ARCNET™

Applications Processor
Operation Manual

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Contents

Introduction

The TRS-80 ARCNET System is a network which enables an office to share equipment, software, and information among a number of users with different tasks to perform, as well as allowing stand-alone microcomputer operation. This arrangement can provide you with all the advantages of up-to-date (even up-to-the-minute) on-line centralized shared files with maximum security. In addition, this system can reduce system cost and increase system storage efficiency by allowing several TRS-80s to use a hard disk.

Whenever additional resources become necessary, ARCNET makes it possible to simply plug into the existing network. Additions can be made repeatedly with minimal or no disruption of the system.

An ARCNET network can grow (up to 255 microcomputers) or be rearranged easily through any number of small steps at readily determinable costs. While supporting distributed data processing, your ARCNET can be configured to concentrate management of common data bases so that data used by a number of terminals need not be duplicated.

System Requirements

To use a TRS-80 Model II/12 as an Application Processor in an ARCNET System, the Computer must have a minimum of 64K of Random Access Memory (RAM) and an ARCNET Circuit Board installed.

A Z80 Memory Expansion Board is also required. (You will not need this modification if your Model II/12 is being used with a hard disk.)

Remember that all modifications to your Computer must be made by a qualified Radio Shack service technician.

About This Manual...

This manual will describe how you can use a TRS-80 Model II/12 as a Application Processor. This includes how to initialize for ARCNET access. Furthermore, this manual will describe how using a Model II/12 as an Application Processor is different from using a Model II/12 as a "normal" TRS-80.

This manual will not describe how to operate the Model II/12 in general (keyboard description, etc.). For information along this line, see your TRS-80® Model II/12 Owner's Manual.

Neither will this manual describe how to use a specific application program with the Application Processor. For details on the application program you're using on the Model II/12, see that program's user's guide.

For instructions on using a Model II/12 as a File Processor, see the TRS-80® ARCNET™ File Processor Operation Manual.

Note: When the Model II/12 is being used as an Application Processor, the following TRSDOS-II utilities are not available:

- HOST
- DEBUG
- COMM

The volume structures (disk formats, files and directories) on the File Processor are TRSDOS-II type.

Some Terms You Will Run Across

"Remote" vs. "Local"

A couple of terms you'll run across when talking about drives are "local" drives vs. "remote" drives.

Anything that is referred to as "local" is at the Application Processor. This may include disk drives, printers, or printing operations.

Anything that is referred to as "remote" is at the File Processor. Again, this may include disk drives, printers, or printing operations.

You know how many "local drives" there are and if a printer is performing "local printing" because this takes place right in front of you at the Application Processor. However, you may not know how many "remote drives" there are or if a printer is performing "remote printing" because this takes place at the File Processor.

"Volume and Volume Name"

A Volume is a remote disk drive which has an assigned Volume Name which when entered with the MOUNT Command allows access to that drive.

Right away, you can see the importance of keeping track of the volumes (volume names) you are using and the local drive you assign them to.

"Passive Hub"

The Passive Hub is a junction from which an unconditioned signal can be relayed along a common pathway.

"Active Hub"

An Active Hub is a junction at which a signal is regenerated and amplified to its original strength before being relayed.

"Application Processor"

Application Processors (APs) are TRS-80 microcomputers which actually input or process the data under the control of application programs, system utilities, or other programs. Application Processors can be equipped with up to four floppy and/or four hard disk drives, communications adapters, printers and local or remote terminals.

"File Processor"

File Processsors are TRS-80 Model II/12 computers which buffer data, optimize use of shared disks, resolve access conflicts, coordinate data base update transactions, provide security and service incoming data requests.

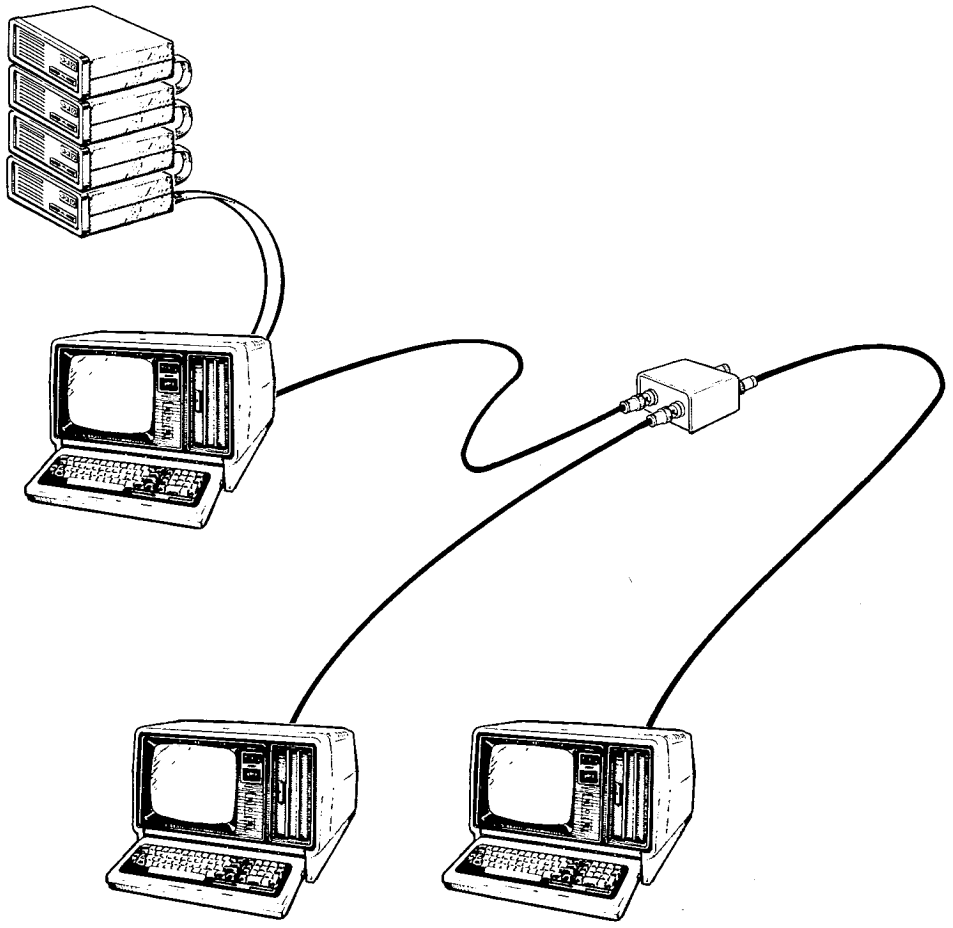
This is a dedicated use and no application programs can run on the Model II/12 while it is serving as a File Processor.

The only requirments for a Model II/12 to serve as a File Processor are that it be running the File Processor Operating System and that it be directly connected to the remote common data base files. Just as you must have at least one Application Processor in an ARCNET system, you must have at least one File Processor.

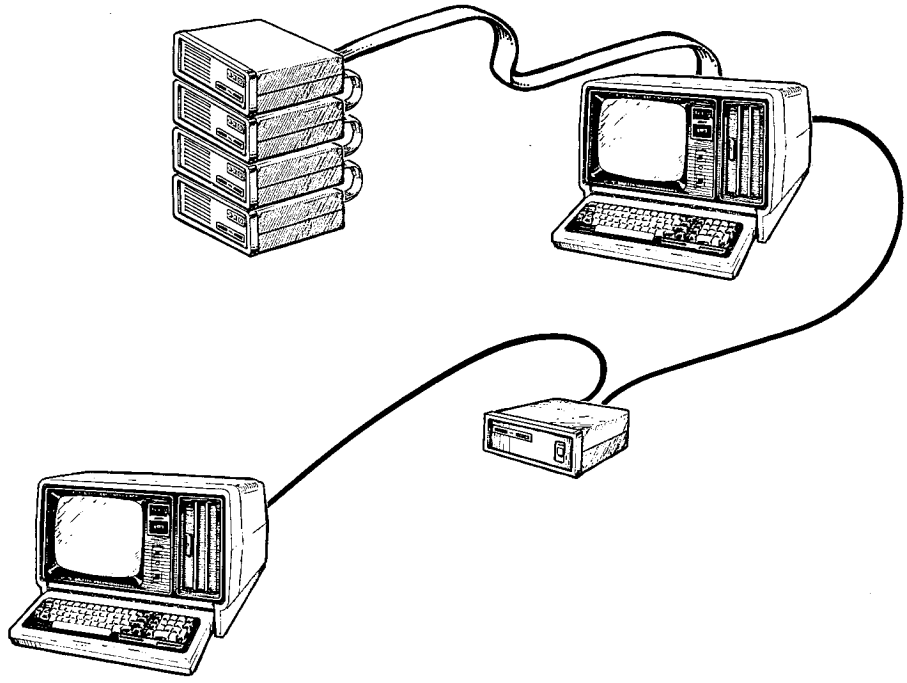
If your system does not have any computers with two floppy disk drives and you want to transfer your TRSDOS 2.0 files to the File Processor's hard disk, the transfer will have to be done using the File Processor in the off-line (stand alone) mode. See your hard disk drive owner's manual for details.

1/ A Brief Overview of ARCNET Application Processing

An ARCNET System consists (in part) of central files located at and controlled by a File Processor. The File Processor manages the remote central data base (files).



In addition ARCNET consists of the Application Processor, such as the one you're probably sitting at right now. The Application Processor is connected to the File Processor by hubs and cables. The central files are rendered accessable to the Application Processor with the Application Processor MOUNT command.



This MOUNT command associates a local drive number with a remote volume using the volume name. A volume is a physical disk medium (hard disk or floppy disk). Each disk has a name.

Processors (Model II/12's) usually execute application programs such as word processing, accounts receivable, general ledger, etc. This is consistent with ARCNET philosophy for distributed processing. However, the application programs (files) may reside on remote volumes. Thus, the name Application Processor is used to designate the processor which executes the application, and the name File Processor is used to designate the processor which manages the files.

With ARCNET, the application programs (and all data files that it uses) may be stored at the File Processor. However, when you use an Application Processor, it doesn't matter if that File Processor and your programs are sitting at the next desk, the next room, or on the next floor.

ARCNET also allows two or more Application Processors to use the same file or program (stored at the File Processor) simultaneously. This is called "file sharing." The Application Processors can then work in conjunction with each other to access and update that common "data base."

However, computers that are being used as Application Processors can still work independently of each other and have access to the central storage files controlled by the File Processor.

In technical terms, this is called "distributed processing" since information processing takes place at several locations.

How Many Computers Are In the ARCNET System?

A typical TRS-80 ARCNET System will have a single File Processor. However, it can have up to 254 Application Processing computers. A minimum system will have one Application Processor and one File Processor, however, any number of either processor can be added after that, up to 255 total processors.

Typically, the File Processor will have a hard disk drive connected to it. This is where the programs and data used by the Application Processors can be stored.

Furthermore, the File Processor may have a printer connected to it. All Application Processors can use this printer to print out files stored on the File Processors remote central data base.

As you can see, this allows a more efficient use of your computer equipment since up to 254 computers can use one printer without having to move the printer from place to place.

However, for large networks several File Processors will probably be installed in order to improve performance.

How does a TRS-80 Computer become an Application Processor?

A TRS-80 Model II/12 becomes an Application Processor by using the diskette supplied with this manual after the Computer has been modified by a qualified Radio Shack service technician. The Application Processor must then be connected to a File Processor via a "hub" and connecting cables.

Is a Model II/12 used as an Application Processor different from a Model II/12 Used as a "Computer?"

Once the ARCNET System is set up, you can use the Application Processors just like an unmodified Model II/12. Operationally, there is no difference whatsoever. (For details on operating your Model II/12, see your TRS-80® Model II/12 Owner's Manual.)

However, there are a few software enhancements the ARCNET system offers that aren't described in your Model II/12 Owner's Manual. These enhancements are stored on the diskette supplied with this manual. They include special programs that allow you to:

- Access remote files stored at the File Processor
- Print a remote file at the File Processor

This manual will describe how to use these features. See Chapter 3.

2/ Starting Up ARCNET

The first step in using your Model II/12 as an Application Processor is to power up your Computer and load TRSDOS-II, the TRS-80 Disk Operating System.

Powering Up the Computer

1. Set the POWER Switch (on the front panel of your Model II/12) to the ON position.

   See your TRS-80 Model II/12 or Hard Disk owner's manual for more details.

2. When the Computer prompts you to INSERT DISKETTE, carefully insert the diskette supplied with this manual into Drive 0.

   The label should be to the right, away from the Screen when using a Model II and to the left when using a Model 12.

3. Gently close the drive door.

   As soon as you close the door, the Computer will begin the Operating System initialization process.

   (If nothing happens when you close the drive door, the diskette is probably inserted incorrectly. Remove it and reinsert it correctly.)

4. After the System starts up, you will be prompted to enter the date. Type in the date in MM/DD/YYYY form and press <ENTER>.

   For example:

   11/16/1982 <ENTER>

   for November 16, 1982.

5. Next, the System will prompt you to enter the time. To set the time, type in the time in HH.MM.SS 24-hour form. Periods are used instead of colons since they're easier to type in. The seconds are optional. For example:

   16.30 <ENTER>

   for 4:30 PM.

   To skip this question, press <ENTER>. The time will start at 00:00:00.

   The System will record the time and date internally and return with the message:

   TRSDOS-II READY
   .....

At this point you should make a BACKUP of the supplied diskette. If you have never made a duplicate copy of a diskette, see Appendix A, "Making a Backup", of this manual for more details.

Once you've made the backup copy of the diskette, press RESET on your Model II/12, remove the supplied diskette from Drive 0 and store it in a safe place. Insert the backup copy of the supplied diskette into Drive 0, close the drive door, and press RESET again. Reintialize the System as described above.

Providing Access to the ARCNET Program

Be sure to use the backup copy of the ARCNET diskette!

1. To convert the Computer to an Application Processor, type (when TRSDOS-II READY appears):

   ARC80AP ON <ENTER>

   The ARCNET program will be loaded and you will be able to use the Model II/12 as an Application Processor. Of course, a File Processor must also be running in order for the Application Processor to access the remote files. "ON" is optional. Typing "ARC80AP" defaults to ON.

2. As soon as the Application Processor is initialized, the TRSDOS-II READY prompt will return and you can access any local application program you want to use as described in your specific application program user's manual. To access the remote volumes (programs and data) you must first do a MOUNT. See Chapter 3.

A Special Note for Hard Disk Systems...

If the System has a hard disk and the hard disk is to serve as the System disk, it will be necessary to install TRSDOS-II on the hard disk using a copy of the supplied diskette. See your hard disk owner's manual and the TRSDOS-II update material for the procedures for installing a new system on a hard disk.

3/ Using the ARCNET Application Processor

When using the ARCNET Application Processor for accessing the remote data base, there are five general steps that you need to follow:

1. Load the ARCNET Application Processor program by typing ARC80AP.
2. Specify which volumes you want to use. (See MOUNT in this chapter - which associates a remote volume with a local drive number.)
3. Now you can use the application programs in the normal manner using the local drive number you assigned to the remote volume(s).
4. DISMOUNT the volumes you've been using by specifing the local drive you assigned them to.
5. Exit the ARCNET Application Processor program by typing ARC80AP OFF.

Other operations, such as printing, can also be performed while using the Application Processor program.

Note: The "volume mounted" (see below for a definition of this term) by the Application Processor may not be used as:

- The destination drive for SAVE.
- The source drive for RESTORE.
- The destination drive for FORMAT.
- The source or destination drive for BACKUP.
- A 2.0 diskette with FCOPY.

System software and volume maintenance on the File Processor drives should be performed under TRSDOS-II while the processor is not running as a File Processor..

Drive Numbers

The MOUNT command assigns ("associates") a remote volume (located at the File Processor) with a local drive number.

When a drive number at the Application Processor is assigned to a remote volume with the MOUNT utility, the local disk drive with that number at the Application Processor is no longer accessable. To make it accessable, you must DISMOUNT the volume (see below).

The Model II/12 must be started up under TRSDOS-II using Drive 0 for floppy diskettes or Drive 4 for hard disk. These drives are referred to as the "System Drives."

The System Drive cannot be remotely mounted. Therefore, if the Computer used Drive 0 to start up, the command MOUNT VOL:0 would be rejected. Similarly, if the Computer was started up off hard disk, the command MOUNT VOL:4 would be rejected.

Ten drive numbers are available for mounting on an Application Processor -- 0 through 9.

Note: When a drive number is not specified in a file specification, the search sequence for TRSDOS-II is as follows:

System Type	Search sequence
Floppy (System Drive = 0)	8,9,0,1,2,3,4,5,6,7
Hard Disk (System Drive = 4)	8,9,4,5,6,7,0,1,2,3

Note: Drive numbers 8 and 9 are intended to be used for mounting remotes and will be searched first.

The MOUNT Command

Once the ARCNET Application Processor is initialized (by typing ARC80AP), you will be ready to specify which volume (volume name), located at the File Processor, you want to use. To do this, use the MOUNT command.

The MOUNT command allows you to associate a local drive number with a remote volume. The local drive number can be used to access the remote volume to obtain information (programs or data) stored on the disk drives at the File Processor.

MOUNT assigns the requested disk (volume) to the local drive number specified thereby giving you access to all files on that disk.

Before using MOUNT you must know the names and protective passwords of the volumes you have to access and your user name(s) and password(s).

Each disk is referred to as a "volume." When you enter the MOUNT command, certain information will be required. If you do not enter the optional information, MOUNT will use pre-determined "default" values.

Each volume (disk) is assigned a specific "volume name" when the disk is formatted. For instance, a disk which stores all information (programs and data) concerning a payroll file might be named PAYROLL. This will allow you to instantly recognize which volume you want. The only restriction is that a volume name must be eight characters or less in length.

If you do not specify a volume name when you use MOUNT, the program will assume you want the volume named TRSDOS.

At the same time, a volume "password" must be entered before you can gain access to the volume you've specified. This volume password (the first level of protection) was assigned when the disk was formatted. If you do not specify a password, the program uses the password PASSWORD. If the correct password is not entered, you cannot gain access to the specified volume.

Next, the MOUNT command lets you specify the local drive number you want to assign the volume to. This drive number can be any number from 0 to 9. This number is for your reference only! Keep in mind that this is an Application Processor's local drive number. That is, you may not know if there is one hard disk drive at the File Processor or four hard disk drives. Just assign a local drive number, remember that number, and the ARCNET Application Processor will do the rest. You must assign a drive number at this point! MOUNT will not supply a default value for the local drive number.

Your "user ID" is required at this point. This is the ID assigned at the File Processor. The only restriction is that it must be eight characters or less in length. If you do not specify an ID, MOUNT will assume that your ID is USERNAME. If the correct ID is not entered, you cannot gain access to the volume.

The second level of protection is the "User Name Password." This is the user password assigned at the File Processor. The password you enter must be eight characters or fewer in length. If you do not assign a user password, the program will assume your password is PASSWORD.

In short, the format for the MOUNT command is:

MOUNT volume.password:drive ID=username PW=password

To MOUNT a volume, type (when TRSDOS-II READY is displayed):

MOUNT volume name, volume password, drive number, user identification name, and username

The following examples use the MOUNT command:

MOUNT MYVOL:8 <ENTER>

This example will assign the remote volume named MYVOL to local Drive 8.

MOUNT :9 <ENTER>

This example mounts the remote volume TRSDOS to local Drive 9.

MOUNT PAYROLL.MONEY:5 <ENTER>

This example assigns remote volume PAYROLL which has a volume password of MONEY to local Drive 5.

If MOUNT is entered without any parameters , the volumes currently mounted will be displayed.

MOUNT <ENTER>

MOUNT ACCTS:3 ID=JOHN PW=SMITH <ENTER>

This use of MOUNT assigns remote volume ACCTS to local Drive 3. The user's name is JOHN and his password is SMITH.

When a volume has been MOUNTed to an Application Processor local drive, the drive number can be used with the standard TRSDOS-II commands and file specifications. The volume accessed will be the remote volume assigned to the drive number. For example:

MOUNT VOL1:8 <ENTER>

will assign VOL1 to local Drive 8.

COPY MYFILE:0 TO MYFILE:8 <ENTER>

will copy MYFILE from the local volume on Drive 0 to MYFILE on the remote volume VOL1 which has been assigned to Drive 8.

Your next step is to "call up" or load the applications (or systems) program you want to use.

The DISMOUNT Command

Once you've used the application program and closed all files, you will need to free the disk drive so that you can either MOUNT a volume stored on another drive or sign-off the System.

The DISMOUNT command allows you to free up that drive.

To use DISMOUNT, simply return to TRSDOS-II READY, type DISMOUNT followed by the drive number of the local drive you specified with MOUNT and press <ENTER>.

For instance:

DISMOUNT 1 <ENTER>

will free local Drive 1.

If an "*" is used in place of the drive number, all remote volumes will be dismounted.

DISMOUNT * <ENTER>

DISMOUNT disassociates the File Processor volume you specified with MOUNT from the Application Processor local drive number. That local drive number can then be accessed at the Application Processor. For instance after local drive 1 has been dismounted:

When you type:

DIR :1 <ENTER>

the directory on local Drive 1 of the Application Processor, will be displayed.

For clean operation all mounted volumes should be dismounted. DO NOT turn off the Application Processor without dismounting volumes.

SPOOL

The purpose of SPOOL is to increase the efficency of the System by reducing the time when the Application Processor is sitting idle while the printer is printing. It allows you to use the System while a print operation is in progress either at the File Processor or at the Application Processor.

SPOOL performs two functions:

- It saves ("captures") data in a file that would normally go to the printer. The file that contains the captured data may be thrown away or it may be saved in a capture-file for later use.

- It prints data from a disk file while other operations are in progress. That is, you can be using the Application Processor while the file is being printed.

The two functions may be used one at a time or simultaneously. In the latter case, the spool-file is printed and real-time printer output is captured for later use.

Note: This is local spooling at the Application Processor with a local printer.

Sample Uses

1. Capture a File. You are going to run a program that outputs to the printer. Instead of waiting while the printing is done, you would like to capture it in a disk file, and print it all out later. We'll call the capture-file SPOOL1 (filename). Type:

```
SPOOL ON

SPOOL N,F = SPOOL1 <ENTER>
```

Now all printer output will be saved in SPOOL1.

To stop capturing the printer output in SPOOL1, type:

```
SPOOL OFF <ENTER>
```

Now SPOOL1 is a text file which may be LISTed or PRINTed normally.

2. Print a File. You need to print a file created by the spooler, but you want to use the system at the same time. Suppose the file is named SPOOL1, from the previous example. The spooler is off. Type:

```
SPOOL ON <ENTER>
SPOOL P,F=SPOOL1 <ENTER>
```

The file will begin to be printed as a "background task", meaning that printing is performed only when the system is not busy with some higher-priority operation like interpreting and executing your keyboard commands. Since we did not include the K or C= copies option, SPOOL1 will be deleted after it is printed, and will print only one copy.

Note. K Tells the operating system to keep the print-file after printing it. C= copies specifies how many copies you want (1-255).

Spooler does not turn itself off after completing a print-file. To turn it off, type:

```
SPOOL OFF
```

3. Simultaneous Capture into a New File and Printing of an Old Spool Capture File . You want to save real-time printer output at the same time as the spooler is printing a file. In some applications, this will be common.

For this purpose, you will need one capture file and one print file. We'll use the filenames SPOOL1 and SPOOL2.

First turn the spooler on and begin capturing printer output in SPOOL1:

```
SPOOL ON
SPOOL N,F = SPOOL1 (old filename) <ENTER>
```

Now use the computer normally until you are ready to begin printing SPOOL1. When you are ready, type:

```
SPOOL N,F = SPOOL2 (new filename) <ENTER>
```

This closes SPOOL1 and makes SPOOL2 the new capture file.To print the old captured-file, type:

```
SPOOL P,F = SPOOL1 (old filename) <ENTER>
```

To stop ("halt") printing at anytime, type (at TRSDOS-II READY):

```
SPOOL H <ENTER>
```

To resume printing after a "halt", type (at TRSDOS-II READY):

```
SPOOL R <ENTER>
```

When you've completed the SPOOLing operation, turn the SPOOLER off by typing (at TRSDOS-II READY):

```
SPOOL OFF <ENTER>
```

The file has now been captured. Once captured, the file can be printed .

Printing and the Application Processor

With ARCNET, SPOOL files can be captured on remote volumes as well as on local disks:

SPOOL N,F=filename:drive number

The drive number is the local drive number assigned to the remote volume by the MOUNT command.

If the print file is captured on the remote volume, there are two options:

- Local printing at the Application Processors:

  1. The print file captured on the remote volume can be printed on the local printer with TRSDOS-II PRINT utility:

     SPOOL N,F=filename:drive number <ENTER>

     (execute program to generate print output)

     PRINT filename:drive number <ENTER>

  2. The print file captured on the remote volume can be printed in a background mode using the SPOOL utility:

     SPOOL N,F=filename:drive number <ENTER>

     (execute program to generate print output)

     SPOOL P,F= filename:drive number <ENTER>

     (execute another program while the file is being printed)

- Remote printing at the File Processor:

  The print file captured on the remote volume can be printed at the File Processor's printer. The new TRSDOS-II print utility RPRINT can be used:

  SPOOL N,F=filename:drive number <ENTER>

  (execute program to generate print output)

  RPRINT filename:drive number <ENTER>

The RPRINT utility will notify the File Processor that the file is to be printed. RPRINT returns control to the Application Processor as soon as the File Processor has been notified. Thus the Application Processor can be used to execute another program while the File Processor is printing the file.

To capture print output on a remote volume and to print the file perform the following general steps:

1. MOUNT a remote volume and assign a local drive number

   MOUNT : drive number <ENTER>

2. turn the spooler on

   SPOOL ON <ENTER>

3. specify the capture file

   SPOOL N,F=filename:drive number

4. execute the program that generates print output

5. close the spooler

   SPOOL OFF <ENTER>

6. print the file local or remote

   PRINT filename:drive number - local print

   RPRINT filename:drive number - remote print

Note: You cannot DISMOUNT a drive that has a spooler file open. You must first close the spool file or turn spooling off.

Printing (PRINT and RPRINT)

When a printer is connected to an Application Processor, you can print any file listed on the directory using the TRSDOS-II PRINT command. To do this, type (at TRSDOS-II READY):

PRINT filename <ENTER>

where filename is the name of the file you want printed.

Note: When you use PRINT to perform printing operations, you cannot use the Application Processor for other types of processing.

If you wish to print a file at the File Processor, use the RPRINT ("remote print"). The file will be queued for printing with other files at the File Processor and will be printed as soon as the printer is available.

To RPRINT a file, you must specify the file name and the local drive number you assigned the file to with MOUNT. Furthermore, there are several options. Among them:

- The number of copies to print -- from 1 to 256. If you do not specify this option, 1 copy of the file will be printed.
- The line number of the program where printing is to begin. This number can be between 1 and 65535. If you do not specify a line number, line 1 is used.
- The priority of this specific file (High, Normal, or Low) if you have several files in the queue.
- The FORMS character of what is to be printed. This must correspond to the FORMS parameters established at the File Processor. If you do not use this option, blank is used. Check with your System Manager for FORMS information.
- Whether or not the first character of each line is an ASCII forms control character.

The RPRINT command can be used to print any file at the File Processor as long as the file resides on one of the File Processor's volumes and you have mounted that volume.

In short, RPRINT can be used like this:

RPRINT filename:drive C=copies L=line P=priority F='forms'

Example:

RPRINT MYFILE: C=1 L=1 P=N F='A'

Multiple Directories

When MOUNTing and accessing remote volumes, care must be taken to insure that programs do not try to OPEN/CREATE files with identical names.

One way the problem can occur is for two Application Processors to mount the same remote volume and execute the same program which tries to create a temporary scratch file.

If the temporary scratch file name is fixed, the first program's OPEN will succeed, but the second will fail because of duplicate file name. The problem is a result of trying to create two files with the same name in the same directory (on the same volume). To avoid the condition, direct the scratch files to local or separate volumes where they will be created in a separate directory.

Changing the System Drive

The Application Processor runs under the TRSDOS-II operating system. When a Model II/12 with a single floppy disk drive operates as an Application Processor, the system drive for TRSDOS-II is drive 0. Since the system drive must be available at all times for operating in stand alone mode, the floppy system disk on drive 0 cannot be removed during normal operations. With ARCNET this limitation is removed using the new Change System Drive command:

SYSDRV n	where n is the new system drive number from 0 to 9.

The SYSDRV command can be used to re-assign the current system drive to another available system drive. THE OPERATING SYSTEMS ON THE TWO DRIVES MUST BE IDENTICAL (same release and version). If a remote drive on the File Processor has been mounted, the current system drive can be re-assigned to the File Processor.

For example:

```
ARC80AP

MOUNT FP1:4

SYSDRV 4
```

will re-assign the system drive to the File Processor. The system floppy on local drive 0 can then be removed.

The reassigning of the system drive to the File Processor can be useful for single drive systems since the local floppy is freed for other uses. One example might be to FCOPY a TRSDOS 2.0 style file from a floppy to the File Processor.

Note that SYSDRV does not change the global search sequence (see the section on DRIVE NUMBERS). Also the performance may degrade if the File Processor is used as the system drive.

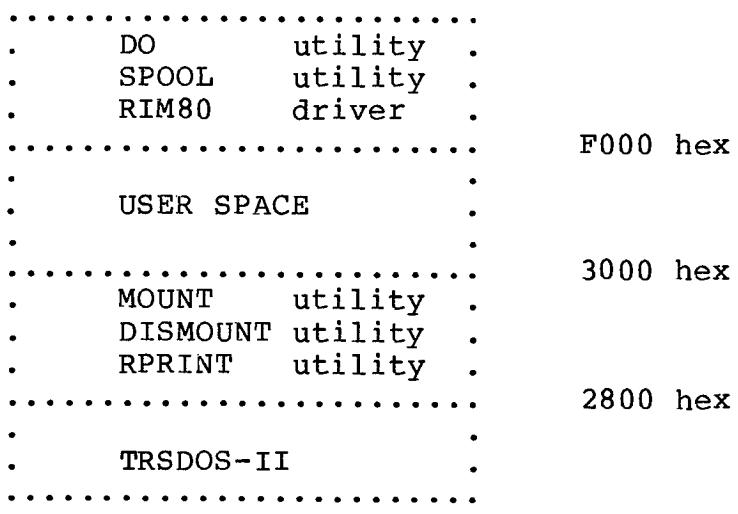
4/ Technical and Programming Information

If you're like most people who will be using a Model II/12 as an Application Processor, you'll be using application programs that were written by someone else. However, there will be some people who will need more technical information for writing programs from the Application Processor. If this describes how you're using an Application Processor, this section is for you.

Be aware that this section is technical in nature. Understanding it is not necessary for using the Model II/12 as an Application Processor.

Utilities Memory Map

The MOUNT, DISMOUNT, and RPRINT utilities that support the Application Processor and ARCNET are executed at 2800 hex. The following represents the memory map when the TRS-80 is operating as an Application Processor:



In addition, new features have been added to TRSDOS-II which allow application programs to share a file. OPEN has been enhanced to allow a file to be opened exclusively or opened shared. The ability to lock records has also been added.

Sharing Files

The Application Processor, in conjunction with the File Processor and some new features of TRSDOS-II, has the capability for two or more programs to concurrently open and share data within the same file. For example, two Application Processors could concurrently mount the same remote volume which has a file called PARTS and execute the same program called INVENTORY which opens and updates the PARTS file without either Application Processor knowing the other exists. The TRSDOS-II features which allow this capability are:

- Exclusive/shared file open
- Record lock/unlock

The features are available through TRSDOS-II SVC's. To take advantage of these features, existing applications must be enhanced. To provide data security for existing applications, all opens will default to open exclusive. A file must be open shared for two programs to concurrently access the data or use the lock/unlock capability.

Exclusive and Shared OPENs

A new creation code for the OPEN SVC allows a program to open an existing file shared. Another program (or the same program executing at another Application Processor) may access the file concurrently if the program also opens the file shared. All of the existing creation codes retain their function and request exclusive control of the file.

A file that is OPENed shared may be read or written to, depending on what is specified in the OPEN parameter list. A file OPENed shared may not be extended. VLR files may be OPENed for shared read only. An attempt to open a VLR file for read/write access will be transformed into an OPEN Exclusive Request.

OPEN shared existing (code 3) acts like OPEN Exclusive existing (code 0) except for the shared function. OPENs for new files are always exclusive. It is permissible to OPEN a file on a local drive shared since no other user can access the file. OPEN shared on a local drive is treated as an OPEN Exclusive.

CREATION CODES in parameter list:

0 = OPEN Exclusive - existing file

1 = OPEN Exclusive - create new file

2 = OPEN Exclusive - existing file or create new file

3 = OPEN Shared - existing file

Note: Files OPENed exclusively on a remote volume can be left opened exclusively if the Application Processor fails and does not close the file. If a file is left OPENed exclusively by the Application Processor, access by other Application Processors can be inhibited. Restarting the File Processor will always correct the condition.

LOCK/UNLOCK

The LOCK/UNLOCK SVC allows records to be locked and unlocked. The request block passed to the SVC consists of a count of the number of request block entries (effectively the number of records to lock/unlock) followed immediately by the request block entries themselves. Each request block entry has a pointer to a DCB for an OPEN file and a logical record number in that file to lock.

A lock with NO WAIT will result in an immediate error return if another program has any of the records locked. The LOCK with WAIT (when locking a single record) will result in waiting for up to one minute for the record to become UNLOCKed before returning an error. For LOCK with WAIT, if another program releases it's lock within a minute, the waiting LOCK will take effect with a good return. LOCK with WAIT for multiple records is equivalent to LOCK without a wait.

Once the record(s) are LOCKed, the lock time indicates the amount of time the LOCK will remain in effect. If the time expires before the records are UNLOCKed, the records will be automatically unlocked. UNLOCKs always succeed.

. LOCK/UNLOCK SVC (function code = 61)

. calling sequence:

A = function code

B = request type

0 = lock with wait
2 = lock with no wait
4 = unlock

HL = pointer to request block

request block format:

byte 1	= number of request block entries
bytes 2 thru n	= request block entries (4 entries max) (HSB/MSB/LSB order)

request block entry format:

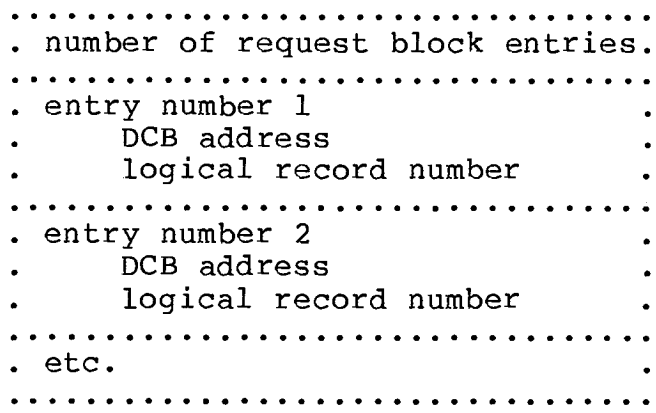
bytes 1-2	= address of DCB for opened file
bytes 3-5	= logical record number of record to lock/unlock

DE = timeout value (1 to 240)

. condition code return:

Z = no error
NZ = error

Example Lock/Unlock request block:



Guidelines for Sharing Files

LOCKing a record by one program does not inhibit access by another program that does not lock records. LOCKs only protect programs from access by other programs that also use LOCKs. Files may be OPENed shared and accessed without using LOCKs. The typical case is access by programs that read only. For updates, a file can be OPENed shared but should use LOCKs to prevent access by other programs. If a file is OPENed shared and is being updated by a program that is using LOCKs, any other program that OPENs the file shared should also use LOCKs (even if reading only) to guarantee data integrity.

No indication that a LOCK has expired is returned.

LOCKing of records in local files (files on volumes local to the Application Processor) always succeed immediately.

Multiple LOCKs on the same record by the same program (same Application Processor) are permitted. The LOCK time will be the longest time. The record will be considered unlocked when all UNLOCKs have been issued or the time expires.

Closing a file does not UNLOCK records.

LOCKs cannot be used on files with variable length records since the files cannot be updated in a shared mode. VLR files should be OPENed shared for read only. OPEN VLR files in an exclusive mode for updating.

LOCKs are permitted on files OPENed exclusively.

LOCKS add overhead to the network. Excessive use of LOCKS can not only degrade the performance of the application but also the network and other users.

Local Spooling Considerations

1. Spooler is invoked by the console command: SPOOL ON. This will cause a high memory module to be loaded and linked with the operating system. Whenever spooler is active (resident in high-RAM), the user must insure that this high-RAM space is not overlayed with any programs or subroutines.

2. Before getting into the details of spooler, a brief explanation of how it works is in order. Spooler itself can be thought of as a high level "supervisor" whose role is to monitor the use of the "physical" printer. As such, spooler can be said to "control" or "own" the printer. Spooler will accept your commands to print out disk files of text to the real printer and will, upon your command, save all data which was intended to be printed onto a disk file.

   As long as spooler is active (or until you issue the command line: SPOOL OFF), all data that would normally go to the printer will be intercepted by the spooler. This is called the "capture" function of spooler. "Capturing" can be done to a disk file of the name you specify in the command line:
   SPOOL N F = filespec
   "Capturing" can also be done such that all of the printed data bytes will get "thrown" away - this is called capturing to a dummy file. In this case, no file is opened and no data is saved. There is a good use for this , as we will discuss later. Because of this capturing function, your program is now said to be outputting data to a "logical" printer, not the "physical" printer.

   While the spooler is active, and while it is printing out a previously captured file, it is using the extra processor cycles that would normally be wasted. Previously, the computer would just wait for certain operations to complete: now,these small time periods are used by the spooler to get the data from a disk file, then output them to the real printer. Not only are wait times used, but, just to insure that your printed report doesn't stop running altogether, some extra "time slices" are given to the spool printer. The the spooler, as you can see, is a true multi-tasked operation. The technique is more correctly known as background/foreground processing, where the spool printer is a background task, and your application program is a foreground task.

The capture function and the printing functions of spooler are separate. It should be noted that the capture function is directly controlled by the application program or utility that creates printed data. In BASIC, the "LPRINT" verb directs data to the printer. When spooler is active, every byte output to the printer will be intercepted and either output to a disk capture file or thrown away.The time it takes to write the data out to a disk is much faster than if it were going out to a real printer, due to the differences in speed between a disk drive and even the fastest printers that you might use. This feature alone can be used to speed up long jobs that prepare a printed report as an output. The trade-off for the increased speed is, of course, disk space. Printed reports usually take a lot of disk space to store. More on this later.

3. Some of the features that spooler print has that should be helpful are listed below:

   A. The operator has control over the printing of the report from the disk file. Such controls include pausing the report, stopping it altogether, resuming the report, restarting the report on a certain line, and starting it up from a certain line. The line positioning feature is especially useful when you only need a certain part of a printed report, or if you ran out of paper, or the paper jammed, while you were printing the report for the first time.
   B. Other operator controls include number of copies, and whether to keep or delete the spool disk file after printing is complete.
   C. Assuming none of the high-RAM where the spooler program resides has been used for user subroutines, etc., then the operator has the operational flexibility to run spooler printing as desired. Again, spooler was designed to be used without any application program modification to printer functions.

D. Special code has been installed that can sense printer faults in parallel printers. This causes the printing function to just wait for the problem to get corrected before the printing will resume. This should be especially helpful when you have a paper jam or run out of paper. As soon as the printer goes back on-line and is ready, spooler printing will resume. Also, you may stop the printer by taking it off-line (parallel printer only) so that you may look at the printed material and spooler will just "wait" for the printer to go back on-line.

4. While the spooler print function is running, programs may be run concurrently with the printing. As a background task, spool printing will usually run as fast as it can using the left-over computer cycles. Programs which cause extra computer cycles will cause the printing function to slow down. This is to be expected. Every effort has been made to insure that the foreground task, your application program, will not be unduly affected by the running of a spooler file.

5. Other things which affect the speed of the spooler printing function are listed below:

   A. The number and frequency of disk input/output operations, i.e., OPENS, CLOSES, READS, and WRITES.
   B. The printer you have, especially the size of its RAM buffer, and whether it is a serial or parallel
   C. How often the processing program waits for keyboard input.

These all affect the spool print operation because, as a background task, the spooler must wait for your processing program to finish some operations before it can get control. Your program will have a higher priority than the spooler and if there is any competition for the same software in the operating system then the spooler will take a "back seat" to your program. An example would be: spooler printer needs another disk record to continue printing. Your program is currently needing a disk record itself to continue processing. Spooler, in this case, will wait for your disk operation to complete before it will request its next disk record.

6. Spooler has, in its capture function, the ability to save or throw away the printed data. When it is first brought up, the capture function is set up to "throw away" the printed data until you specify (with the SPOOL N F = filespec command) what the capture-file's file name will be. As soon as you do that, all data bytes normally going to the printer will be captured into the file you've specified. The printed bytes will continue to be captured into this file until you issue another SPOOL N F = filespec command, which tells the capture function to close out the first file, then open up another file to start capturing into. As soon as the first file is closed, it may be printed. You may find it useful to delay printing of this file until a later time. The only requirement is that the capture file must be closed before it can be printed by the spooler print function.

   When a capture file is open, you will notice that it appears in the directory with a "?" after the file name. This is because the file is open and has not been closed. Any other file which was opened and not closed will be marked in the same way (see DIR command for details).

7. You may find it useful to setup the dummy capture mode, which is invoked by the command SPOOL N F=<CR>. In this mode, all printed bytes will not get saved on a disk file, but instead will be thrown away. The most common use for this feature is when you have already run, and printed, the desired report, but you must rerun the program so that it can re-update or re-build the disk files that it created. This will speed up the running of the program (in comparison to having to print the report again). Independent of this mode, you may still be printing out another report, captured earlier, with the spooler print function.

8. It should be noted that, while spooler printer is running, the line count and character counts that are kept by the operating system (see SVCPRCTRL) are pertinent to the printing that is taking place by the spooler. This will usually have no relationship to the data that your processing program might be outputting to the capture file. Because of this, if your applications program uses this new printer control supervisor function, it will not give correct line counts, character counts, etc. to your program if spooler is running. This is because the print software only keeps track of one set of line counts, character counts, etc. and those values will be affected only by the spooler print function, not by the data which is getting intercepted by the capture function. Consider this before writing subroutines to use the new printer control supervisor function in your applications. The use of these new functions will preclude the use of spooler print while your program is running. Only when your program is outputting data directly to a physical printer (which is not the case if spooler is running) will these line and character counts correctly reflect what the printer is doing at the time.

   Also, programs which use the functions of setting line counts or character counts should not be run when spooler is running. The results will be unpredictable, and most assuredly, undesirable. The print control functions relate to the physical printer, not to the "logical" printer that exists when spooler is active. Your program, when spooler is active, outputs to the "logical" printer which has no line counts, character counts, etc.

9. The amount of disk space that will be required to store a printed report that has been captured is strictly a function of the size of the report itself -- basically, the number of bytes of data. Certain techniques may be utilized to help speed up the capture and to insure that you can get the most printed data in a file. These are listed below:

   A. It is recommended that you always use an empty diskette (a data diskette with no other files on it is best) for the capture file, when you have a Disk Expansion Unit and have an extra drive to dedicate to the capture file.

B. If your application or system doesn't allow the use of a separate, dedicated drive for the capture file, then use a diskette with the most space available on it that will be on-line when capturing is to take place.

C. In either case above, using CREATE to set aside the largest possible space for the capture file will speed up the capturing itself -- an additional disk space allocation will not be needed during the run.

D. Do not keep a capture file any longer than necessary so that the space on the disk may be used for another capture file. The default, when printing out a captured file, is for the captured file to be deleted upon completion of the printing.

E. Try to avoid outputting a large number of spaces in a printed report. If at all possible, use the tab character (X'09') instead of the spaces, to 'position' to the next printed column or field. The capture file will only have to store the single tab character instead of the spaces. This will save on disk storage space.

F. You might be able to move some of your data files from one disk to another (in a multi-drive system) to free up the largest amount of disk space onto a single disk for the capture file. This could slow down your disk accesses, depending on a lot of other factors, but this still might be faster just because of using the capture function instead of a real, "physical" printer.

Some applications, because of the amount of free space on the disks, or because of the size of the printed reports, will preclude the use of spooler. Sample runs should show you what disk space requirements you might have and what limitations of printed report size you might experience.

10. Spooler should never be run when formatter, or backup is running. In addition the disk that has the capture file on it should never be removed from the drive until that capture file is closed and/or spooler is de-activated. Keep in mind that when a printing function is currently in progress, the disk with the file being printed must not be removed from the drive it is in, until the file is closed (and deleted, if so desired). Depending on what else is going on, sometimes the print file will remain open for several minutes after the printing has been completed. Make sure by doing a directory, looking for the print file in the DIR before removing the diskette. The print file will not appear in the directory with a "?" next to the name, because it was only opened for reading, not for writing. Only files opened for writing will have this "?" appear in the DIR listing.

Notes:

1. The SPOOL ON command cannot be called from BASIC or any user program, because it always jumps to TRSDOS READY upon completion. (Other spooler commands may be called from BASIC, i.e. SPOOL N F = filespec etc.).
2. When a capture file is first opened, the spooler writes a header record at the front of the file. This consists of a "length" byte followed by the TRSDOS time-date text. This information will not be printed by the SPOOL P command. You can create a spool print-file by following this format. If no header is to be used, the first byte of the file should be a binary zero. In this case, spool printing will begin with the second byte. Spool files must have fixed-length, 256-byte records.
3. While the spooler is on and you have not named a capture file, all printer output is ignored. To begin capturing the output, you must name a file (SPOOL N F = file).
4. While spool is ON and data is being captured and/or printed, the capture-file and/or print-file are open. DO NOT REMOVE THE CAPTURE-FILE OR PRINT-FILE DISKETTES UNTIL YOU HAVE TURNED THE SPOOLER OFF. Do not Backup or Format to these disks, either.

5. The capture-file traps all printer bytes -- no translation is done. This is true regardless of what print control options may have been selected (e.g. auto line-feeds). On the other hand, the print-file is output using the current selection of print control options. For example, a X'0C' will be captured literally; but a X'0C' in a print-file may be interpreted before it is printed, depending on the currently selected print control options. See FORMS and SVC PRCTRL in your TRSDOS-II Manual.
6. When the spooler completes a print-file, it will not kill the print-file immediately, but at the earliest opportunity. If you issue a DIR command immediately after completion of a spool print operation, you may notice that the file is still in the DIRectory. The file will be killed during execution of any user program or any "high-overlay" TRSDOS command such as LIST.
7. Once it has been closed, a spooler capture-file may be printed via the PRINT command or by the spooler's print facility. However, the PRINT command will not operate as a "background" operation allowing you to key in commands during printing, and the time/date text will be printed at the beginning of the file.

Unique Temporary File Names

SVC SVCNID	SVC 64
Entry Parameters:	None
Exit Parameters:	Z, A=ØØ, L=Address of 1st ARCNET board, H=Address of 2nd ARCNET board All other registers are preserved.

The purpose of this SVC is to allow application programs to create unique names for temporary files that might be placed on ARCNET volumes. The ARCNET board address returned for a board that does not exist is ØØ, an illegal ARCNET board address. If ARC8ØAP has not been turned on, or no volume has been mounted, or ARC8ØAP has been turned off, HL will be returned as ØØØØ, and it will be nonzero otherwise. The ARCNET board address is guaranteed to be unique for machines on that network by hardware settings.

This SVC does not return error codes, as no error is possible. A machine that is not on the network, either because it does not have the hardware or because the network is not turned on, will get back a value of Ø, which is valid for putting into temporary file names.

Appendix A/ Making a Backup of the Supplied Diskette

Since anything from static electricity to an unexpected loss of power to your Computer can destroy the information on a diskette, it's a good idea to make an extra, "backup" copy of the disk supplied with this manual. Then, file the supplied diskette away in a safe place and always use the backup copy in your Computer.

Multi-Drive System Backups

Backup copies all the information from the original disk to the new disk. Here is the step-by-step Backup procedure:

1. Turn the Expansion Drives on first. The Expansion Drives are in a separate box near the computer. A single switch on the right side of the front panel turns the drives on.

2. Turn the Computer on (the Switch marked "Power" below the name plate on the front panel).

3. Insert the supplied diskette into Drive Ø (the disk drive that is built into the Computer).

   Insert the disk with the label facing to the right when you are using a Model II and to the left when you are using a Model 12.You will feel the disk click into place. Close the door firmly. Wait for the red light on the disk drive door to go off.

4. Insert the blank disk or (a disk you wish to reuse) into Drive 1 and close the door. There must be a gummed foil tape covering the upper notch on the disk.

5. Type today's date and press <ENTER>. For example, January 9, 1982 would be Ø1/Ø9/1982 <ENTER>. Press the <ENTER> key in response to the time question. TRSDOS-II READY will appear with a line of dots. Press the <CAPS> key. The red light should be on.

To copy a program disk, or to copy existing data disks, continue with the instructions.

6. Type BACKUP Ø TO 1 <ENTER>.

7. The Screen will show: Source Diskette Ready? (Y/Q). The Source disk has the information you wish to copy to the new disk. Insert the Source disk in Drive Ø, close the drive door, and press<Y> and <ENTER>.

8. The Computer will read the first track of the Source disk, then ask: DESTINATION Disk Ready? (Y/Q). Press <Y> <ENTER>. The last question is: Change Diskette Information?. Press <N> <ENTER> to make an exact copy of the Source disk.

During the Backup, the Computer will appear to stop for short periods, as if it is "hung up" or not running. This is normal. The program is bring information from the Source disk, then transferring the data to the Destination disk. Some programs are very large and take a long time to transfer.

The Backup procedure takes several minutes to complete. When the Backup is finished, remove the Backup disk, and store it in its protective sleeve. Also, put the original in its protective sleeve and keep it in a safe place.

Appendix B/ ARCNET Application Processor Command Summary

ARC8ØAP OFF Exits the Application Processor program.

```
ARC8ØAP OFF
```

ARC8ØAP Loads the Application Processor program.

```
ARC8ØAP
```

DISMOUNT drive number Allows you to free a drive at the File Processor which was previously MOUNTed.

```
DISMOUNT 1
```

MOUNT volume.password:drive ID=username PW=password Allows you to access specific files stored at the File Processor.

```
MOUNT ACCTS:3 ID=JOHN PW=SMITH      MOUNT VOL1:8
MOUNT PAYROLL.MONEY:5               MOUNT MYVOL:8
```

PRINT filename Allows you to perform local printing at the Application Processor.

```
PRINT PAYROLL
```

RPRINT filename:drive C=copies L=line P=priority F='forms' A
Allows you to perform remote printing at the File Processor.

```
RPRINT PAYROLL:4 C=2 P=H
```

SPOOL N,F = filename:drive number To create, but not print a file.
SPOOL P,F = filename:drive number To print a file, but not save it.

```
SPOOL N,F = PAYROLL:4      SPOOL P,F = TEXT:1
```

SERVICE POLICY

Radio Shack's nationwide network of service facilities provides quick, convenient, and reliable repair services for all of its computer products, in most instances. Warranty service will be performed in accordance with Radio Shack's Limited Warranty. Non-warranty service will be provided at reasonable parts and labor costs.

Because of the sensitivity of computer equipment, and the problems which can result from improper servicing, the following limitations also apply to the services offered by Radio Shack:

1. If any of the warranty seals on any Radio Shack computer products are broken, Radio Shack reserves the right to refuse to service the equipment or to void any remaining warranty on the equipment.
2. If any Radio Shack computer equipment has been modified so that it is not within manufacturer's specifications, including, but not limited to, the installation of any non-Radio Shack parts, components, or replacement boards, then Radio Shack reserves the right to refuse to service the equipment, void any remaining warranty, remove and replace any non-Radio Shack part found in the equipment, and perform whatever modifications are necessary to return the equipment to original factory manufacturer's specifications.
3. The cost for the labor and parts required to return the Radio Shack computer equipment to original manufacturer's specifications will be charged to the customer in addition to the normal repair charge.

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