Ethernet Console (Extended Edition)

User's Manual

Rev B

October 2011

AFAR Communications Inc.
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$25.00

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Manual Revision Log:

Revision	Date	Description
-	February 2011	Preliminary release
	July 2011	ECON 04.09
A	August 2011	ECON 04.10
B	October 2011	ECON 04.11

Table of Contents

1 ECONSOLE OVERVIEW

The ECONSOLE (ECON for short) program is supplied by Afar Communications Inc for use with our PulsAR line of wireless communication devices and our NetCrossing gateway products. It provides a way for a technician to access the command line interface of the device from a Windows desktop or notebook computer for installation, troubleshooting and management purposes.

While the command line can also be accessed from a serial terminal or using the TELNET protocol, ECON is preferred in most cases, because (a) it can be done over the ethernet cable that is required to use the device in any case, and (b) it does not require the device to have an IP address before it can be used.

The Extended Edition is preferred over the Standard edition for large installations (10 radios and up) because it allows the technician to use a scripting feature to apply a set of commands (in particular one or more "download" commands) on a large group of radios without having to type the command for each individual radio. This is a large productivity gain in installations (such as some metro-rail installations) with several hundred radios.

The ECON program is a Windows Console Application. It runs on Windows XP, Windows Vista and Windows 7 (32-bit and 64-bit). It requires the installation of the `WinPCap.DLL` system extension, which is supplied with our program.

2 USING ECONSOLE

2.1 Starting ECON

It is usually best to run ECON in a command window under Windows (sometimes called a "DOS box"). If your computer has more than one network interface (and most notebooks have two, namely an ethernet port and a WiFi port) it will show the available ports and ask you to select one. Once you have chosen the one where your radios can be found, it will show a list of the available devices on that ethernet.

```
c:\work\ucwtools\econ_04>econ


╔═══════════════════════════════════════╦═══════════════════════════════════════╗
║ Econsole ECON 04.09                   ║                                       ║
║ AFAR Communications Inc. (c) 2011     ║  For updates & fixes visit:           ║
║ Ethernet Console Program              ║  http://www.afar.net                  ║
╚═══════════════════════════════════════╩═══════════════════════════════════════╝
Host name:  LARS-DESKTOP  - OS Version: Vista 6.0 (6002) Service Pack 2
You have 2 network connections:
0 00:25:11:01:AC:53  207.154.90.133  Network adapter 'NVIDIA nForce MCP Netwo
2 00:1D:0F:BF:43:06  192.168.1.1     Network adapter 'Realtek PCIe GBE Family
Select adapter #:0
┌──────┬──────────────┬──────────────┬──────┬──────────────┐
│ Node │ Name         │ Firmware     │ S/N  │ Last Connect │
│   1  │ Unknown Name │ BOOT 01.38   │ 30029│              │
└──────┴──────────────┴──────────────┴──────┴──────────────┘
1 devices were found.
Econsole>
```

When starting ECON from the command line, you can pre-select the network connection by adding the `-c` option to the command line (as in `-c 0`). You can also switch to a different network adapter later by using the `adapter` command.

2.2 Typing Commands

When ECON is ready, it displays the prompt "`Econsole>` ". For a list of the commands that can be used, type "`help`". For more information about a specific command, type "`help`" followed by the command name, e.g. "`help help`". All commands can be abbreviated. If you abbreviate too much so that the command is ambiguous, you will get a list of all the commands that match what you typed. The abbreviation rules are the same as in the command line interface on the radios themselves.

```
Econsole> help
[Econsole]
  adapter                 connect                 discover
  select                  deselect                download
  set                     show                    sort
 [Miscellaneous]
  delete-file             directory               edit
  help                    quit                    screen
  version                 debug
Econsole>
```

```
Econsole> help help
 [Miscellaneous]
  help
     command=<string>

Econsole> s
Ambiguous command s matches
 [Econsole]
  select                    set                         show
  sort
 [Miscellaneous]
  screen
Econsole>
```

2.3 Command Arguments

Most commands have arguments. This section will use the "`connect`" command (the basic command to connect to a device) to illustrate the different kinds of arguments. We use this, because it is one of the most complex commands in the current version of ECON. For a full description of ECON, please see page 6 of this manual. "`connect`" can have 4 arguments:

```
  connect
     device=<string>
     command-file=<string>
     output-file=<string>
     pause={Boolean}
```

As you type the command, you separate each argument from the command name and from the previous argument with a space. If the arguments you supply are in the normal order from the beginning of the list, you do not have to give the name of each argument, but if you are skipping any or taking them out of order, you must include the argument name, as in

```
Econsole> connect pmp-30126 pause=yes
```

In most cases, however, you will find that the natural order of the arguments works.

In the "`select`" command, you usually use only one of the possible arguments, and the argument name tells the program which one you intended.

```
  select
     device=<string>
     name=<string>
     firmware=<string>

Econsole> select 2-4
3 additional units selected - 3 selected now
Econsole> select firm=pmp
2 additional devices selected - 3 selected previously
Econsole>
```

The section about "selecting devices" will discuss the very flexible format of the "`select`" command in more detail.

2.4 Selecting Devices

In radio networks with more than a few radios, it is useful to be able to perform a "`download`" command or a scripted "`connect`" command on a set of devices. To do this, you mark some (or all) of the devices in the list of devices that was shown when you started ECON with a selection flag, using the "select" command. You can then do a "`connect selected`" or "`download selected`" command.

The "`select`" command can flag

- a single device identified by its number in the table ("`select 4`")
- a list of specific devices ("`select 1,4,7`")
- a range of devices ("`select 3-7`")
- all devices whose names begin with the same letters ("`select name=bra`")
- all devices with firmware loads have names beginning with the same string
    - "`select firm=pmp`"
    - "`select firm="pmp 05.85`"
- all devices in the table ("`select all`"). This is useful if you want most, but not all devices; you can then do "`select all`" followed by "`deselect 1,4,7`".

The list of devices is normally sorted by name, but to facilitate complex selections, you can use the "`sort`" command to arrange it differently.

```
 sort
     by={name|type|firmware|serial-number|ip-address|distance}
```

For example, if your network has a mixture of AR24027 radios and AR24027E radios, which take different firmware files, you can sort by device type, so that all the AR24027 radios (hardware type 2423 and 2424) come before all the ArxxxE radios (hardware types 2560, 2561 and 2562), so that either type can be selected by a single range before the "download" command.

After sorting the table in a new order, you usually need to display the table again, because the table entry numbers will have changed to reflect the new sort order. If your table is very large (more than 40-50 devices) you will want to display only a part of the table at a time.

```
Econsole> show first=1 max=40
Econsole> show first=41 max=40
Econsole>
```

To help with this, the default for the max-units parameter in the show command is set to 45.

2.5 Connecting to Multiple Devices

Users of earlier versions of the ECON program will be familiar with the practice of connecting to one radio at a time. With the Extended Edition, this is still available, and works as before.

```
Econsole> connect 1
AR24027E-BV3 by Afar Communications, Inc
   Hardware type:    2561-00A0   Serial Number: 000d-9400-754d (AF030029)
   Software Version: BOOT 01.38   built May 11 2010
boot >
```

But in addition, you can now create a command file, and send that to multiple radios.

```
Econsole> connect selected command=dir.txt
```

This connects to the selected radios one at a time and sends the content of the command file to each of them in turn. In order to make it easy to create such a command file, ECON includes an "edit" command that will use your preferred editor (by default, it uses NOTEPAD [1]) to create or modify such a command file.

```
Econsole> edit dir.txt
```

This starts NOTEPAD with the given filename as an argument. When you exit NOTEPAD, you return to the ECON prompt. To use a different editor, set an environment variable name EDITOR which contains the file specification for the editor to use. (To set environment variables, go to **Computer->Properties->advanced system settings** and click on the "**Environment Variables**" button.)

A common special case of a command to be executed on multiple devices is the "**download**" command. To make this as simple as possible, it exists as an ECON command with a syntax very similar to that of the embedded system command.

Commands that operate on multiple radios are performed in the order that the radios appear in the device table. When rebooting the devices after a download, it is usually best to do this so that the most remote devices are rebooted first, because when you give the reboot command, all devices behind that device also become unavailable until the device is back online again. To help with this, the sort command has an option to arrange the device table with the most remote devices at the top.

```
Econsole> sort by=distance
Econsole> connect selected reboot.txt
```

---

[1] On Windows, it uses `NOTEPAD`. On Linux, it uses `vi`.
Emacs fans probably have already defined `EDITOR` to be `/usr/bin/emacs`

3 COMMAND REFERENCE

This section contains a description of each command in alphabetical order.

3.1 Adapter

```
adapter
    index= 0..5
```

The `adapter` command switches to a different ethernet port and performs a `discover` to display the Afar devices visible on that port.

3.2 Connect

```
connect
    device=<string>
    command-file=<string>
    output-file=<string>
    pause={Boolean}
```

The `connect` command initiates a command session with one or more devices.

The `device` argument is somewhat non-standard, in that it can be parsed several ways:

- a device number (device table index)
- the keyword `all`
- the keyword `selected` (can be abbreviated but at least `SEL` must be typed)
- a device name

If there is only one device in the device table, the device argument may be omitted.

The `command-file` argument is a file name. When you are connecting to multiple radios, the content of this file is sent to each radio in turn. If you are connecting to a single radio and the command-file is not specified, input comes from your keyboard instead.

The `output-file` argument is a file name. The file is opened in append mode, so when connecting to multiple radios, the outputs from all the sessions appear in the file consecutively. (And if the file existed and was not empty, the old contents will be left in the beginning of the file.)

The `pause` argument is normally omitted (and `false`). When `true`, each session switches to keyboard input at the end of the command file.

The connection can be terminated and returned to the `Econsole>` prompt by any of these methods:

- entering a **`logout`** or **`exit`** command to the device
- entering a **`reboot`** command to the device
- entering the **F3** function key
- entering the **F4** function key (performs a `show` before the `Econsole>` prompt)

3.2.1 Connecting to a single device

Users of earlier versions of the ECON program will be familiar with the practice of connecting to one radio at a time. With the Extended Edition, this is still available, and works as before.

```
Econsole> connect 1
AR24027E-BV3 by Afar Communications, Inc
   Hardware type:    2561-00A0   Serial Number: 000d-9400-754d (AF030029)
   Software Version: BV3  0.00 (Development Version) built Jan 27 2010 14:36:16
boot >
```

But in addition, you can now create a command file, and send that to multiple radios.

3.2.2 Connecting to multiple devices

When the first argument to connect is either `all` or `selected`, ECON will connect to multiple devices, one at a time. In that case, you must specify an input command file as the second argument. If you have specified `pause=yes`, then ECON will switch to the keyboard for each radio at the end of the command file. You can then close the connection and go on to the next device by typing the `logout` (or `exit`) command to the command prompt from the device.

3.3 Debug

```
debug
   flags=bitflags{download|ack-seq|session-pcap|session-text|keep-traces
                  |date-time|threads|adapter}
   level= 0..3
```

The `debug` command is not normally used by customers; it is intended for use in troubleshooting under the direction of Afar's support staff. When the debug `level` is set to a non-zero value, additional (undocumented) commands may become enabled, and additional output may be interspersed with the normal outputs.

3.4 Delete-file

```
delete-file
   filename=<string>
```

This command is used to delete a file from your working directory on the PC.

3.5 Deselect

```
deselect
   device=<string>
   name=<string>
   firmware=<string>
```

This command is used in conjunction with the `select` command to mark a subset of the device table entries as “selected” so that those devices will be addressed by “connect selected” or “download selected” commands. Where the “select” command sets the “selected” mark (*), the deselect command clears the mark.

The `deselect` command accepts the same arguments as the `select` command. For the full description, see under `select`.

3.6 Diagnose[2]

```
diagnose
    device=<string>
    output-file=<string>
```

This command is used to collect data for troubleshooting. Econsole will connect to a group of radios and issue commands to output the information most commonly needed for troubleshooting.

The `device` parameter can define a single radio, `all` or `selected`.

The data from all the selected radios will be written to the named output file.

Example:

```
diagnose all wednesday.log
```

3.7 Directory

```
directory
   filename=<string>
```

This command displays the working directory on the PC or a subset thereof.

```
Econsole> dir /od
Econsole> dire *.bze
Econsole>
```

This is often useful when you are preparing to do a multiple connect and you cannot remember if you already created a command file for what you are preparing to do.

The filename argument is passed directly to the Windows directory command. In the example above, /OD is a windows directory command option that means “display entries in date/time order”.

The following is the full description of the format of the Windows directory command:

```
Displays a list of files and subdirectories in a directory.

DIR [drive:][path][filename] [/A[[:]attributes]] [/B] [/C] [/D] [/L] [/N]
  [/O[[:]sortorder]] [/P] [/Q] [/R] [/S] [/T[[:]timefield]] [/W] [/X] [/4]

  [drive:][path][filename]
              Specifies drive, directory, and/or files to list.

  /A          Displays files with specified attributes.
  attributes   D  Directories                R  Read-only files
               H  Hidden files               A  Files ready for archiving
               S  System files               I  Not content indexed files
               L  Reparse Points             -  Prefix meaning not
  /B          Uses bare format (no heading information or summary).
  /C          Display the thousand separator in file sizes.  This is the
              default.  Use /-C to disable display of separator.
```

[2] This feature was added in ECON 04.11

```
  /D          Same as wide but files are list sorted by column.
  /L          Uses lowercase.
  /N          New long list format where filenames are on the far right.
  /O          List by files in sorted order.
  sortorder    N  By name (alphabetic)       S  By size (smallest first)
               E  By extension (alphabetic)  D  By date/time (oldest first)
               G  Group directories first    -  Prefix to reverse order
  /P          Pauses after each screenful of information.
  /Q          Display the owner of the file.
  /R          Display alternate data streams of the file.
  /S          Displays files in specified directory and all subdirectories.
  /T          Controls which time field displayed or used for sorting
  timefield   C  Creation
              A  Last Access
              W  Last Written
  /W          Uses wide list format.
  /X          This displays the short names generated for non-8dot3 file
              names.  The format is that of /N with the short name inserted
              before the long name. If no short name is present, blanks are
              displayed in its place.
  /4          Displays four-digit years

Switches may be preset in the DIRCMD environment variable.  Override
preset switches by prefixing any switch with - (hyphen)--for example, /-W.
```

3.8 Discover

This command repeats the survey of devices that was done when the program started. This is useful after a software update/reboot sequence to confirm that the radios are now running the new firmware.

3.9 Download

```
download
   device=<string>
   source=<string>
   destination=<string>
   output-file=<string>
```

The `download` command is similar to the `connect` command. It initiates a command session with one or more devices with a predetermined set of commands: It displays the directory of the selected device's flash memory, verifies that there is at least 300 KB of available space, and then issues a `download` command to install a new firmware file on the device.

The `device` argument is somewhat non-standard, in that it can be parsed several ways:

- a device number (device table index)
- the keyword `all`
- the keyword `selected` (can be abbreviated but at least `SEL` must be typed
- a device name

If there is only one device in the device table, the device argument may be omitted.

The `command-file` argument is a file name. When you are connecting to multiple radios, the content of this file is sent to each radio in turn. If you are connecting to a single radio and the command-file is not specified, input comes from your keyboard instead.

The `source` argument is a firmware file name (in the current working directory on the PC). If the name is given with no extension, and the working directory on the PC contains both .bz and .bze versions of the file, each device will receive the version that matches the hardware type of the device. This is useful in a radio network that contains a mix of "Classic" and "Enhanced" radios.[3]

The `destination` argument allows you to select a different file name in the device's flash memory. It is normally omitted, in which case the flash file name will be the same as the PC file name with the file extension (.bz or .bze) stripped off.

The `output-file` argument is a filename in the PC working directory. It is used in the same way as in the `connect` command.

3.10 Edit

```
  edit
     filename=<string>
```

The `edit` command allows you to create or edit a file to be used as the command file in a `connect` (multiple) command, or to examine and print the results that were written to an output file.

By default, it starts NOTEPAD with the given file name as the argument, but a different editor can be specified by writing the name of its .EXE file in an environment variable named EDITOR in the Windows system. (To set environment variables, go to Computer->Properties->advanced system settings and click on the "Environment Variables" button.)

3.11 Help

```
  help
     command=<string>
```

When the `help` command has no arguments, it gives a list of all available commands.

```
Econsole> help
[Econsole]
  adapter                  connect                  discover
  select                   deselect                 download
  set                      show                     sort
 [Miscellaneous]
  delete-file              directory                edit
  help                     quit                     screen
  version                  debug
Econsole>
```

When the command argument is a partial command name, it lists those commands that match:

```
Econsole> help d
 [Econsole]
  discover                 deselect                 download
 [Miscellaneous]
  delete-file              directory                debug
Econsole>
```

[3] This feature was added in ECON 04.11

When the argument matches only one command, it shows the valid arguments to that command:

```
Econsole> help select
 [Econsole]
  select
     device=<string>
     name=<string>
     firmware=<string>

Econsole> help show
 [Econsole]
  show
     table={devices}
     format={short|long}
     first= 1..512
     max-units= 1..512

Econsole>
```

In the examples above, the `first` and `max` arguments to the `show` command are numbers in the range from 1 to 512, while the `format` argument is a keyword that can be either "`short`" or "`long`".

Arguments with a complex structure are sometimes described as "string"even if there actually is a structure. This happens when the structure is such that it cannot be validated by the command parser alone.

3.12 Quit

This command ends the ECON program.

Both `exit` and `logout` are undocumented equivalents (which do not appear in the `HELP` output).

3.13 Screen

```
  screen
     background={white|black}
     lines= 24..500
```

If you started the command process (or even the ECON program) by clicking on an icon in the windows explorer, you may find that you have inappropriate options defined for the window. The screen command allows you to:

- switch the screen between black-on-white and white-on-black
- increase the scroll-back buffer to see more devices on the screen at one time.

3.14 Select

```
  select
     device=<string>
     name=<string>
     firmware=<string>
```

This command is used in conjunction with the `deselect` command to mark a subset of the device table entries as "`selected`" so that those devices will be addressed by "`connect selected`" or

"download selected" commands. Where the "select" command sets the "selected" mark (*), the deselect command clears the mark.

The device argument is special. It will allow a single number which is an index in the device table, a comma-separated list of numbers or a range of numbers (e.g. 5-11). It will also allow the special value **all** which selects all devices in the device table.

The name argument allows you to enter a partial device name. If you enter 3 characters, all devices where the first three characters of the device name match the given string will be selected.

Similarly, the firmware (which can also be abbreviated) will select those devices that are running a particular firmware family or a specific build.

Examples of use:

```
Econsole> select 1,7-12
Econsole> select pmp
Econsole> deselect "PMP 05.88"
Econsole>
```

After making a selection, you may want to verify it by using the show command to display the device table. The selected devices will have a star next to the index on the left side of the table.

3.15 Set

```
set
   output-file=<string>
```

ECON can write a copy of the interactive session to a file on your PC. You can activate this feature by including the output filename on a connect command, or by typing it separately on the set command. The result is the same. Once an output file has been defined, it remains in effect for all subsequent connect commands until a new file name is specified.

3.16 Show

```
show
   table={devices}
   format={short|long}
   first= 1..512
   max-units= 1..512
```

The show command displays the device table. It is always shown at startup and after a discover command, but you may need to show it again after a sort command (to see the new device numbers) or after a select command (to verify which devices are now selected).

At the present time only the device table exists and can be shown. Devices that have been **select**-ed have a ***** next to their slot number in the table display.

The format argument allows you to choose a format that displays more information about each device. The normal format is short and displays one line per device. With format=long, a second line is displayed with additional information fields.

When the device table is longer than will fit on your screen, the `first` and `max` arguments will let you select a portion of the table to be displayed. By default, `first` is 1 and `max` is 45, so that the first 45 radios are displayed. If you have 250 radios, you can display them in groups of 40 like this:

```
Econsole> show first=1 m=40
Econsole> show first=41 m=40
Econsole> show first=81 m=40
Econsole> show first=121 m=40
Econsole> show first=161 m=40
Econsole> show first=201 m=40
Econsole> show first=241
Econsole>
```

3.17 Sort

```
sort
   by={name|type|firmware|serial-number|ip-address|distance}
```

The `sort` command allows you to rearrange the table of devices.

Normally it is sorted by device name.

When sorted by distance, the most distant units (those that take the longest time to respond when taking inventory) are placed at the top of the table. When rebooting units after a firmware update, it should be done with the most distant units first, because as you reboot each unit, you temporarily lose contact with the units behind it until the reboot is complete and the link is established again.

After a `sort` command, you will usually need to `show` the device table to get the table index of the devices again. To save you some typing, `sort` will display the first 45 devices before returning to the `Econsole>` prompt.

3.18 Version

This command displays the revision level of the ECONSOLE program.

4 INSTALLING ECONSOLE

The ECONSOLE program package is supplied as a ZIP file containing:

- econ.exe – The Econsole program
- econ_man.pdf – This Econsole User Manual
- WinPCap.exe – The installer program for WinPCap

The filenames for each may vary slightly, reflecting different revision levels.

4.1 Installing WinPCap

The Windows Packet Capture DLL is a system extension implementing what is known as the Berkeley Packet filter. This is also used by some other popular programs, most notably the WireShark network debugging tool. If you already have WireShark installed, there is no need to install WinPCap again.

To install WinPCap, double-click on the installer program and follow the screen prompts.

4.2 Installing ECON

After WinPCap is installed, ECON is a simple executable. In order to ensure that it will run no matter which working directory your command window is set to, you should put it in a folder that is included in your system's PATH environment variable. You can either create a folder for this purpose and edit PATH to include it, or you can put ECON.EXE in a folder that is already in PATH, such as C:\WINDOWS. At Afar, we usually create the folder C:\BIN to hold all the add-on programs.

To edit PATH, open the **System** control panel and click on **Advanced System Settings** in the upper left corner. Click **Allow** on the permission dialog from Windows Account Control. When the System Properties window opens, select the **Advanced** tab and click the **Environment Variables** button. The window has two panes, labeled User variables and System variables. In **System Variable**s (the lower pane) select **Path** and click the **Edit** button. The variable is longer than what can be displayed in the small Variable value box. Click in the box and use the right-arrow key to scroll to the end, then add **;**C:\BIN (semicolon, followed by the folder name where you put ECON.EXE) at the end of the string, then click **OK**.

It is generally a good idea to keep your firmware files, command scripts and system logs in one folder, either at the top level of your hard disk as C:\AFAR or as a subfolder under your home directory as C:\Users\yourname\AFAR. After you have created this folder, create an icon for a command window to use with ECON:

- Open the start menu
- Click on **All Programs**
- Click on **Accessories**
- Right-click on **Command-Prompt** and drag it to the desktop
- In the pop-up dialog, click **Create Shortcut Here**
- Right-click on the new desktop icon and select **Properties**
- The properties open on the **Shortcut** tab. In the field **Start In**, enter the name of the folder you created for your firmware files (C:\Afar).

- On the **General** tab, in the first text field (the icon label), insert AFAR in front of Command Prompt.
-
- On the Colors tab, select your desired colors for screen text and screen background. By default the background is black (0/0/0) and the text is white (192/192/192). We recommend reversing these – text=0/0/0 and background=255/255/255.
- On the layout tab, select window size (80x50) and screen buffer size (80x500).
- Click **OK** to close the properties window.

4.3 Common Installation Problems

Some commonly seen problems:

- Symptom: ECON does not find any network connections.
  Possible cause: WinPCap is not installed or is installed incorrectly or is of a version that does not support your version of Windows.

- Symptom: ECON sees network connection, but does not find any devices
  Possible cause: Firewall software prevents ECON from sending or receiving packets.
  Try to disable all security software.

5 ECONSOLE ON LINUX

Afar has ported ECONSOLE to Fedora Linux. A “tarball” with source code and an executable built on Fedora 14 (i686) is available to qualified customers on request . Due to the wide variety of Linux distributions, we expect that you may have to compile and link `econ` on your own system. We are very interested in learning which Linux variants are used by our customers, and what problems (if any) you have encountered.

Because use of **`libpcap`** gets access to all packets seen on the selected ethernet port, `econ` must be installed **suid** `root` in order to function properly. (Or started with the **`sudo`** command.)

On Linux, you can give an arbitrary shell command prefixed with an ! (exclamation mark) at the `Econsole>` prompt.

We have not attempted to port econ to Apple OS X or other BSD family operating systems. If you attempt to do so, we will be interested in working with you.