This contains schematics, information on hardware registers, serial port information and more. If you're thinking about making your own hardware to interface to the Atari, here's the place to start.

CP/M -

There are lots of resources available for CP/M, but to get started with the ATR8000 I suggest the **ATR8000 CP/M Supplement by SWP Inc. Microcomputer Products**. This will give you a basic understanding of the version of CP/M included with the system and some of the commands you can use.

Final Thoughts

That's it reader.

You have everything you need to get started with my old friend. I hope this computer and the resources I've collected for it over the years brings you as much joy as it had for me. I hope I've answered the initial questions for I presented in the Introduction of:

"Why do I want this thing?"

"What am I supposed to do with this?"

"This thing is so old. Is it even useful still?"

One thing this system taught me was that no matter how much you think you know a subject, there's always something new to learn about it. Sometimes you'll read something you've known only to get one more thing from it that somehow never occurred to you before. When we say, "Oh, I know this already.", we shut ourselves off from the possibility that there's more to learn.

Before computers got infinitely more complex, components became minuscule surface mounted devices, and computer memory size wasn't more than 128k, there was the Atari. Clever people found ways of making such a limited machine do things that they had only dreamed of.

Now it's your turn to dream, learn, experiment, do the impossible, and be proud of your achievements. Perhaps it will be a fun toy or maybe it will lead you to something more as it did for me.

The "sweater" is yours. It's time to pull the thread.