

Introduction to FujiNet for ATARI® Users

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Dedication

This book is dedicated to the thousands of FujiNet users, now across multiple platforms. You all have given the FujiNet team the drive and determination to make FujiNet a comprehensive platform to connect all of our retro-computing and retro-gaming systems together to do new and fun things.

ACKNOWLEDGEMENTS

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PREFACE

Thank you for your purchase of a #FujiNet Wi-Fi Network adapter. We hope that this device will provide you with hours of useful enjoyment, and open your ATARI® computer to the wider world of Internet connectivity.

This manual is for new users of #FujiNet to get a quick grasp on its comprehensive feature set, and can be thought of as both a Getting Started manual, as well as a reference guide.

Part I. USER'S GUIDE

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I. What is FujiNet?

FujiNet is a Wi-Fi Network Adapter that plugs into your ATARI® "Peripheral" or SIO port. It provides storage, printing, communications, networking, and more in a single peripheral.

Figure I.1. A FujiNet



Based on the Espressif ESP32® micro controller, FujiNet provides the ATARI® computer with a wide range of devices that may all be used simultaneously. These devices include a virtual "disk" drive, a virtual "printer", a virtual "MODEM", and a "Network Adapter" which provides comprehensive access to a wide variety of local and Internet services through the use of protocol adapters.

Each of these virtual devices is described below.

Virtual Disk Drive "D:"

FujiNet provides the virtual disk device, both so that it can automatically load its configuration program, and to provide the ability to load and use software both from the local SD card slot, or from one of many available TNFS servers that are not only available on the Internet, but can also be run on the local network, as well.

What is TNFS? TNFS is a simple networking protocol that was developed by the Spectranet project, which provides network connectivity to Sinclair® ZX Spectrum™ computers. Because the protocol is open source, and it was deemed useful, the FujiNet project implemented it as the primary method of file sharing for the virtual disk drive.

The FujiNet provides up to eight (8) virtual "disk" drives. These disk drives can accept a disk or file image in one of several available formats (ATR, ATX, or XEX), which can be provided from one of eight (8) host slots.

By selecting one of the host slots in the FujiNet Configuration program (CONFIG), a disk image can be selected, which can then be mounted into one of the eight device slots.

FujiNet can mount one of four different file formats into a device slot:

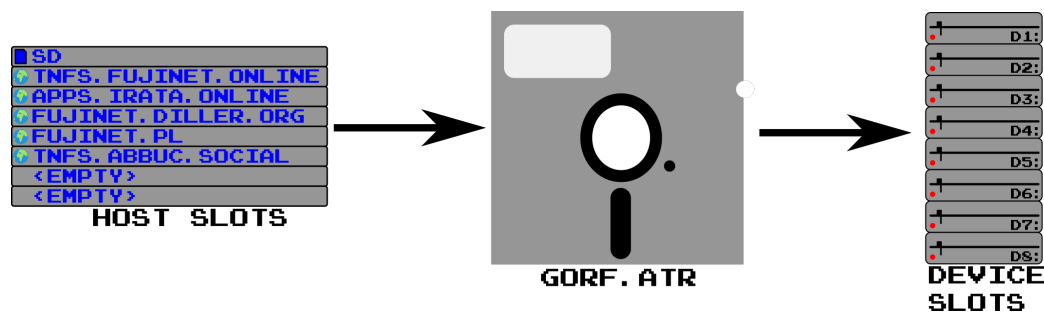
ATR The most common ATARI® disk image format, originally specified by the SIO2PC project. It can support unprotected disks up to 65535 sectors long, and can support disk images with sector sizes of 128 (single density), 256 (double density), and 512 bytes. FujiNet also uses an unused set of three bytes in this header to specify which sectors are allowed to be written

to, when the disk is mounted read only, so that "High Score Enabled" functionality can be supported.

ATX A disk image format specifically designed to represent the unique requirements for copy protected disks on ATARI® systems, by specifying how each track is laid out and positioned on the disk. This includes the alignment of each track. In addition, for each sector, additional information is represented to specify any errors that need to be properly simulated, such as bad, missing, or weak sectors. This format is currently maintained by the a8preservation project: <https://www.a8preservation.com/>

CAS A cassette image format roughly analogous to ATR. It stores each tape block, along with the delay in milliseconds before the next one should be sent. **CAS files can be mounted into device slot 8.**

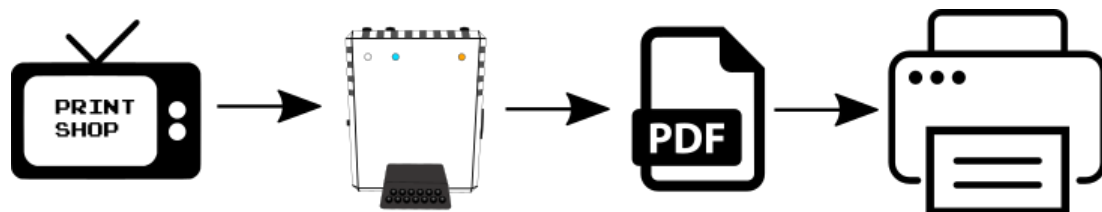
Figure I.2. Virtual Disks



Virtual Printer "P:"

FujiNet also provides a virtual printer device, which works exactly the same as a physical printer attached directly to the ATARI® computer. When a program sends something to the "P:" device, the FujiNet will simulate one of more than a dozen available virtual printers. The end result is rendered into a document which can be read in a viewer, or sent to a modern printer.

Figure I.3. Virtual Printer



The following printers are supported:

- | | |
|--------------------|--|
| RAW | The printer data is sent as-is, with no conversion. |
| TRIM | Like RAW, but everything after an ATASCII end of line is truncated. |
| ASCII | Like RAW, but every non-ASCII character is ignored. |
| ATARI® 820™ | A 40 column dot matrix impact printer. Used a 5x7 font with ASCII characters. Printed to 3 7/8 inches (98.425mm) width |

	paper. Could also print sideways (vertical). Outputs in PDF. Matches the 400/800 systems.
ATARI® 822™	A 40 column thermal printer. Used a 5x7 font with ASCII characters. Printed to 4 7/16" (112.7125mm) width thermal paper. Could also print dot graphics. Outputs in PDF. Matches the 400/800 systems.
ATARI® 825™	An 80 column dot matrix impact printer. Supported normal, elongated, and condensed fonts in 10 and 16.7 characters per inch widths. Could also support reverse line feeds (which could be used, e.g. to make multi-column text in AtariWriter), and other advanced features. Outputs in PDF. Matches the 400/800 systems.
ATARI® 1020™	A plotter which can draw calligraphic graphics using a pen, and one of four colors (red, green, blue, and black). Unlike most of the other printers in this list, this printer outputs in SVG. Matches the XL systems.
ATARI® 1025™	An 80 column dot matrix impact printer. Uses a 5x7 font with ASCII characters. Printed to either single sheets or fan-fold tractor fed paper anywhere from 4.5 to 8.5 inches (114.3 to 215.9mm) wide. Could accept tractor feed or friction fed paper. Could also accept an automatic document feeder attachment. Outputs in PDF. Matches the XL systems.
ATARI® 1027™	An 80 column letter quality printer. The print font is very close to Prestige Elite. Outputs in PDF. Matches the XL systems.
ATARI® 1029™	An 80 column dot matrix impact printer. Used a 5x7 font, with only ASCII characters. Released in limited quantities in Europe. Outputs in PDF. Matches the XL systems.
ATARI® XMM801™	An 80 column dot matrix impact printer. Epson MX80 and FX80 compatible. Contains many font widths. Can handle NLQ (near-letter-quality) mode. Outputs in PDF. Matches the XE systems.
ATARI® XDM121™	An 80 column letter quality daisy wheel printer. Produced letter quality output. Outputs in PDF. Matches the XE systems.
EPSON® MX80™	An 80 column dot matrix impact printer with graphics printing capability, as well as configurable font widths. Widely considered the standard for dot matrix printers in the 1980s. Outputs in PDF. This is the printer to use with The Print Shop.™
OKI Data® OkiMate 10™	A thermal wax printer capable of printing vivid color graphics. Outputs in PDF.
GRANTIC	An implementation of Claus Buchholz's "PRANTIC" screen capture to printer device. Outputs in PNG.
HTML Printer	Useful for printing out program listings, as it embeds the ATASCII font.

Virtual MODEM "R:"

FujiNet also provides a virtual MODEM device by combining emulation for an ATARI® 850™ interface, and a Hayes® compatible modem with AT instruction set. The resulting virtual device is compatible with existing communications programs that use the "R:" device, and can be used to dial hobbyist Bulletin Board Systems (BBS) hosts over raw or TELNET connections.

The following terminal emulator programs have been tested with FujiNet:

- ICE-T
- BobTerm
- Express!
- AMODEM Plus
- ATARI® Telelink I

The MODEM emulation also supports opening a listening socket that can accept a single incoming connection. This allows existing BBS programs to be used as-is to accept TELNET or raw connections from potential "callers."

The following BBS programs have been tested with FujiNet:

- AMIS BBS
- BBS Express 1.0, 2.0, 5.0
- FoReM-26M, FoReM XE Professional 5.4
- Carina BBS

Network Adapter "N:"

Finally, FujiNet provides a totally new **N:** device for your ATARI® computer. This device brings not only any local network; the wider Internet, accessible from any program or programming language that accepts a devicespec, such as ATARI® BASIC, or AtariWriter™

This is made possible by the addition of protocol adapters which perform all the heavy lifting for the complex protocols used by the modern Internet. These adapters run on the FujiNet itself, and utilize its increased processing power to create an easy to use I/O channel for the ATARI® computer.

Figure I.4. The HTTP Protocol Adapter



Once you have loaded a DOS disk with the "N:" handler, you can, for example, load a BASIC program, directly from a web server:

Example I.1. Loading a BASIC Program from a Web Server

```
READY
RUN"N:HTTP://FUJINET-TESTING.IRATA.ONLINE/BLACKJACK.BAS"
```

Similarly, opening a connection to a TCP socket to host 192.168.0.123 port 1234 is as simple as:

Example I.2. Opening a TCP socket in BASIC

```
READY
OPEN #1,12,2,"N:TCP://192.168.0.123:1234/"
```

- 12 = READ and WRITE
- 2 = Translate Line-feeds into ATASCII EOL (UNIX line endings)

Once a connection is opened, writing to it is equally as simple:

Example I.3. Writing to a TCP socket in BASIC

```
READY
PRINT #1;"HELLO FROM THE ATARI"
```

The EOL here is translated into a UNIX line feed, because of how the connection was previously opened.

Reading from an open connection, is as simple as writing to it:

Example I.4. Reading from a TCP socket in BASIC

```
READY
DIM A$(99)

READY
INPUT #1,A$

READY
PRINT A$
Testing from PC.
```

When done with a connection, it can be closed. FujiNet will then disconnect the socket.

Example I.5. Closing the previously opened TCP socket

```
READY
CLOSE #1
```

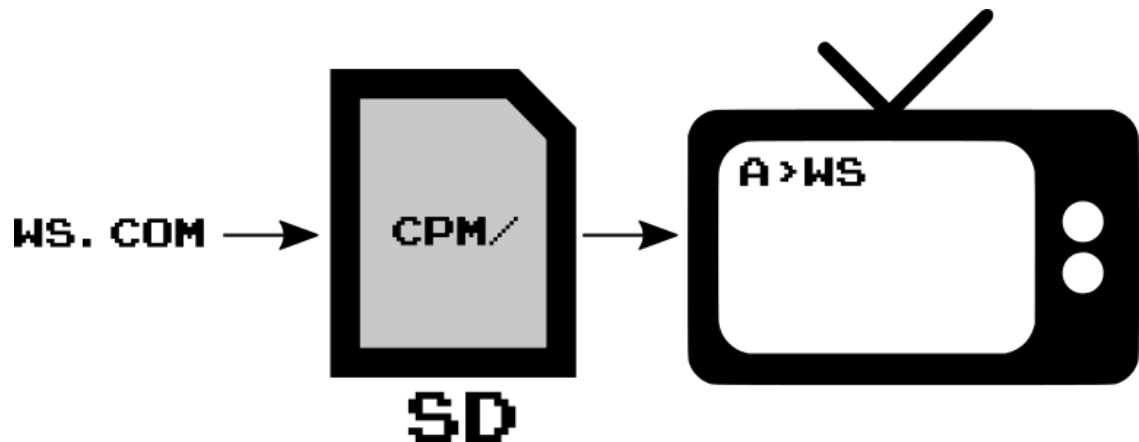
We hope that the addition of the Network device, a whole new class of Internet connected applications can be made, easily and affectively, by anyone in their spare time, using the tools of their choice.

CP/M Compatibility

FujiNet adds a complete Z80 computer emulation that runs a copy of RunCPM. This provides complete CP/M® 2.2 compatibility, being able to run thousands of additional programs, such as WordStar® and dBASE II®.

To make this easier for most users, CP/M files are stored directly on the SD card, without needing to deal with floppy disk image formats. Any CP/M program or data file in question can be copied to your local SD card, placed inside the CPM/ folder, and used.

Figure I.5. CP/M Compatibility



The CP/M emulation uses the ATR8000 protocol for connecting the CP/M computer to the ATARI®. This means that programs such as DT-80 can be used to provide the requisite terminal program. In addition, the CP/M emulation can be accessed by any ATARI® MODEM program that supports the "R:" device.

S.A.M. Voice "P4:"

Because the micro controller provides an 8-bit DAC, and the ATARI® SIO connector provides an AUDIO IN pin, it was trivial to add an implementation of Don't Ask Software's Software Automatic Mouth (S.A.M.) directly on the FujiNet device! This has the advantage of not blanking out the display when you wish to use the voice synthesizer.

Since the P4: device is used, it means that SAM is available to speak at any time, simply by writing to the device.

Example I.6. Making SAM Talk is Easy!

```
READY
OPEN #1,8,0,"P4:"

READY
PRINT #1;"HELLO FROM FUJINET!"
```

APETIME Compatibility

FujiNet includes a real-time clock that is synchronized to the Internet via SNTP (Simple Network Time Protocol), exposed as a device that is compatible with the `APETIME.COM` utility. Operating systems like SpartaDOS and SpartaDOS X can make use of this real time clock to provide time-stamps to files. It is also possible for any program to query the FujiNet to ask for the current time.

II. Unpacking and Connecting

III. Configuring your FujiNet

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VIII. Atari BASIC

IX. FastBASIC

X. Assembler

XI. ACTION!

XII. FORTH

XIII. C

(using CC65)

XIV. Pascal

(using Mad Pascal)

Part III. REFERENCE

Colophon

This book was produced using the DocBook 5.1 XML schema, and XSL style sheets.

The source material for this book may be found on GitHub at the "fujinet-manuals" repository inside the FujiNet repository group:

https://github.com/FujiNetWIFI/fujinet-manuals/tree/main/fujinet_for_atari_users

For the printed format, the xsltproc tool was used to generate the intermediate FO format, and Apache FOP was used to process the intermediate format into PDF.

The HTML format is processed using OpenJade, and styled with CSS style sheets.

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