

Pump and Snatch

Version 1.17

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Introduction

A System file with several fonts and DAs installed is already much larger than a floppy disk. With the advent of System 7 the smallest practical system is likely to be over three Mbytes. This coupled with virtual memory means that all Macintoshes will need hard disks. One method of running a network of Macintoshes is to mount the System and Applications (large and slow to load) on the hard disk and use an AppleShare volume or floppy disks to hold personal files (relatively small and fast to load). This has the advantage that everybody can reach all their files from any computer on the network.

The main disadvantage of this system is the large time overhead needed to update a large number of hard disks with exactly the same information. **Pump and Snatch** overcomes this problem by allowing a master station and disks to be used to update the whole network in a much shorter time than previously possible.

Pump and Snatch broadcasts information across a LocalTalk network to update the contents of a hard or floppy disk. Because the information is broadcast thirty one disks can be updated in exactly the same time as one. Information on the source disk is pumped around the network using **Pump...** and snatched from the network to the destination disks using **Snatch....** As it is possible that information may become lost or damaged in this process, an error detection system corrects any errors at the end of the update. Obviously this application is most useful when updating large numbers of hard disks but it can be used for batch updating of floppies. All System information, fonts, inits, startup screens, folders and files can be updated by this process. Also the Time, Macintosh settings (Parameter Ram), Disc name and Chooser name can be changed. When the update is finished the computers can be automatically Shut-down or Restarted.

Some typical copying times are:

Pump and Snatch	30 Floppy Disks	2 mins 8 secs
	30 Hard Disks (20 Mbytes each)	23 minutes
Finder	1 Floppy Disk	2 mins 20 secs
	1 Hard Disk (20 Mbytes)	~30 minutes

A Quick Guide

Before using Pump and Snatch take notice of the following warnings:

Warnings

The LocalTalk network must be completely isolated from other Internets before starting the update. **ALL BRIDGES MUST BE TURNED OFF.** Some other devices connected to a Network broadcast information that can interfere with the updating process. These devices should be turned off before starting the update.

The Destination Drives must all be the same. Hard disks should have the same SCSI number if multiple drives are mounted. Floppy disks must all be in the same drive (internal or external). For a Volume copy the disks must be the same size unless using **Blocks to Copy** (See: Settings Menu Section). The latter type of copy effectively erases the Destination Drives in much the same way as **Erase Disk** so be careful when choosing Drives. The new copy completely replaces the contents of the Destination Drives.

The Pump settings are preset at time of sale for a safe copy on a Macintosh Plus. They should be as follows:

Pump Delay	0
Pump Write Delay	5
Pump Repeats	1
Blocks To Copy	This is filled in as necessary for a Volume copy.

Do not change **Blocks To Copy** unless you know what you are doing.

If you are using a more powerful Macintosh for the Pump, the settings may need to be changed (See: Settings Menu Section). Failure to heed this warning may result in corrupt copies and the necessity of re-initializing every Destination Drive. The Snatch computers can be of any type without changes to the Settings.

To do a Update

Make two copies of the original Pump and Snatch disk for use as the Pump and Snatch masters. If you only have the application you will need to create a floppy with a minimal System on it and copy the application on to it. Using the Snatch master run the application and from the **Settings Menu, Disable Pump and Turn Snatch Auto-Start On. Quit** and set this to be the Start Up application instead of Finder. Make as many copies of this disk as you have computers to be updated. You are now ready to start the copy.

Using the **Pump...** command it is possible to copy a single File, a whole Folder, or the complete Volume. If possible it is much more efficient to copy the complete Volume. The type of copy is selected from the **File** menu.

On the Macintoshes you wish to copy to (The Destination Drives):

To Update Hard Disks:

1. Insert the floppy disk with Snatch on it and turn on the Macintosh.

After the system has booted and application loaded ***Waiting for Session Information*** should appear in the Snatch window.

To Update Floppy Disks:

1. Insert a destination floppy disk into the Destination Drives.
2. Open the Snatch application from the startup disk.

Waiting for Session Information should appear in the window.

On the Macintosh you wish to copy from (The Source Volume):

1. Open the **Pump** application.
2. Select **Pump...** from the Command menu.
3. To Copy a Complete Volume: Select **Open Source Volume...** from the **File** menu and choose a Source Volume by selecting it and clicking on the **Open** button.

To Copy a Folder: Select **Open Source Folder...** from the **File** menu and choose a Source Folder by selecting it and clicking on the **Folder** button. Note that **Open** works in the normal way and is not used to select a folder.

To Copy a Single File: Select **Open Source File...** from the **File** menu and choose a Source File.

4. Select **Open Destination Drive...** from the **File** menu and choose the Destination Drive.
5. Click on the **Start** button.

----- **Session Number # Started** ----- should appear in the window.

The copy should then proceed with a status report of the amount done appearing on all the Macintoshes. If any errors occur during the copy they will be displayed on the Snatch computers next to the amount done. The Pump will automatically correct them at the end of the session. The Snatch computers wait for their turn to correct these errors so wait for ----- **Session Number # Completed** ----- before turning them off. The Pump will attempt to continue correcting errors for ever , so select the **Stop** button before starting another session or quitting.

The other Pump commands can be selected directly from the **Commands** Menu. There is no need for the **Pump...** window to be open, although it will be updated as necessary even if it is closed.

Note

- All Macintoshes that are to be copied by Snatch must be started before the Pump.
- The Pump does not know any details of where it is sending the copy, so you have to select a Destination Drive rather than Volume. For a Complete Volume Copy the Source and Destination Volume sizes should be the same.
- It is inadvisable to play with the **Stop**, **Start** and **Resume** buttons during a copy unless something has gone wrong. Even mouse movements on the Snatch computers may cause (recoverable) errors.
- Do not change anything on the **Settings** menu unless you are using the Macintosh SE30 or II range of computers as the Pump. If you want to tune the Pump then read the Settings Section first.
- The network should not be used at all during a copy as this will introduce errors. Any computer attached to the network will almost grind to a halt (even mouse movements will be very slow).

The File menu

Open Source File...	Before doing a copy it is necessary to select a File, Folder or Volume to copy from on the Pump. Files can be opened using the standard Macintosh interface.
Open Source Folder...	To copy a complete folder Open folders until the correct one is found, select it and click on the Folder button. The selected Folder cannot be more than 15 levels down from the top or root.
Open Source Volume...	The available Volumes are shown in the window. (AppleShare Volumes are not shown and are unmounted if possible.) Volumes can be selected by clicking on them or the Volume button. Either double click or click on the Open button to open the volume.
Open Destination Drive...	This selects the Drive to copy to and is set up on the Pump only. If 'Hard Disk (Undefined SCSI Port)' is selected the first SCSI drive that mounted will be chosen. Obviously, if more than one drive is mounted this is a dangerous way of selecting the Destination Drive.
Quit	This performs the normal Macintosh function of returning to Finder. If you have Snatched over the disk containing the active System File (ie. the Startup disk) all menu options are disabled except Restart .
Restart	This Restarts the computer.
Shut Down	This Shuts Down the computer.

The Commands menu

Pump...

This selects the Pump dialog prior to updating the contents of a disk over the network. The Source and Destination volumes are filled in by **Open Source Volume...** and **Open Destination Drive...** from the **File** menu. The **Start** button is disabled until the volumes are opened. It is possible to **Stop** the copy at any time. If the copy was stopped in the middle then there is the option to **Start** (from the beginning) or **Resume**. **Resume** makes sure no blocks are lost by starting from the last disk read.

Pump Time

This sets the Date and Time on the Snatch computers to that on the Pump.

Pump Macintosh Settings

This alters the Macintosh Settings held in the Parameter Ram to those on the Pump. It does not alter the LocalTalk node number or the Date and Time.

Pump Disk Name

This command changes the Disc Name to that on the source volume.

Pump Unique Disk Name

This changes the Disk Name to the source volume name with the Snatch station's node number appended to it

Pump Chooser Name

This command changes the Chooser Name to that on the source volume. If the source volume does not contain an active System file an error will be generated.

Pump Unique Chooser Name

This changes the Chooser Name to the source volume Chooser Name with the Snatch station's node number appended to it

Pump Abort Session

This aborts the present session on all the Snatch computers and allows a new one to be started.

Pump Shut Down

This Shuts Down all the Snatch computers.

Pump Restart

This Restarts all the Snatch computers.

Snatch...

This selects the Snatch dialog prior to receiving the update information over the network. The Source and Destination Volumes are filled in when the volume information is received from the Pump. Although it is possible to **Stop** the copy, this is inadvisable as the Pump will continue to send.

SCSI Single Copy

This is similar in operation to **Pump...** but the copy is between two drives connected to the same Macintosh through the SCSI bus by a cable. The copy proceeds much quicker than across the network. If an external floppy drive is connected this can also be used for a quick copy of two floppies. The copy is not verified.

Eject Internal

These commands eject the respective floppy disks.

Eject External

The Settings menu

If a Setting is changed its new value is saved inside the application.

Pump Delay...

This should normally be set to 0 unless a fast model of Macintosh is being used for the Pump.

The Pump sends out blocks as fast as the Snatch computers can receive them . If the Pump computer is more powerful than the Snatch ones then this will be too fast and data will get lost causing many (possibly fatal) errors. The safest way to stop this problem is to always use the slowest type of computer on the network.as the Pump and set the **Pump Delay** to 0. However, it is possible to introduce a delay before sending each block of data and therefore use a faster computer for the Pump. **Pump Delay...** sets this delay, the number representing the delay time in milliseconds. On a Macintosh Plus a block of data is sent about every 30 milliseconds so there is no point in setting a delay greater than this, even on a computer with ultimate processing power.

The best way of setting up this delay (if you must) is to select the slowest (Snatch) computer on the network and set it up as the Pump. Disconnect the network lead and start a Volume copy. Time a section between disc reads. Now set up the actual computer that is going to be used for the Pump and adjust the **Pump Delay** to give the same time between disc reads.

For example this yields a **Pump Delay** of 5 to 6 milliseconds for a SE 30 or Mac IIcx pumping to the Macintosh Plus model.

This delay cannot be set automatically because the Pump has no knowledge of what types of Snatch computer are being used.

Pump Write Delay...

This should be set to 5 and does not need changing at all in normal circumstances. It is independent of computer model.

All disks take slightly longer to write than read so the Pump must wait a certain time before sending the next set of data after reading it. This delay is calculated automatically and should cope with any circumstance with the **Write Delay** set to the

mid range value of 5. (For instance sending a Folder from hard disk to floppy.) If this delay turns out to be inadequate (See: Problems Section) then it can be increased. It is normally possible to reduce this delay to 4 and still have successful copies but 3 will almost certainly cause problems. A unit change, alters every delay by about 15%.

Pump Repeats...

This should be set to 1 unless the network is not working properly.

One method of ensuring the blocks reach the Snatch computers is to send them more than once. **Pump Repeats...** sets the number of times each block is sent (1 sends the data only once). As most of the copying time is taken up with sending data across the network doubling the **Pump Repeats** will almost double the copying time. There is little advantage in setting the **Repeats** to more than one unless the LocalTalk Network is very noisy or not working properly.

Although using a single **Pump Repeat** may introduce a few errors these will be corrected at the end of the copy. With correct **Pump Delay** setting and a single **Pump Repeat** there should be no errors to correct on most Snatch computers.

Blocks To Copy...

This only applies to complete Volume copies and should not normally be used.

It is not always necessary to copy a complete disk as sectors near the end may not be used. **Blocks To Copy...** sets the number of blocks that will be copied. This facility can also be used for copying a smaller disk onto a larger one, for instance converting a 100 Mbyte Hard disk to behave like a fast 800k floppy!

Blocks to Copy can also be used to copy onto a mixture of makes of hard disk which have the same nominal size. Select the hard disk with the smallest actual size for the master to be used on the Pump and type in the number suggested in the **Blocks To Copy...** dialog. This will limit the number of blocks copied to the size of the smallest hard disk. Note that any extra blocks on the larger hard disks are not available for storage.

Warning

Use of the above facility is not recommended unless you know exactly what you are doing.

**Turn Snatch
Auto-Start On**

This sets the Pump to do an automatic Snatch on launch. Set this before copying the application onto each Snatch computer.

Disable Pump

This permanently disables all of the Pump commands. This allows the application to be left on hard disks without the problem of people Pumping rubbish across the network. It would normally be used in conjunction with an automatic Snatch.

There is no easy way of restoring these menu commands so make sure you have a copy of the original disk before selecting this option.

Problems

Recoverable Errors

As the information is broadcast across the network, blocks of data can become lost. Any lost data is detected and corrected at the end of a session using normal AppleTalk protocols as used by File Servers. Recoverable errors are reported in square brackets, the first number represents the number of errors that occurred while sending the last file or set of blocks and the second number represents the total since the start of the session.

For example: Writing Fred [2/4] means 2 out of 4 errors occurred while doing 'Fred'.

In theory each Snatch computer can cope with up to 1000 errors. If 30 computers are Snatching this means the Pump has to deal with 30,000 consecutive errors. At 0.4 secs an error this mess is going to take about 3.5 hours to sort out! Obviously, meantime some sort of time out is likely to happen. The practical limit to the number of errors per computer is about 50 and above this an audible warning is given each time the buffer is written to the disk. Try to keep errors to a minimum - an average Snatch for 30 computers doing 20 Mbyte hard disks should result in no more than a couple of errors on two or three computers.

Warning

Not all errors are recoverable. If the Pump becomes disconnected for a long while (1/6 second is a long while for a computer) a whole File may be lost from a Directory copy or a complete set of blocks may not be written on a Volume copy. This can be simulated by temporarily stopping a Snatch computer while allowing the Pump to continue. If this happens a Warning Error will be issued and in extreme cases the Session will be terminated. In general this should not happen unless the Settings are incorrect.

Error and Settings

Some information can be gleaned from type of error that occurs and this is best illustrated by examples:

- 1) Done 460k [2/2]
Done 920k [2/4]
Done 1380k [3/7]
Done 1840k [5/9]

This regular pattern of errors can be caused by a Bridge sending out its Routing Table Maintenance packets. A similar pattern is produced if the Snatch computers are booted from a System containing a regular Init or Cdev such as a clock. As these actions only happen in a time scale of seconds only a few errors are produced. The only cure is to power down the Bridge or start with a clean system. Some Bridges may produce so many errors that Folder copies are corrupted because files are put in the wrong Folders. In this case the Error correction stage will fail because the wrong file will be corrected.

- 2) Writing Fred [23/23]
 - Writing Jim [27/50]
 - Writing Jane [31/81]
 - Writing Kim [17/98]

This less regular pattern involving many errors is normally caused by a slightly incorrect **Pump Delay**. A **Pump Delay** that is more than 2 milliseconds too small will cause fatal Warning Errors. See Settings Menu section for details of a cure.

- 3) During the correction phase:
 - Correcting Fred (0) - R
 - Correcting Fred (1) - R
 - Correcting Fred (2) - R
 - Correcting Fred (3) - R
 - Correcting Jim(0) - D
 - etc.

This report shows that the first four sectors ('R' = Resource Fork, 'D' = Data Fork) of Fred are missing and have been corrected at the end of the Session. This is caused by too small a **Pump Write Delay** The Snatch computer is still writing the last file while the next one is being sent. This is a mild form of this problem, more severe cases can result in Warning Errors of lost Files and Directories.

In extreme cases it is difficult to differentiate between the errors cause by incorrect **Pump Delays** and **Pump Write Delays**. The only way to proceed is to set one to a much higher value than ever needed and see if this effects a cure.

Faulty or over long networks produce random errors. Setting **Pump Repeats** to more than one may cure them but will make the copy much slower.

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Efficiency

The Efficiency value is printed at the end of a Volume Snatch, if **Pump Repeats** are more than one. This value gives an indication of what percentage of the EXTRA blocks (sent by the Repeats) actually arrived.

Known Bugs

This application has been tested on several sites over a period of about two years. Several bugs have been reported and corrected. It is now relatively safe to use. The following minor bugs have been ignored because they are too tedious to correct:

1) Main Status Lists (Pump and Snatch Windows). If a these lists become very long (>1500 entries) then the they scroll to the beginning rather than the end when the start button is clicked. Very odd! When they become really really big (Memory nearly full) they can become jumbled.

1) Pump and Snatch Windows. If an Error occurs causing an Error dialog then the text in the Status lists is not always correctly restored after the dialog is put away. This is only a minor mess up (90% of the text under the dialog is restored).

3) The number of blocks found on some hard disk drives may be a few short (~2). As the last two sectors are not used this is unlikely to effect a Volume Copy.

4) There is a possible bug of giving an error of 'Source Folder Level Too Deep (>15)' (when it isn't) while writing the original Pathname Information. I think this is cured (but it only occurred once!).

5) After a Folder copy containing the System file, the latter is not Blessed until it is entered. (The opposite of a Virgin.) The Folder copy does not copy the information contained in the Info boxes - as if the desktop file has been rebuilt.

Although **Pump** has been used under System 7 it has not been thoroughly tested. This may cause problems with file and directory copies and possibly with Pump Chooser Name which modifies a resource in the System File. Try it and see.

This software has not been tested on an EtherTalk network and although it should work it may not result in much speed increase over LocalTalk. This is because there is a one millisecond delay between each packet sent even when Pump Delay is set to 0 to ensure safe data transfer. (Actual Pump Delay = Pump Delay +1.)

Happy Pumping...