



KAYNET
USER'S GUIDE



USER'S GUIDE

for the

ULCnet Connector Adapter

and the

ULC-OPSnet Network Operating System

DOCUMENTATION COPYRIGHT

Copyright (c) 1983 by Orange Compuco, Inc. All rights reserved. No part of this User's Guide may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written permission of Orange Compuco, Inc.

SOFTWARE COPYRIGHT

Copyright (c) 1983 by Aquinas, Inc. All rights reserved. No part of these programs may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means electronic, mechanical, magnetic, optical, chemical, manual or otherwise (except a maximum of five backup copies may be reproduced), without the prior written permission of Aquinas, Inc.

DISCLAIMER

Orange Compuco, Inc. and Aquinas, Inc. make no representation or warranties with respect to the contents hereof and specifically disclaim any implied warranties of merchantability or fitness for any particular purpose. Further, Aquinas and Orange reserve the right to revise these programs and to make changes from time to time in the content hereof without obligation of Aquinas or Orange to notify any person or organization of such revision or changes.

TRADEMARK

OPS-NET, OPS-80, OPSnet and Aquinas are registered trademarks of Aquinas, Inc. and ULCnet is a registered trademark of Orange Compuco, Inc.

TABLE OF CONTENTS

<u>Chapter</u>	<u>Title/Subject</u>	<u>Page</u>
1	INTRODUCTION TO ULCnet and the ULC-OPSnet OPERATING SYSTEM	
	General.....	1-1
	Components.....	1-1
	Features.....	1-1
	Commands.....	1-2
	Memory Requirements.....	1-2
	Software.....	1-3
	Gatekeeper Software	1-3
	Workstation Software.....	1-3
	Self Clocking Operation.....	1-4
	Software Updates and Assistance.....	1-4
	What This Package Contains.....	1-4
	Other Necessary Equipment.....	1-5
2	THE ULCnet CONNECTOR ADAPTER	
	Installation.....	2-1
	Installing the Signal Carrier Board.....	2-3
	Operation.....	2-4
3	GETTING STARTED	
	Care of Diskettes.....	3-1
	Installing the ULC-OPSnet Gatekeeper on a KAYPRO Model 2 or 4.....	3-2
	Installing the ULC-OPSnet Gatekeeper on a KAYPRO Model 10.....	3-4
	Installing the ULC-OPSnet Workstation on a KAYPRO Model 2 or 4.....	3-5
	Installing the ULC-OPSnet Workstation on a KAYPRO Model 10.....	3-7
	Testing the Network.....	3-7
	Review.....	3-8
4	NETWORK ENVIRONMENT, SYSTEM ACCESS, AND FILE SECURITY	
	Introduction.....	4-1
	System Access Security.....	4-2
	The REACT.COM Program - Changing Passwords and Privilege Levels.....	4-6
	File Security.....	4-9
	Other Recommended Security Measures.....	4-11
	Pre-Determined, Automatic Initialization.....	4-11
	Automatic Load of ULC-OPSnet.....	4-13

TABLE OF CONTENTS (Continued)

<u>Chapter</u>	<u>Title/Subject</u>	<u>Page</u>
	How to Auto-Load ULC-OPSnet on a KAYPRO Model 10.....	4-13
	Procedure for KAYPRO Model 10 Hard Disk..	4-13
	Procedure for KAYPRO Model 10 Bootable Floppy Diskettes.....	4-15
	How to Auto-Load ULC-OPSnet on the KAYPRO Models 2 and 4.....	4-16
5	ASSIGNMENT OF DEVICES	
	The "WHERE" Command (Obtaining a Table of Device Assignments).....	5-1
	The "ASSIGN" Command (Changing the Table of Logical Drive Assignments).....	5-2
	The "SPOOL" Command (Assigning a Printer to a Workstation).....	5-3
	Getting Information about Files on the Network.....	5-4
	The "LOCATE" Command.....	5-6
	Getting RAM Information and Performing a Reset.....	5-7
6	OTHER ULC-OPSnet OPERATIONS	
	Printing a File.....	6-1
	Printing Files With Special Word Processing Printer Drivers.....	6-2
	Interstation Messages.....	6-4
	Electronic Mail.....	6-5
	File Transfers Over the Network.....	6-6
	Changing User ID.....	6-6
	Assistance From ULC-OPSnet.....	6-7
	Bringing Up the Network.....	6-8
	Leaving the System.....	6-8
7	OPERATIONAL AND APPLICATIONS CONSIDERATIONS WITH ULCnet	
	Introduction.....	7-1
	Operating Procedures.....	7-1
	Applications Considerations.....	7-5
8	TECHNICAL CONSIDERATIONS FOR PROGRAMMING AND OPERATIONS	
	Placement of .COM and .OV? Files.....	8-1
	- Search path for loading programs.....	8-1
	- Overlay autosearch.....	8-2

TABLE OF CONTENTS (Continued)

<u>Chapter</u>	<u>Title/Subject</u>	<u>Page</u>
	- PIPing Overlay files.....	8-2
	- Using autosearch in operational procedures; i.e., where to put programs...	8-2
	- Performance impact of program location.	8-3
	Multi-User File Operations Under ULC-OPSnet.....	8-3
	- How to implement File Lock in an application program.....	8-3
	- Sample dBASE-II command file with File Lock implemented.....	8-4
	- Operational considerations; using the .DBU file extension.....	8-4
	- PIPing files with the .DBU extension...	8-4
	Restricted ASCII Characters and File Names in ULC-OPSnet.....	8-4
	- Table of ASCII Characters and HEX equivalents.....	8-6
	- Restricted .COM filenames.....	8-7
	Submit operations with OSUB.COM, OXSUB.COM, and PSUB.COM.....	8-7
	- Enhancements to CP/M equivalents.....	8-7
	- Syntax and operational compatibility...	8-7
	Other Procedural and Operational Considerations with ULCnet.....	8-8
	- The RETRY command and its effect.....	8-8
	- Limitations of the SEND command.....	8-8
	- Reserved Virtual Disk designations.....	8-8
	Additional XBDOS Calls Implemented in ULC-OPSnet.....	8-9
	XBDOS Call Examples.....	8-12
9	SUMMARY OF COMMANDS AND ERROR MESSAGES	
	Command Summary.....	9-1
	Classification of Commands.....	9-1
	Error Messages.....	9-5

LIST OF ILLUSTRATIONS

Figure

2-1	Making a Terminated Tap Socket.
2-2	Placing a RJ-11 Tap Socket into the Network.
2-3	Installing the Network Circuit Board.
3-1	Write Protection for an 5-1/4" Diskette.
4-1	User I.D. and Privilege Level as They Relate to File Access and Network System Functions.

CHAPTER 1

INTRODUCTION TO ULCnet and the ULC-OPSnet OPERATING SYSTEM

GENERAL

You have purchased a complete networking system for the KAYPRO Models 2, 4, 10, and Robie line of microcomputers. Most other Z80 based CP/M(c) microcomputers may be added to the network as long as they are equipped with a RS-232C serial port driven by a Zilog SIO PUSART (or equivalent) and capable of transmitting and receiving synchronously. The software and hardware to connect many other brands of microcomputers to your ULCnet(c) may be special ordered from your KAYPRO dealer.

COMPONENTS

The networking components are divided into three groups: (1) the KAYNET/ULCnet Connector Adapter PCB's (hardware), (2) the network media, i.e., the four conductor telco cable, RJ-11 terminators and RJ-11 tap sockets, and (3) the ULC-OPSnet(c) network operating system (software) contained on diskettes. Chapter 2 is devoted to the installation and operation of the KAYNET/ULCnet Connector Adapter PCB's and network media while the remainder of the chapters are devoted to installing and using the network operating system.

NOTE: All Figures (illustrations and tables) are contained in Appendix i and are appropriately referenced in the text of this manual.

Once the network wire and tap sockets have been installed, the KAYNET/ULCnet Connector Adapter PCB's have been connected to both the network and to their respective microcomputers, and the microcomputers have been powered up, the ULC-OPSnet software is ready to be installed. Once the software is completely installed (see Chapters 3 and 4) the entire network is ready for use.

FEATURES

ULC-OPSnet provides the ability to assign any remote peripheral devices on the network as local devices for a particular workstation. Therefore, programs may be executed, files may be opened, processed, copied and, listed by any station on the network, even though they may reside on any other station on the network. A remote printer may be accessed from any station, and

(c) - Signifies trademark and/or copyright.

ULCnet is a registered trademark of Orange Compuco, Inc.

OPSnet is a registered trademark of Aquinas, Inc.

CP/M is a registered trademark of Digital Research, Inc.

since printing operates in the background mode, the station to which the printer is attached is available for processing while the printer is operating. Disk I/O serving also operates in background mode. Thus an operator may be processing at Station #1 while other stations on the network are being serviced by the disk drives attached to Station #1.

Messages may be sent from one station to another. They are displayed on the destination station's console device, or if that station is busy, electronic mail may be employed such that messages queue up in a station's "mail box."

Complete security is provided by a comprehensive access security system, limiting system use with a combination of passwords, privilege levels, and user identification numbers (USER ID's). The system further permits files to be designated "private" or "sharable" and "locked" or "unlocked." A facility is also provided which will support a dynamic file lock status for multi-user applications.

The command structure for ULC-OPSnet is discussed beginning with Chapter 5. ULC-OPSnet supports three classes of commands:

1. The General Commands
2. The Network Commands
3. The Enhanced CP/M Commands

COMMANDS

This User's Guide is concerned with the use of the General and Network commands which provide for using the operating system and maximizing the use of network concepts. The ULC-OPSnet operating system interprets CP/M commands and all CP/M commands are available as described in your CP/M manual. Enhanced versions of these same CP/M commands which are described in Chapter 9 are available under ULC-OPSnet and may be used without leaving ULC-OPSnet. The technical distinctions between the CP/M commands and their enhanced counterparts in ULC-OPSnet are discussed in the ULC-OPSnet Technical Manual.

MEMORY REQUIREMENTS

As a general rule, any application program which operates under CP/M and which requires up to 7K bytes of storage less than the TPA for your current CP/M operating system will run under ULC-OPSnet. The standard TPA size for the KAYPRO Models 2 and 4 is 56K. Thus, the useable TPA for the KAYPRO Models 2 and 4 with ULC-OPSnet is 49K. The useable TPA for the KAYPRO Model 10 with ULC-OPSnet is 48K.

SOFTWARE

The ULC-OPSnet software is distributed in two versions:

1. The Gatekeeper software
2. The Workstation software

Each of these versions is distributed on a diskette. Both Gatekeeper and Workstation software are distributed on a double-density 5-1/4" diskette. The content of the User's Guide for each version is identical. One Gatekeeper version is required per network while the number of Workstation versions required is equal to the number of stations to be placed on the network minus one (the Gatekeeper counts as one workstation). The Gatekeeper software may reside on either a hard disk or a floppy disk system.

GATEKEEPER SOFTWARE

ULC-OPSnet provides that one station on the network is to be designated as the Gatekeeper. In addition to the standard Workstation software, the systems disk for the Gatekeeper station contains additional software routines which perform network management functions. A station on the network may become the Gatekeeper merely by using the Gatekeeper systems disk on that station.

The functions of the Gatekeeper are:

1. Permits the Gatekeeper operator to determine which operators and which functions are active on the network at any time.
2. Checks that all station identification numbers (entered during network operations) are unique.
3. Manages the assignment and/or modification of all user numbers, passwords, and privilege levels for all operators on all stations.
4. Provides an affirmative response to a remote station's inquiry as to the presence of a Gatekeeper.
5. Checks that all serial numbers on the various workstations are unique.

WORKSTATION SOFTWARE

ULC-OPSnet is provided on a system diskette configured for the particular brand of workstation to be used. Each system diskette contains a unique encrypted serial number. The Workstation software contains all of the ULC-OPSnet system software described herein with the exception of the Gatekeeper software.

ULC-OPSnet is independently installed on each workstation. User numbers, passwords, and privilege levels unique to the operators of a given station are assigned during that station's installation phase. When attempting to bring up a workstation on the network, ULC-OPSnet requires that the Workstation software first check the network for the presence of a Gatekeeper. Upon an affirmative response, the Workstation software continues the initialization function.

SELF CLOCKING OPERATION

The KAYPRO Models 2, 4 and 10 each utilize a Zilog SIO PUSART as the serial port controller chip. The Zilog SIO generates a clock sync pulse capable of providing communications at synchronous baud rates of up to 307.2K baud. The KAYNET/ULCnet Connector Adapter PCB for the KAYPRO Models 2, 4 and 10 runs in the synchronous mode. A switch is provided next to the KAYNET RJ-11 jack to either the Network or the communications serial port.

SOFTWARE UPDATES AND ASSISTANCE

Prior to opening the package containing this manual, you were asked to read the attached License Agreement which describes the terms under which this software may be used. Included with the License Agreement is the Software Registration Card. At this point, please fill out the card and mail as indicated. Unless the Software Registration Card is on file, you will not receive software updates or be entitled to participation in the software performance program. Note that a Software Registration Card is required for each package of software purchased. If, after following the instructions in this manual, you have any problems with the software, please complete the Software Performance Report and mail as indicated. Problems with hardware items should be brought to the attention of your dealer.

WHAT THIS PACKAGE CONTAINS

You should have purchased one Gatekeeper software package and the number of Workstation software packages equal to the number of workstations you intend to network minus one (the Gatekeeper counts as one workstation). Check that the Gatekeeper version contains a diskette marked "GATEKEEPER VERSION" and that each Workstation version contains a diskette marked "WORKSTATION VERSION." Report any discrepancies to your dealer.

OTHER NECESSARY EQUIPMENT

You should also have purchased one KAYNET/ULCnet Connector Adapter Kit for each KAYPRO computer to be placed on the network. The carton containing the Connector Adapter Kit should include:

- 1 - KAYNET/ULCnet Connector Adapter PCB.
- 1 - 6' Interconnect cable (RJ11).
- 1 - Tap socket (RJ11).
- 1 - KAYNET Bulkhead RJ11 socket/switch housing.
- 2 - Signal harnesses.

CHAPTER 2

THE ULCnet CONNECTOR ADAPTER

INSTALLATION

The ULCnet Connector Adapter is a transceiver device designed to interface the serial RS-232C port of a Z80 based microcomputer which runs the CP/M operating system to a network whose medium is a four-conductor telco cable. Connections to the network wire are made via common RJ-11 plugs and tap sockets which are readily available from your dealer or any electronics supply house.

The tap sockets at either end of the network must be terminated in order to provide for a balanced line. These special terminated tap sockets may be purchased from your dealer or made up from ordinary tap sockets as shown in Figure 2-1.

The total length (terminator-to-terminator) of the network wire may be up to 2,500 feet, with 7 or fewer Connector Adapters attached, or up to 1,000 feet with the maximum 64 Connector Adapters attached. Common RJ-11 tap (in-line) sockets are used to tap into the network wire at any convenient location. To install a tap socket, first pry off the cover which exposes 12 connector lugs (6 on each side of the RJ-11 socket) and proceed as follows:

IMPORTANT NOTE: ULCnet utilizes low-cost, unshielded telco wire. This reduces overall cost of implementation and makes ULCnet "user installable." To comply with FCC regulations, ULCnet generates a very low energy signal. The signal receivers inside of the ULCnet connector adapter are thus susceptible to some outside interference, such as fluorescent ballast transformers and AC induction motors. Please make certain that the network wire is at least 12" away from any fluorescent lights and air-conditioning fan motors. Otherwise, network performance may be degraded by forced packet retransmissions.

1. Lay out the network wire along the floor next to the baseboard. The network wire may be strung inside walls, over the ceiling or in any convenient fashion to reach all offices in which there will be network connections.
2. Starting at one end of the network, install a terminator tap socket at the physical end of the network wire first. It is not necessary to strip the colored sheathing and expose the bare copper wire. Push the ends of each colored wire (corresponding to the color of the internal wires soldered to each bank of four lugs) into an available lug, using the tip of a needle-nose pliers (see Figure 2-2). The lugs are self-stripping. Fasten terminator tap to wall with screws provided and snap on the cover.

3. Mount (staple) the network wire along the baseboard to the next desired tap point. Cut the wire. Strip outer sheathing leaving about 1-1/2" of the four colored wires exposed. Similarly, strip about 1-1/2" of the outer sheathing from the unstapled end of the network wire.
4. Push corresponding colors of wire onto available lugs with the tip of a needle-nose pliers. Do this for the four wires coming into the tap socket and the four wires leaving the tap socket (see Figure 2-2). Note that the standard ULCnet tap has two available lugs for each of the four colors. The terminator tap has only one available lug for each color (the other lug on the terminator tap is used for the termination resistor). Fasten tap to wall with screws provided and snap on the cover.
5. Continue as above until all desired taps are installed. **The final tap in the network must be a terminator.**

Note: A proper installation of the physical network media is critical to system performance. Tap sockets should be permanently mounted to avoid dangling wires subject to breaking. Although not mandatory, a good practice is to solder the wires to the lugs after the locations have been finalized.

Line balance on the completed network may be checked with an accurate VOM. Resistance measurements should be taken between the red and black wires (Net A) and between the yellow and green wires (Net B). The following table shows the range of resistance values for standard 4 conductor telco wire which should appear for various lengths of network. Measurements are taken without any connections between RJ11 tap sockets and Connector Adapters.

Length of Network (ft.)	Resistance (ohms)	Length of Network (ft.)	Resistance (ohms)
100	49-54	600	54-59
200	50-55	700	55-60
300	51-56	800	56-61
400	52-57	900	57-62
500	53-58	1,000	57-63

INSTALLING THE KAYNET/ULCnet NETWORK CIRCUIT BOARD

The KAYNET/ULCnet NCB (Network Circuit Board) for KAYPRO models with the universal mother board contains all of the Network circuitry, harness connecting pins, and a forty (40) pin IC socket. This NCB must be properly installed in order for ULCnet and the computer's keyboard to operate. The installation procedure involves removing the cover of the KAYPRO computer, removing an SIO chip from its socket, seating the SIO into the socket on the NCB, and plugging the NCB back into the SIO socket on the main board. **It is very important that the user exercise care in removing and replacing the SIO chip so that the pins do not bend and so that all pins seat properly in the socket.** After the NCB is properly seated, all of the signal and power harnesses must be properly installed.

PROCEDURE FOR ALL KAYPRO MODELS WITH UNIVERSAL BOARD

Installing the Network Circuit Board

Unplug the computer. Remove the cover by removing the 10 small Phillips-head screws. Facing the front of the chassis, locate the SIO device #U11 (see figure 2-3). Note that there are two SIO's in the KAYPRO, and that the SIO's may have some designation other than SIO printed on them. Be certain you have located the one marked U11 on the main circuit board. Carefully remove the SIO from its socket by sliding a small screwdriver under each end of the chip and applying even, slight pressure. Locate the "c" mark and the pin 1 mark on the NCB. Line up the "key" of the SIO with the "c" mark on the NCB, and firmly seat all 40 pins of the SIO into the socket on the Network Circuit Board (see figure 2-3). Line up the pins in the Network Circuit Board with the "key" of the SIO socket on the main circuit board in the same orientation as it was before removal. Firmly seat the NCB into socket U11 by applying even pressure from the top and steadying the main circuit board from underneath (see figure 2-3). Hold the spacer underneath the hole at the right front of the NCB. Inset the #6 screw through the top of the hole, and firmly seat the spacer in place.

Installing the KAYNET Bulkhead Tap Connector

The KAYNET bulkhead tap connector attaches to the rear of the computer through the air vents with two screws provided. Route the harness leading from the KAYNET tap along the right side of the main board to the front right-hand side of the NCB. The connector on the other side of the harness is "keyed" with an insert in one hole. Line the harness connector up with the "key" facing the cut-off pin, and inset the connector into the pins at connection point P3 (see figure 2-3). In the same manner, insert the connector from the two-wire harness into the pins at connection point P4. Gently remove the harness from the POWER LED, and insert the connector at the other end of the two wire harness, noting the polarity.

Installing the Power Harness

The other harness provided is a power harness, easily identified by the larger gauge wire and connectors. Gently remove the power harness connector to the main board, and plug it into the rear power connector on the NCB. Now, plug one end of the power harness provided into the other power connector on the NCB, and the other end into the power connector on the main board (see figure 2-3).

Replace the cover, lining up the screw holes with the openings. Replace the Phillips-head screws. This completes the installation on this unit.

Once the network wire has been installed (typically around the baseboard of an office) and the tap sockets have been mounted at designated locations, the KAYNET bulkhead tap connectors may be plugged into the tap sockets via the interconnect cables (a six-foot interconnect cable is supplied with each NCB).

OPERATION

Switch on power to each of the KAYPRO computers connected to the network. The POWER LED should now light as it did before installation of the NCB. When there is no ULCnet activity, the POWER LED should light steadily. When data is transferred on ULCnet, the POWER LED will flicker with each data packet. When network activity is very high, the POWER LED will appear to dim and may even momentarily cease to light. As you become more familiar with its operation, you will be able to use the POWER LED as a rough indication of what kind of activity is occurring on ULCnet.

Now, boot each KAYPRO computer and execute some keyboard operation (like a DIR command) to make certain the NCB and its SIO were properly installed. If the POWER LED remains lit, and the keyboard is responsive, the NCB was most probably installed correctly.

The switch on the KAYNET bulkhead tap connector should be in the **NET** position. In this position, signal connection to the serial data I/O port is disabled, and the ULCnet connection is enabled. Likewise, if the switch is in the **COMM** position, ULCnet I/O is disabled to the station, and the serial data I/O port is enabled. Keep the switch in the **NET** position during the remainder of the installation phase.

CHAPTER 3

GETTING STARTED

GENERAL CARE OF DISKETTES

Depending on the type of computer equipment purchased, you will be using either 5-1/4" or 8" floppy diskettes. These diskettes may be single or double-sided (information may reside on one or both sides) and single or double-density (refers to the amount of information which may be recorded). You need not concern yourself with these designations as long as you use the appropriate diskettes specified by the manufacturer for a particular workstation. The format of the information to be recorded on the diskette also varies from manufacturer to manufacturer so that one 8" floppy diskette will not work on all workstations having 8" disk drives. The same is true for the 5-1/4" floppy diskettes. A good practice is to record the type of equipment on each diskette label.

In general, handle diskettes carefully, using the same precautions you use with tape cassettes and high-fidelity records. A small indentation, dust particle, or scratch can render all or part of a diskette unreadable--permanently.

- . Keep the diskette in its storage envelope whenever it is not in one of the drives.
- . Do not place a diskette in the drive while you are turning the system on or off.
- . Keep diskettes away from magnetic fields (transformers, AC motors, magnets, TVs, radios, etc.). Strong magnetic fields will erase data stored on a diskette.
- . Handle diskettes by the jacket only. Do not touch any of the exposed surfaces. Do not try to wipe or clean the diskette surface; it scratches easily.
- . Keep diskettes out of direct sunlight and away from heat.
- . Avoid contamination of diskettes with cigarette ashes, dust, or other particles.
- . Do not write directly on the diskette jacket with a hard point device such as a ball point pen or lead pencil; use a felt tip pen only.
- . Store diskettes in a vertical file folder on a shelf where they are protected.
- . In very dusty environments, you may need to provide filtered air to the computer room.

Before inserting a diskette, check the write-protect notch. (See Figure 3-1.) If you do not want to write to that diskette, it is a good idea to leave it "write-protected." This way, the ULC-OPSnet operating system will not let you accidentally write to that diskette. To write-protect a diskette, just leave the write-protect notch UNcovered if an 8" diskette, and covered if a 5-1/4" diskette.

If you do want to write to the diskette, cover the write protect notch with gummed-foil tape provided with the diskette if an 8" diskette, and REMOVE the foil tape if a 5-1/4" diskette.

Any alteration of the data on the diskette--even the deletion of data or programs--requires that the diskette not be write-protected. (Cover the notch with gummed-foil tape - 8" diskette; uncover - 5-1/4" diskette.)

All diskettes will wear out after continued use. It is vitally important that you make a working copy of the system diskettes supplied with each of your software packages. Refer to your CP/M manual for the method of formatting and backing up system diskettes. After the copies are made, replace the originals in a safe place for future copies if necessary.

In the following examples, the "NET READY" light refers to the POWER LED on KAYPRO computers containing the NCB.

INSTALLING THE ULC-OPSnet OPERATING SYSTEM

For the initial installation follow the instructions below precisely. The operating system may be reinstalled at any time should you wish to change some or any of the system attributes. Screen formats will appear as an outlined rectangle. What you are to type will appear in **BOLD** print. Type the commands exactly as they appear observing any blanks or spaces. The symbol <RET> means you are to press the RETURN key. Information shown in the screen format which is not in bold print represents responses from the computer.

ULCOPSG.COM and ULCOPS.COM, the main program modules, are actually distributed on each diskette by KAYPRO. ULCOPS.COM is Workstation software and ULCOPSG.COM is Gatekeeper software. Both the Workstation and Gatekeeper modules have common utility programs such as MAIL.COM, SEND.COM, etc. **Only one system in the network may have Gatekeeper software loaded. The Gatekeeper software is usually reserved for use by the installation manager, company controller, or other manager. Both Gatekeeper and Workstation can have access to all systems on the network, but only the Gatekeeper can control access to the network and can view the status of the network. These features are more fully explained in Chapter 4. It would be best to decide now which system in the network will have the Gatekeeper software. If you are installing ULC-OPSnet on a KAYPRO 10 or 12, please refer to the installation section for those particular models. Note that the larger BIOS on the KAYPRO Models 10, 12, and 4X result in a lower TPA**

(Transient Program Area) than is available for the Models 2, 2X, and 4. Note also that the following example illustrates the installation of Gatekeeper software. If Workstation software is to be installed, simply substitute ULCOPS for ULCOPSG and visa versa.

PROCEDURE FOR KAYPRO MODELS 2, 2X, 4, 4X, and ROBIE

1. Power up all microcomputers. The POWER LED, or "NET READY" light should be lit on all (see Chapter 2).
2. "Boot" CP/M in each workstation according to the instructions contained in the CP/M manual. The screen on each workstation should now show the "A" disk drive prompt:

```
+-----+
:      AØ>      :
+-----+
```

3. Select one station to serve as the Gatekeeper. This choice may be changed later at your convenience.
4. Prepare a CP/M systems diskette in accordance with the instructions in your CP/M manual. This diskette should have at a minimum the following files:

```
PIP.COM
STAT.COM
COPY.COM
```

5. Place the CP/M systems diskette in drive A: and the ULC-OPSnet diskette in drive B:. "PIP", or copy all of the ULC-OPSnet files from drive B: to drive A: using:

```
+-----+
:  AØ>PIP A:=B:*. * [VO] <RET>      :
+-----+
```

Remove the ULC-OPSnet master release diskette from drive B: and put it in a safe place.

6. Take a directory of the CP/M system diskette (which now contains the ULC-OPSnet files) on drive A.

```
+-----+
:  AØ>DIR A:<RET>                    :
+-----+
```

In addition to the CP/M files above, at a minimum the following 27 ULC-OPSnet release files should be displayed:

ACCT.SYS	OSUB.COM	SPOOL.COM
APPLNOTE.CMD	OXSUB.COM	ULCOPS.HLP
FIND.COM	PRINTOFF.SUB	ULCOPS.COM
GENULCFD.COM	PRINTON.SUB	ULCOPSG.COM
INET.COM	PSUB.COM	RETRY.COM
LOG.COM	PUTULC.COM	UTIL.COM
MAIL.COM	QUEUE.COM	WHO.COM
NETUTIL.COM	REACT.COM	TEST.DBU
OHELP.COM	SEND.COM	TEST.NDX

7. Now perform the following:

```

+-----+
: AØ>ERA ULCOPS.COM<RET> :
: AØ>REN COPYDISK.COM=COPY.COM<RET> :
: AØ>ULCOPSG<RET> :
: ULC-OPSnet v1.8x Gatekeeper - Node Ø :
: OPSnet by Aquinas, Inc. Copyright (c) 1983 :
: :
: <AØ>LOGIN Ø<RET> :
: Password:1111 (Note: **** will appear instead :
: of 1111) :
: :
: Logged-in on ULC-OPSnet v1.8x Gatekeeper - Node Ø :
: OPSnet by Aquinas, Inc. Copyright (c) 1983 :
: [Ø] User: MANAGER 7ØØØ :
: :
: <AØ>INET KAYPRO<RET> :
: Gatekeeper running... :
: <AØ> :
+-----+

```

8. The Gatekeeper station is now ready for operation.

PROCEDURE FOR KAYPRO MODELS 1Ø and 12

1. Power up all microcomputers. The POWER LED, or "NET READY" light should be lit on all computers (see Chapter 2).
2. The KAYPRO Models 1Ø and 12 are shipped with "bundled" software in many different "USER" areas. You will find later in this manual a description of how the CP/M "USER" area is utilized by ULC-OPSnet. **All of the ULC-OPSnet software must be in USER [Ø] area on the A: partition of the hard disk. As you later plan your installation, you will find it easier to place all shared .COM and .OV? files in USER [Ø] area of either Disk A: or B:.** Be certain that you follow the installation procedure exactly.

3. Since it is assumed that all of the ULC-OPSnet software will reside on the hard disk, it is not necessary to prepare a floppy disk with the CP/M system on it.

3a) "RESET" the KAYPRO system.

3b) Exit the "Main Menu" to the standard CP/M prompt:

```
+-----+
:      AØ>      :
+-----+
```

4. Insert the ULC-OPSnet diskette into the floppy disk drive (logical disk C:).

5. Now perform the following:

```
+-----+
:  AØ>PIP A:=C:*. *[VO]<RET>      :
+-----+
```

(A list of files transferred will be displayed. Note - at a minimum, this list should contain the same files specified in instruction 6 for the Models 2 and 4.)

Remove the ULC-OPSnet master release diskette and put it in a safe place.

6. Now perform the following:

```
+-----+
:  AØ>ERA ULCOPS.COM<RET>          :
:  AØ>ULCOPSG<RET>                 :
:  ULC-OPSnet v1.8x Gatekeeper - Node Ø :
:  OPSnet by Aquinas, Inc. Copyright (c) 1983 :
:  :                               :
:  <AØ>LOGIN Ø<RET>                 :
:  Password:1111 (Note: **** will appear instead :
:  of 1111)                          :
:  Logged-in on ULC-OPSnet v1.8x Gatekeeper - Node Ø :
:  OPSnet by Aquinas, Inc. Copyright (c) 1983 :
:  [Ø] User: MANAGER 7ØØØ           :
:  :                               :
:  <AØ>INET KAYPRO<RET>             :
:  Gatekeeper running...            :
:  <AØ>                              :
+-----+
```

8. The Gatekeeper software is now ready for operation.

INSTALLING THE ULC-OPSnet WORKSTATION

At this time it is a good idea to identify each workstation with a unique identification character. The Gatekeeper station is always automatically specified "G". Workstation identification

characters (hereafter called "Station ID" or "Node ID") may be any single ASCII character except for "G" (the Gatekeeper), "Ø" (reserved for specifying a workstation as "local"), or ASCII characters appearing in BRACKETS ([]) on page 8-6. The following instructions for installing the workstation software must be performed for each workstation on the network.

1. As with Gatekeeper installation, installations of the Workstation software require a slightly different procedure depending upon whether it is installed on a Model 2/4, or on a Model 1Ø/12.
2. Prepare CP/M systems diskettes for each workstation on the network in accordance with the instructions in your CP/M manual. Each of these diskettes should have at a minimum the following files:

```
PIP.COM
STAT.COM
COPY.COM
```

3. For each Workstation, place a CP/M system diskette in drive A, a ULC-OPSnet diskette in drive B, and copy the ULC-OPSnet files from drive B to drive A using:

```
+-----+
: AØ>PIP A:=B:*. * [VO]<RET>:
+-----+
```

Remove the ULC-OPSnet diskette and put it in a safe place. Remember to record the serial number of the ULC-OPSnet diskette used each time so that serial numbers are not duplicated in the Network environment.

4. For each workstation, take a directory of the CP/M systems diskette (which now contains the ULC-OPSnet files) on drive A.

```
+-----+
: AØ>DIR<RET> :
+-----+
```

In addition to the CP/M files above, at a minimum the following 27 ULC-OPSnet release files should be displayed:

ACCT.SYS	OSUB.COM	SPOOL.COM
APPLNOTE.COM	OXSUB.COM	ULCOPS.HLP
FIND.COM	PRINTOFF.SUB	ULCOPS.COM
GENULCFD.COM	PRINTON.SUB	ULCOPSG.COM
INET.COM	PSUB.COM	RETRY.COM
LOG.COM	PUTULC.COM	UTIL.COM
MAIL.COM	QUEUE.COM	WHO.COM
NETUTIL.COM	REACT.COM	TEST.DBU
OHELP.COM	SEND.COM	TEST.NDX

3. At Station #2, the following should appear on the screen:

```
+-----+
: <A0>;Msg from node G-2 HELLO      :
: ;;Msg from node G - ALL GOOD MORNING :
+-----+
```

4. At Station #1, do the following:

```
+-----+
: <RET>                               :
: <A0>SEND ALL GOOD MORNING TO ALL<RET> :
: <A0>                                 :
+-----+
```

5. At Station #2, the following should appear:

```
+-----+
: ;;Msg from node 1 - ALL GOOD MORNING TO ALL :
+-----+
```

6. At Station #2, do the following:

```
+-----+
: <RET>                               :
: <A0>SEND G I AM NODE 2<RET>       :
: <A0>                               :
+-----+
```

7. At the Gatekeeper Station the following should appear:

```
+-----+
: <A0>;Msg from node 1 - ALL GOOD MORNING TO ALL :
: ;;Msg from node 2 - G I AM NODE 2             :
+-----+
```

REVIEW

Thus far, you have been introduced to the procedures for bringing up the network, logging on the system with a user identification number, and supplying a password to gain access. You have also been introduced to the concept of sending messages over the network.

Before going any further, you should become familiar with the use of user identification numbers, passwords, and privileges. Chapter 4 covers these concepts.

From this point on, the User's Guide will refer to the "system prompt" as a starting point for all operations. You have already seen the system prompt:

```
<A0>
^----->USER ID - corresponds to CP/M user area function.
^----->Currently logged disk drive.
```

In the above example the system prompt tells us that user 0 has logged on the system and drive A is the currently logged disk drive. Whenever ULC-OPSnet is first loaded via the ULCOPS command, the currently logged disk drive will be A. To change the currently logged disk to B, simply type:

```
+-----+
: <A0>B:<RET>      :
+-----+
```

The computer will respond with:

```
+-----+
: <B0>              :
+-----+
```

if you are logged in as "USER 0."

In the previous test examples, stations 1 and 2 were "logged in" as USER [0]. Each of them could also have been logged in as USER [1], since Passwords are provided on the release diskette for logging in as both USER [0] and USER [1]. Try the following on Workstation (Node) 1:

```
+-----+
: <A0>LOGOUT<RET>   :
: Logged-out of ULC-OPSnet v1.8x Workstation -Node 1:
: OPSnet by Aquinas, Inc. Copyright (c) 1983      :
:                                                    :
: <A0>LOGIN 1<RET>  :
: Password:DEMO<RET> (Note: **** will appear      :
:                               instead of DEMO)    :
:                                                    :
: Logged-in on ULC-OPSnet v1.8x Workstation - Node 1:
: OPSnet by Aquinas, Inc. Copyright (c) 1983      :
: [1] User: USER 1001                               :
:                                                    :
: <A1>                                                  :
+-----+
```

The significance of LOGIN USER [ID], Passwords, and other aspects of the ULCnet security system will be explained in Chapter 4. You will discover that the ACCT.SYS file for each system as shipped allows a Privilege Level of "7" for USER [0] (fully privileged) and a Privilege Level of "1" for USER [1] (minimum privileges). Thus if you logged in as USER [1] above, you would be able to send messages and queue files to other printers, but you would not be able to get to files located on other systems in the network. It is very important to thoroughly read and understand the examples in the remaining chapters of this manual before attempting to place ULCnet in an operational mode.

CHAPTER 4

NETWORK ENVIRONMENT, SYSTEM ACCESS AND FILE SECURITY

INTRODUCTION

Now that you have successfully installed the network it is necessary to consider how to best utilize the network in your day-to-day environment. First you must understand that ULCnet creates a new and totally different environment. On the one hand all of the standard CP/M commands and features are implemented, and, with the exception of the "<AØ>" prompt instead of the "A>" prompt, you will notice very little difference in running programs under ULC-OPSnet versus running programs under CP/M. What is different about the ULCnet environment, and what must be planned for in your operational routine, is that:

1. Every station on the network (or "node" as it is often called) has a small part of its memory allocated to the "serving partition". This is where requests for resources at your station from other "nodes" in the network are serviced. Thus while you are sitting at your station working, your printer could suddenly begin to print a file "spooled" to it from another station. Likewise, one of your disks could start to read or write because some other node in the network requested a file or program, or might be sending a file to your "mail box".
2. Likewise, when working at your station, you are no longer limited to programs, data and printers located only at your station locally, as you are in CP/M. If a program (.COM) file you want to run is located on a floppy or hard disk drive on some other node, you may run that program on your system by loading it over ULCnet. For example, it is even possible from your station to execute a program where the .COM file is resident on, say, node 3, using data files from disks on nodes 8, T, and G, and printing the output file on a printer located at node 6.

In short, ULCnet and the ULC-OPSnet operating system create a "multi-user, multi-tasking" operating environment. This new kind of operating environment may be likened to that of a large data processing department, with mainframe computers running various different jobs from a variety of peripheral devices and interfacing to a number of different terminals. The average utilization of each device improves because a number of tasks appear to use each device simultaneously. Much of what used to be wasted "wait" time for the microprocessor chip inside each micro-computer can now be utilized to drive printers and handle disk input and output for other stations on the network.

With all of the flexibility and availability created by the ULCnet concept, more attention to the details of operating proce-

dures and security are required. Just as the manager of a large data processing installation must be concerned with how jobs are submitted for processing, who has access to what data, and what programs are permitted to be run by which people, so also must the manager of a ULCnet microcomputer network be concerned about these issues. The ULC-OPSnet operating system provides some state of the art security and control measures for limiting access to the system, access to program and data files, and for "presetting" an operator's system resource assignments. When implemented in a planned and organized manner by the individual responsible for management of the network, these control measures will provide a high level of security for data and programs as well as permit new, inexperienced operators to learn to use the system without fear of loss of critical data.

SYSTEM ACCESS SECURITY

In addition to providing a set of commands for networking, ULC-OPSnet acts as a sort of "super operating system", augmenting many of the functions of CP/M, replacing some functions, and calling CP/M for other functions. Since CP/M was designed to operate in a "single task, single user" environment, no thought was given to the design of a security access system. ULC-OPSnet, however, facilitates access to data, programs, and devices anywhere in the network. Thus the first level of security in the network environment deals with controlling access to any part of the system by any potential user. After ULCOPS.COM or ULCOPSG.COM are first loaded, you will see the standard system prompt, an <AØ>. Notice that an attempt to perform any system function will be denied, and the system will return a message asking the operator to LOGIN. For example, suppose you load ULCOPS.COM and immediately ask for a directory (remember, what you are to type on the keyboard is printed in **bold** and the character <RET> means to press the RETURN key:

```

+-----+
:  A>ULCOPS <RET>                               :
:  ULC-OPSnet v1.7x Workstation - Node Ø         :
:  OPSnet by Aquinas, Inc. Copyright (c) 1983   :
:  :                                             :
:  <AØ>DIR<RET>                                  :
:  ?Login please                                :
:  :                                             :
:  <AØ>                                          :
+-----+

```

Clearly, ULC-OPSnet will not process any commands until the operator has successfully completed the LOGIN sequence. The LOGIN and LOGOUT commands access the ULC-OPSnet LOG.COM module. You will recall from Chapter 3 that after typing LOGIN, a one digit number (called the "USER ID") from Ø-9 had to be entered. The LOG.COM module then calls for a four byte Password to be entered from the keyboard. Only after LOG.COM verifies that the Password entered corresponds to the Password in the ACCT.SYS file for the particular USER ID used will the operator be considered "logged-in" and be able to use the system. A corresponding "Privilege Level," previously assigned in the ACCT.SYS file, is

also activated at this time. A detailed discussion of the Password, Privilege Level and USER ID functions now follows.

1. User Identification (USER ID)

CP/M contains a seldom used feature called "USER". Originally implemented in CP/M to provide upward file compatibility with MP/M, the "USER" facility essentially tacks onto the directory entry for a file a "user number" between 0 and 15. The directory entry, and hence the file, are only visible and utilizable when the operator has invoked the "USER" number attached to the file. The default "USER" number, when CP/M is first loaded, is USER [0]. Hence, most of your files will be in USER [0] area unless you are currently making use of this facility. The ULC-OPSnet "USER ID" corresponds to the CP/M "USER" number. Before going further, please take a moment to familiarize yourself with the CP/M USER facility by performing the following exercise with the STAT.COM file. Start by cold booting your system with the system diskettes prepared in Chapter 3. Do not load ULCOPS for this exercise.

```
+-----+
:  A>USER 1<RET>                                     :
:  A>DIR<RET>                                         :
:  NO FILE      (file names will appear on the KAYPRO 10) :
:  A>PIP STAT.COM=STAT.COM[G0]<RET>                 :
:  PIP?                                              :
:  A>USER 0<RET>                                     :
:  A>DIR<RET>                                         :
:  A: PIP      COM : STAT      COM : (etc.)         :
:  A>                                                :
+-----+
```

In this case we told CP/M to invoke USER [1], and to display the directory. CP/M told us that the directory was empty (NO FILE), even though we know it is not empty for USER [0]. We then attempted to "PIP" the STAT.COM file to USER [1] area from USER [0] area (hence the [G0], meaning "get from USER [0]"). The system could not find PIP.COM, however, because "PIP" was only in USER [0] area. We then changed back to USER [0] and displayed the directory to verify that the files were in fact on the diskette.

ULC-OPSnet assigns the CP/M active "USER" byte during the LOGIN process. You will recall from Chapter 3 that you were able to LOGIN as USER ID [0] and USER ID [1]. Eight additional USER ID numbers are available at each workstation [2-9] permitting up to ten different "classes" of users for each station on the network. Unlike CP/M, ULC-OPSnet ties each of the USER ID's to a Privilege level, which in turn, determines each operator's "privilege" to access files from a different USER ID. Also unlike CP/M, ULC-OPSnet permits "sharable" .COM and .OV? files in USER ID [0] to be executed by operators with other USER ID's. With this feature, it is not necessary to reproduce multiple copies of .COM programs and their associated overlays. Before leaving the section

on USER ID, try the previous example under ULC-OPSnet to make certain that you understand the concept.

```
+-----+
: A>ULCOPS<RET>                                     :
: ULC-OPSnet v1.7x Workstation - Node 0             :
: Opsnet by Aquinas, Inc. Copyright (c) 1983       :
:                                                    :
: <A0>LOGIN 1<RET>                                   :
: Password: DEMO (note that **** will display)     :
: Logged-in on ULCOPS-net v1.7x Workstation - Node 0 :
: Opsnet by Aquinas, Inc. Copyright (c) 1983       :
: [1] User: USER          1001                     :
:                                                    :
: <A1>DIR<RET>                                       :
: ? Directory for disk a: user 1 is empty           :
:                                                    :
: <A1>PIP STAT.COM=STAT.COM[G0]<RET>                 :
: ?Not privileged                                   :
:                                                    :
: <A1>USER 0<RET>                                    :
: ?Not privileged                                   :
:                                                    :
: <A1>                                                :
+-----+
```

In the above example, you logged-in as USER ID [1], and asked for a directory, which was empty. As in the previous CP/M example, you attempted to "PIP" the STAT.COM file from USER [0] to your USER [1] area. Unlike the CP/M example, ULC-OPSnet found the PIP.COM file because it automatically searched shared .COM files in USER [0] area. It did not, however, complete the command because you were not "Privileged". The system would not permit you to change to USER [0] either, again because of "Privilege Level". This brings us to the next important aspect of system access controls, Password and Privilege Level.

NOTE: Ideas and concepts on setting up applications with different "classes of users" will be discussed in a later chapter.

2. Password

The Password is a unique set of four character literals assigned by the network manager at installation time to each USER ID at each station in the network. ULC-OPSnet is shipped with two Passwords in the ACCT.SYS file to facilitate installation. You have already used both of these passwords in Chapter 3; viz., 1111 for USER ID [0] and DEMO for USER ID [1]. The characters comprising the Password may be any ASCII characters except for a "\$" or terminators such as a line feed or carriage return. Upper or lower case is significant; thus "DeMo" is a different Password than "DEMO". Additionally, a user name is also assigned to the USER ID and Password. The user name is only to facilitate the Gatekeeper in associating a name with a node number and USER ID. It is for display purposes only, and has no

function in maintaining security. You will note that the Password must be entered absolutely as it is stored. If not, ULC-OPSnet will force the operator to initiate a new LOGIN sequence. Try this:

```

+-----+
: A>ULCOPS<RET>                                     :
: ULC-OPSnet v1.7x Workstation - Node 0             :
: Opsnet by Aquinas, Inc. Copyright (c) 1983       :
:                                                    :
: <A0>LOGIN 1<RET>                                   :
: Password: demo (note that only **** will display) :
: ?Invalid password - Please LOGIN again.          :
:                                                    :
: <A0>LOGIN 1<RET>                                   :
: Password: DEMOO (note that only ***** will display) :
: ?Invalid password - Please LOGIN again.          :
:                                                    :
: <A0>LOGIN 1<RET>                                   :
: Password: DEMO (note that only **** will display) :
: Logged-in on ULCOPS-net v.1.7x Workstation - Node 0 :
: Opsnet by Aquinas, Inc. Copyright (c) 1983       :
: [1] User: USER          1001                     :
:                                                    :
: <A1>                                               :
+-----+

```

Notice that as you typed in the characters for the password an asterisk (*) was displayed instead of the character you typed. This feature prohibits an unauthorized person from viewing the password as it is being entered.

In the above example, neither the incorrect Password nor the correct Password with too many characters were acceptable to the system. Later in this Chapter you will see how the REACT.COM program is used to set and change Passwords.

3. Privilege Levels

In addition to a Password, each USER ID at each station also has an associated Privilege Level which governs access to files and system resources. The four possible Privilege Level codes, together with a description of each, are set forth below:

CODE 1 - Local access - may LOGIN and access all local files (that is files resident on disk at the local station) only in the user area corresponding to the USER ID at LOGIN. Also, may execute local.COM and .OV? files located on the System disk (Disk A:) in USER ID [0] area. May execute SEND, SPOOL, QUEUE, and MAIL. May not change USER ID, and may not use files located on other stations in the network.

CODE 3 - Local access, with ability to change USER ID - may LOGIN and perform functions identical to a Privilege Level 1 operator. May also change USER ID by

executing the USER command. May not use files located on other stations in the network.

CODE 5 - Remote access - may LOGIN and perform functions identical to a Privilege Level 1 operator. May also use files located on other stations in the network. May not change USER ID.

CODE 7 - Remote access, fully privileged - May LOGIN and perform all functions identical to a Privilege Level 3 and Level 5 user combined. May change remote Private files to Sharable, and may Lock and Unlock files. May change USER ID. May execute the REACT command only if the operator was able to LOGIN with a USER ID [Ø]. An operator with a Privilege Level of "7", but with a LOGIN USER ID other than [Ø], may change to USER [Ø] area and manipulate files in USER [Ø] area, but may not run the REACT.COM program or access the ACCT.SYS file. Thus, if the network manager is the only operator in an installation with a Password permitting LOGIN as USER ID [Ø] at all stations in the network, a Privilege Level of "7" may be assigned to other operators in the network without fear of unauthorized access to Passwords or the ability to alter them.

THE REACT.COM PROGRAM - CHANGING PASSWORDS AND PRIVILEGE LEVELS

The REACT.COM program is a ULC-OPSnet utility program used to establish and change Passwords and Privilege Levels for each of the possible USER ID's at each station. REACT.COM may be run from any of the nodes in the network locally and may also be executed from the Gatekeeper (Node G) to act on Passwords and Privilege Levels at any other node in the network. We will practice using the REACT.COM program from the Gatekeeper. Do not attempt to make final assignments of Passwords, Privilege Levels, and USER ID's until you have completed the entire manual and have organized your approach to applications and operations structure. Try the following from the station in the network with the Gatekeeper software.

```
+-----+
: A>ULCOPSG<RET>                                     :
: ULC-OPSnet v1.7x Gatekeeper - Node Ø               :
: Opsnet by Aquinas, Inc. Copyright (c) 1983        :
:                                                     :
: <AØ>LOGIN Ø<RET>                                    :
: Password: 1111                                       :
: Logged-in on ULCOPS-net v1.7x Gatekeeper - Node Ø  :
: Opsnet by Aquinas, Inc. Copyright (c) 1983        :
: [Ø] User: MANAGER      7ØØØ                          :
:                                                     :
: <AØ>INET XEROX<RET>                                  :
: Gatekeeper running....                             :
: <AØ>REACT <RET>                                     :
+-----+
```


Name? - The current name is displayed and the cursor is positioned on the first position. Up to 9 characters may be changed. When the RETURN key is pressed, or when the 9th character has been entered, the field is stored as it appears on the screen. If an attempt is made to enter more than 9 characters, the next field "privileged" appears.

Privilege? - The current privilege level is displayed with the cursor on it. If the RETURN key is pressed, the original privilege level is stored. If an attempt is made to enter more than one character or an invalid character, "privileges?" appears and the operator is reprompted.

2. Delete entry

User ID? - Pressing RETURN causes a return to main menu. An invalid USER ID (either an entry other than 0-9 or a 0-9 where there is no information in the ACCT.SYS file) causes "?Invalid User ID" to appear and reprompts the operator. A valid entry causes hyphens to replace the data in all fields. After a valid entry, a new table is displayed with the appropriate USER ID information deleted (the deletion is not yet saved) and the menu reappears.

3. Change Stations

Station ID? - Pressing RETURN causes a return to main menu. A valid entry causes a table for the station selected to appear together with the menu. Changes to a remote workstation's ACCT.SYS file may now be made from the Gatekeeper as described above. Note: Previous changes must be saved before changing stations or all changes will be lost. See 4 and 5 below. An Invalid Station ID, or a Valid Station ID where the station accessed is properly "INET"ed, will cause the "Node x Busy or unavailable - Retry? (Y/N)" message and prompt to display.

4. Save Changes

If 4 is entered, all changes are permanently made and operator is returned to REACT menu. The previous ACCT.SYS file is saved as ACCT.BAK and the new information is saved in ACCT.SYS.

5. Exit - No Changes

If 5 is entered, no changes are made and operator is returned to system prompt.

The REACT program may also be run locally at any one of the Workstations, however, only information pertinent to that station may be changed. Technically, all information pertaining to the station operator controls is contained in a file called ACCT.SYS.

All ACCT.SYS files on the network may be accessed by the Gatekeeper. Only the ACCT.SYS file related to a given workstation may be accessed by that workstation. The following material describes how REACT functions when run from a non-Gatekeeper workstation.

1. Menu selections 1, 2, 4 and 5 have the same meaning and function in a like manner as if REACT were run from a Gatekeeper.
2. Selection 3 in menu still reads "Change station". If a 3 is entered from a local station menu, the error message "?May not use this function unless a Gatekeeper" appears, and the main menu reappears after the 5-10 second wait.

Figure 4-1 is a detailed table outlining the various functions and commands available to each class of operator, i.e., each combination of Privilege Level and USER ID. It will be useful for you to review this table before you install all of the ACCT .SYS files in your network. It will also be useful for you to read the remainder of the User's Guide for an understanding of all of the ULC-OPSnet commands and system functions before establishing operator Privilege Levels. If you permit Workstation operators to LOGIN as USER ID [0] with a Privilege Level 7, you may want to ERASE the REACT.COM file from the diskettes to prohibit unauthorized changing of Passwords and Privilege Levels.

FILE SECURITY

A standard CP/M file may be stored with two kinds of "file attributes"; viz., whether or not the file name is to be viewable with the DIRectory command and whether or not the file may be erased or altered in any manner. These file attributes are invoked with the use of the STAT.COM utility. Since the STAT.COM utility may be used by anyone, it is necessary to add additional file attributes in the network environment to guarantee a secure file system. ULC-OPSnet implements two additional file attributes to assist in creating a more secure networked file system. In addition, ULC-OPSnet also recognizes the standard CP/M file attributes of Read/Write or Read Only and Directory or System. The file control attributes available under ULC-OPSnet are as follows:

1. Read Only or Read/Write

A read only file may not be modified or updated by anyone on the system. It is analogous to having the write protect notch covered on an 5-1/4" diskette.

A read/write file may be modified or updated by anyone who is able to access the file. It is analogous to having the write protect notch uncovered on an 5-1/4" diskette.

2. Directory or System

A directory file is a file whose name will always appear when a directory of files on a drive is taken.

A system file is a file whose name will only appear on a directory when requested by a user with Privilege Level "7".

3. Locked or Unlocked

A locked file is automatically unavailable to other operators once it is opened and remains unavailable until unlocked. A locked file is automatically unlocked when it is closed.

An unlocked file is available simultaneously to all operators with appropriate USER ID's or privileges. Any operator on any station may update a sharable read/write file which is unlocked. The contents of the file at any given time will reflect the last "saved" version.

Note: Record lockout is automatic. When a record from an open file is accessed, it becomes unavailable to any other operator until operations on that record cease.

4. Private or Sharable

A private file may not be accessed from a remote station. A user with Privilege Level "7" may, however, make a remote private file sharable.

A sharable file is available to all operators with appropriate USER ID's.

In order to place the file attribute controls on a specific file, the PROTECT command is used. PROTECT is an internal ULC-OPSnet command that performs functions similar to those performed by the STAT.COM utility. The general format of this command is:

```
+-----+  
: <A0>PROTECT <device>:<filename> <attribute><RET> :  
+-----+
```

The attribute refers to the four pairs of controls discussed above. Only one element of each pair may be entered at one time:

<u>CONTROL DESIRED</u>	<u>TYPE FOR THE ATTRIBUTE</u>
1. Read Only or Read/Write	RO or RW
2. Directory or System	DIR or SYS
3. Locked or Unlocked	LOCK or UNLOCK
4. Private or Sharable	PRIV or SHAR

For example, if you wish to put controls on a file called MYFILE.DOC on disk B:, such that it is:

Read Only, System, Locked, and Private,

then perform the following operations:

```
+-----+
: <AØ>PROTECT B:MYFILE.DOC RO<RET>           :
: File(s) protect to Read/Only for disk B: user Ø:   :
: MYFILE .DOC                                     :
:                                                 :
: <AØ>PROTECT B:MYFILE.DOC SYS<RET>           :
: File(s) protect to System for disk B: user Ø:   :
: MYFILE .DOC                                     :
:                                                 :
: <AØ>PROTECT B:MYFILE.DOC LOCK<RET>          :
: File(s) protect to Locked for disk B: user Ø:   :
: MYFILE .DOC                                     :
:                                                 :
: <AØ>PROTECT B:MYFILE.DOC PRI<RET>          :
: File(s) protect to Private for disk B: user Ø:   :
: MYFILE .DOC                                     :
: <AØ>                                           :
+-----+
```

OTHER RECOMMENDED SECURITY MEASURES

The ACCT.SYS and REACT.COM files are shipped as: directory, read/write, shared, and unlocked. This is necessary to permit PIP.COM to copy these files from the master release diskette to the operational diskette or hard disk. PIP.COM will not copy files that are stored as system files. After copying the master release diskette, put it away. When using REACT.COM to change the ACCT.SYS file, REACT.COM will automatically store ACCT.SYS as: system, locked, private, and read/write and create an ACCT.BAK file. Erase the ACCT.BAK file when changes are complete. For further protection, erase the REACT.COM file on all Workstation diskettes.

It is recommended that no person other than those responsible for managing the network processing activities have access to Logging-in as USER [Ø] with a privilege level of "7". With this precaution, no unauthorized personnel may run the REACT.COM program at the Gatekeeper or workstations. It is also recommended that a Privilege Level of "7" or "3" be assigned cautiously. These Privilege Levels permit changing USER ID, and thus allow the operator to erase or alter files in other USER areas.

After the network is installed and operating satisfactorily, take appropriate measures to insure that the original diskettes (both Gatekeeper and Workstation versions) supplied in the User Guides are not available to unauthorized persons.

PRE-DETERMINED, AUTOMATIC INITIALIZATION

One of the features of ULC-OPSnet is a provision for automatic execution of programs at LOGIN time. This feature may also be used as a security measure. When the LOGIN command has been

executed and the Password supplied, ULC-OPSnet automatically searches the A: disk in the Logged-in USER area for a file named INITIA.INI. If no INITIA.INI file (on the A: disk) is found, the system returns the normal "<A0>" prompt. If an INITIA.INI file is found, the entries in this file are executed as commands. It is up to the user to supply a sequence of commands he wishes to be executed at LOGIN time. For example, suppose the network manager wanted Workstation (Node) #1 to automatically check the mail box, come to the "NET READY" status, and execute WordStar*(c) (WS.COM) each time USER [3] logs in. Further, since USER [3] is new and just learning word processing, the network manager wants the operator only to have access to WordStar, and LOGOUT when finished. All of this can be accomplished by the creation of an INITIA.INI file for this user as follows (the example assumes the use of WordStar to create the INITIA.INI file, though any screen editor will suffice):

```
+-----+
: <A0>USER 3<RET>                                     :
: <A3>WS                                               :
+-----+
```

1. Use the "N", or non-document option in WordStar by typing an N when the "NO FILE MENU" appears.
2. Once into WordStar, supply the following commands:

```
+-----+
: MAIL<RET>                                           :
: INET KAYPRO 1 <RET>                                  :
: WS<RET>                                             :
: LOGOUT<RET>                                         :
: ^KX                                                :
:                                                     :
: <A3>USER 0<RET>                                     :
: <A0>                                               :
+-----+
```

Now, each time USER [3] executes a LOGIN on Station #1, the commands contained in the INITIA.INI file will be executed just after the RETURN key is pressed following the password. In the above example, the workstation will be identified as a KAYPRO, Station #1. If there is any mail, it will be displayed. If not, the message:

Mail box is empty

will appear (see Chapter 6). The network will be initialized (see Chapter 5) and the prompt:

NET READY
(network initialization message)

will appear. WordStar will then load. When the operator leaves WordStar, he will automatically be Logged-out of ULC-OPSnet.

* WordStar is a registered trademark of MicroPro International Corporation.

If there are plans for multiple operators to use each workstation at different times, each with his own Password, USER ID, and Privilege Level, a different INITIA.INI file can be created for each operator simply by invoking the "USER" command prior to creating and storing the INITIA.INI file.

AUTOMATIC LOAD OF ULC-OPSnet

Another consideration in implementing security measures is to limit access to the standard CP/M operating system. Since there is no built-in password facility or other file security measure in CP/M, anyone with access to a system need only "boot" the system and use the CP/M "USER" command to be able to view and "PIP" any of the files locally. While the password facility in ULC-OPSnet prohibits unauthorized access to files over the network, the only method of limiting unauthorized access to files resident on a local workstation is to force the users of the workstation to use the ULC-OPSnet system and go through the LOGIN and Password routine. Once ULCOPS is loaded, a proper LOGIN and Password verification must occur before the user has access to any system facilities. The next section deals with automatically loading ULC-OPSnet on the variety of microprocessor for which you may have purchased this system.

HOW TO AUTO-LOAD ULC-OPSnet ON THE KAYPRO Model 10

The CP/M system supplied with the KAYPRO Model 10 has two utilities called "PUTSYS.COM" and "GENFLPY.COM". These utilities are used to record the CP/M operating system on the system tracks of the hard disk and floppy diskettes respectively. Your ULC-OPSnet release diskettes contain a copy of the "PUTSYS.COM" utility called either "PUTWULC.COM" or "PUTGULC.COM". These utility programs are versions of the KAYPRO "PUTSYS.COM" utility with one addition: each utility on your ULC-OPSnet release diskette records a command line that is executed immediately after the CP/M operating system is loaded. The other specialized version of a KAYPRO utility on your ULC-OPSnet release diskette is called either "GENWFPL0.COM" or "GENGFPL0.COM", each of which is the version of "GENFLPY.COM" that records a command line on the system tracks of diskettes to be used as "bootable" diskettes on the Model 10. If your ULC-OPSnet release diskette is a Gatekeeper software diskette, the command line executed (either from the bootable floppy or from the hard disk on a cold boot) is "ULCOPSG"; if your diskette is a Workstation software diskette, the command line executed is "ULCOPS".

PROCEDURE FOR KAYPRO Model 10 HARD DISK

Use the following instructions to force ULC-OPSnet to load after every cold boot. Once you have established a CP/M system track configured to auto-load ULC-OPSnet, a proper LOGIN sequence will be required every time the system is turned on or the "RESET" button is pushed. Thus, no-one will be able to operate the system without access to a valid Password.

1. Turn on the computer or press the RESET button if the computer is already on. (The locations of the ON/OFF switch and RESET button are shown in your KAYPRO manual). The screen will display the following:

```

+-----+
:KAYPRO 10 CP/M Version 2.2x      :
:                                  :
:A0>                               :
+-----+

```

2. Make certain that you have performed all of the steps in the ULC-OPSnet installation process as documented in Chapter 3. In addition to the standard ULC-OPSnet files on the A: partition of the hard disk, you should also have "PUTG-ULC.COM" and "GENGF10.COM" (if the station is to be a Gatekeeper) or "PUTWULC.COM" and "GENWF10.COM" (if the station is to be a Workstation).
3. Perform the following (if a Gatekeeper):

```

+-----+
:A0>PUTGULC<RET>                 :
:                                  :
:PUTSYS VER 1.x                  :
:                                  :
:A0>                               :
+-----+

```

-or-

3. Perform the following (if a Workstation):

```

+-----+
:A0>PUTWULC<RET>                 :
:                                  :
:PUTSYS VER 1.x                  :
:                                  :
:A0>                               :
+-----+

```

4. Push the RESET button. The following should now appear:

```

+-----+
:KAYPRO 10 CP/M Version 2.2x      :
:                                  :
:ULC-OPSnet v1.70x (Workstn. or Gatekpr.), Node 0 :
:OPSnet by Aquinas Inc., Copyright (c) 1983      :
:                                  :
:<A0>                                           :
+-----+

```

5. You will now find that ULC-OPSnet is loaded every time the KAYPRO 10 is "RESET". This will require a proper LOGIN and Password to be used before access is gained to the system. Now go ahead and perform a normal LOGIN as USER [0].

6. To make certain that "PUTSYS.COM", "NOMENU.COM", and "GENFLPY.COM" are not misused, backup each of these files on your ULC-OPSnet release diskette and erase them from the hard disk. "PUTSYS.COM" and "NOMENU.COM" both record the CP/M operating system on the system tracks of the hard disk, but without the command line that would otherwise force the loading of ULC-OPSnet and the LOGIN procedure. "GENFLPY.-COM" permits booting the KAYPRO 10 from the floppy disk drive in standard CP/M, and thus the viewing of files on the hard disk. If an unauthorized operator had access to these programs, he would be able to read and alter files on the hard disk. The procedure is as follows:

- a. Place the ULC-OPSnet release diskette in the floppy disk drive.
- b. Perform the following operations.

```

+-----+
: <A0> GENFLPY <RET>           {This procedure      } :
:                               {"SYSGEN"s a copy    } :
: SOURCE....SKIP? <RET>       {of standard CP/M  } :
: FUNCTION COMPLETE....      {on the diskette   } :
: DESTINATION....SKIP?C      {in case you need to} :
: FUNCTION COMPLETE....      {boot w/o ULC-OPSnet} :
: DESTINATION....SKIP? <RET> :
:                               :
: <A0> PIP C:=A:PUTSYS.COM[VO] <RET> :
:                               :
: <A0> ERA A:PUTSYS.COM <RET> :
:                               :
: <A0> PIP C:=A:NOMENU.COM[VO] <RET> :
:                               :
: <A0> ERA A:NOMENU.COM <RET> :
:                               :
: <A0> PIP C:=A:GENFLPY.COM[VO] <RET> :
:                               :
: <A0> ERA A:GENFLPY.COM[VO] <RET> :
:                               :
: <A0> :
:                               :
+-----+

```

- c. Now put the ULC-OPSnet release diskette in a safe or other suitable storage place.

PROCEDURE FOR KAYPRO Model 10 BOOTABLE FLOPPY DISKETTES

As a further precaution against unauthorized access to files, all floppy diskettes you intend to be bootable on a KAYPRO 10 should be "SYSGEN"ed with either "GENWF10.COM" or "GEN-GFP10.COM", and should have (at a minimum) a copy of either "ULCOPS.COM" or "ULCOPSG.COM" on the diskette in USER [0]. If this procedure is followed, then all floppy diskettes booted on a KAYPRO 10, whether for transporting data or backup, will load ULC-OPSnet when booted, and will not permit access to the data files on the hard disk without satisfying the standard LOGIN sequence. Perform the following on each floppy you intend to be

bootable on a KAYPRO 10 (the example assumes a Gatekeeper; substitute "GENWFP10" and "ULCOPS.COM" for a Workstation):

- a. Place a formatted diskette in the floppy disk drive.
- b. Perform the following operations individually on each diskette:

```

+-----+
: <A0>GENGFPI0<RET>           {This procedure      } :
:                               {"SYSGEN"s a copy of} :
: SOURCE....SKIP?<RET>        {CP/M with the ULC- } :
: FUNCTION COMPLETE....      {OPSG command line  } :
: DESTINATION....SKIP?C      {causing ULCOPSG.COM} :
: FUNCTION COMPLETE....      {to load on each boot} :
: DESTINATION....SKIP?<RET>   :
+-----+

```

```

+-----+
:                               :
: <A0>PIP C:=A:ULCOPSG.COM[VO]<RET> :
:                               :
: <A0>                           :
+-----+

```

- c. You need not have any file on the diskette other than "ULCOPSG.COM" (or, "ULCOPS.COM", if you used "GENWFP10.COM" in the previous example) in order to preserve the integrity of the security system.

HOW TO AUTO-LOAD ULC-OPSnet ON THE KAYPRO Models 2 and 4

The procedure for causing the "ULCOPS" or "ULCOPSG" command line to be recorded on the system tracks of a diskette to be bootable in a KAYPRO Model 2, 4, or 4E is to use the COPY.COM utility supplied by KAYPRO. Remember that the COPY.COM utility was renamed to FORMAT.COM as part of the installation procedure. This was necessary as ULC-OPSnet recognizes COPY as an imbedded command in the system. When executing the FORMAT (KAYPRO COPY.COM) program, after a diskette has been formatted and copied, you will be prompted by the system as to whether or not you wish to record a command line upon cold boot. The command line to cause to be copied is ULCOPSG if this is to be a Gatekeeper diskette or ULCOPS if it is to be a Workstation diskette. **REMEMBER: If you do not wish the floppy diskette to be utilized by other than an authorized user, either the ULCOPSG.COM or the ULCOPS.COM program must be on the diskette in addition to recording the appropriate command line on cold boot.**

CHAPTER 5

ASSIGNMENT OF DEVICES

One of the outstanding features of networking microcomputers under ULC-OPSnet is the ability to assign physically remote devices (such as disk drives) to a local workstation. For example, Workstation #1 may have two floppy disk drives (A: and B:) attached to it physically. Logically Workstation #1 could have 16 disk drives (A: through P: with M:, O:, and P: reserved). Therefore, Workstation #1 may assign as its C: disk drive, for example, the A: disk drive of Workstation #2. After the assignment, Workstation #1 may perform operations on its C: disk (the A: disk of Workstation 2) as if it were physically attached to Workstation #1.

Although files may be physically transferred over the network from workstation to workstation with ease, in most cases such a transfer is not necessary. A local workstation may execute programs located on a remote workstation over the network without physically transferring the remote files to the local workstation.

THE "WHERE" COMMAND (OBTAINING A TABLE OF DEVICE ASSIGNMENTS)

To obtain a table of device assignments in effect for your local workstation, simply type at the system prompt:

```
+-----+
: <AØ>WHERE<RET>                                     :
: Log:      Phy:      Location                         :
: A:        A:        Local                           :
: B:        B:        Local                           :
: LST:      LPT:      Local                           :
: PUN:      TTY:      Local                           :
: RDR:      TTY:      Local                           :
: CON:      CRT:      Local                           :
:                                                    :
: <AØ>                                                :
+-----+
```

This is the default device assignment table immediately after LOGIN. The table shows that all devices are local and:

- . The logical drives A: and B: are the physical drives A: and B:.
- . The list device (LST) is a printer (LPT:).
- . The punch device (PUN) is a teletype (TTY:).
- . The reader device (RDR) is a teletype (TTY:).
- . The console device (CON) is a terminal (CRT:).

Another form of the WHERE command is:

```
WHERE <Dev>:<RET>
```

which will display the location of a specific device on the network.

The WHERE command may be invoked at any time after a system prompt.

THE "ASSIGN" COMMAND (CHANGING THE TABLE OF LOGICAL DRIVE ASSIGNMENTS)

To make changes in the table of logical disk device assignments, the ASSIGN command is used. The general format is:

```
+-----+
:  ASSIGN <logical disk>:=<physical disk>:<station ID><RET>  :
+-----+
```

For example, you are at Workstation #1 and you wish to operate on files which are resident on the A: drive of Workstation #2 and the B: drive of Workstation #3. At the system prompt, type:

```
+-----+
:  <A0>ASSIGN C:=A:2<RET>      :
:  Device C: assigned          :
:                               :
:  <A0>ASSIGN D:=B:3<RET>      :
:  Device D: assigned          :
:                               :
:  <A0>WHERE<RET>              :
:  Log:   Phy:   Location      :
:  A:     A:     Local         :
:  B:     B:     Local         :
:  C:     A:     Node 2        :
:  D:     B:     Node 3        :
:  LST:   LPT:   Local         :
:  PUN:   TTY:   Local         :
:  RDR:   TTY:   Local         :
:  CON:   CRT:   Local         :
:                               :
:  <A0>                          :
+-----+
```

Now the logical disk C: at Workstation #1 is the physical disk A: at Workstation #2 and the logical disk D: at Workstation #1 is the physical disk B: at Workstation #3. You now have four separate disk drives containing their respective files available to you for processing.

It is also possible to assign the local logical disks A: and B as other physical drives on the network. Caution; even though the currently logged disk may be B: (or some other disk) the system disk always resides in drive A:. Therefore, if the logical disk A: must be assigned elsewhere, it should only be assigned as the physical disk A: at some other workstation.

A disk drive may also be "deassigned" using the ASSIGN command. If any local logical disk C: through P: had been previously assigned as a physical disk on some other workstation it may be deassigned by typing:

```

+-----+
: <A0>ASSIGN C:<RET>      :
: Device assigned        :
:                        :
: <A0>                   :
+-----+

```

The net effect of deassigning any disk C: through P: is that there will now be no entry for that disk in the table of assignments.

If local logical disk A: or B: had been previously assigned as the physical disk at some other workstation, it may be deassigned by typing:

```

+-----+
: <A0>ASSIGN B:<RET>      :
: Device B: assigned     :
:                        :
: <A0>WHERE<RET>        :
: Log:      Phy:      Location :
: A:        A:        Local    :
: D:        B:        Node 3   :
: LST:     LPT:      Local    :
: PUN:     TTY:      Local    :
: RDR:     TTY:      Local    :
: CON:     CRT:      Local    :
:                        :
: <A0>                   :
+-----+

```

The net effect of deassigning any disk A or B is that the entry for the deassigned disk will be deleted.

Note: The A: (System Disk) should never be deassigned.

THE "SPOOL" COMMAND (ASSIGNING A PRINTER TO A WORKSTATION)

Just as the ASSIGN command is used to make assignments of disk drives, the SPOOL command is used to assign a printer to a particular workstation. The general format of the command is:

```

+-----+
: <A0>SPOOL <station ID><RET> :
+-----+

```

If you wish to use a printer at Workstation #4, type:

```
+-----+
: <AØ>SPOOL 4<RET>      :
: Spooler is remote - Node 4.      :
:                                  :
: <AØ>WHERE<RET>       :
:                                  :
: Log:   Phy:   Location      :
: A:     A:     Local         :
: B:     B:     Local         :
: LST:   LPT:   Node 4 spooler :
: PUN:   TTY:   Local         :
: RDR:   TTY:   Local         :
: CON:   CRT:   Local         :
:                                  :
: <AØ>                  :
+-----+
```

The table now shows that all printing operations from your local workstation will be performed on the printer located at Station 4.

If you don't know where your spooler is currently assigned, type:

```
+-----+
: <AØ>SPOOL<RET>      :
: Spooler is remote - Node 4 :
:                                  :
: <AØ>                :
+-----+
```

If a printer is attached to your local workstation and you wish to use it and the table shows the LST device at another location, type:

```
+-----+
: <AØ>SPOOL Ø<RET>   :
: Spooler is local   :
:                                  :
: <AØ>                :
+-----+
```

Now the printer is assigned locally.

GETTING INFORMATION ABOUT FILES ON THE NETWORK

Many times you will not know which diskettes are resident on which drives at which workstations. To determine which files are resident on your local drive B:, type:

```
+-----+
: <AØ>DIR B:<RET>    :
+-----+
```

A directory of disk B: will be displayed. To obtain a directory of the currently logged (default disk), type:

```
+-----+
: <A0>DIR<RET>      :
+-----+
```

A directory of disk A: (the logged disk) will now be displayed. The DIR command under ULC-OPSnet functions similarly to the DIR command under CP/M except as noted in the Technical Manual. One such difference is the use of the "/W" switch. Using the /W switch in a DIR command under ULC-OPSnet provides detailed information about each filename such as:

- . Ext (file type extension)
- . Acc (access status)
- . Recs (number of records in file)
- . Size (file size in K-bytes)
- . Access Notes (is file PRIVATE, LOCKED, etc.)
- . Total number of files and amount of storage used in the device's user area.

A summary of total size and number of files is also displayed when using the /W switch. For example, to take a directory of disk A using the /W switch, type:

```
+-----+
: <A0>DIR A:/W<RET>  :
+-----+
```

The directory of disk A will now be displayed under the following columnar headings:

```
+-----+
:           Directory for disk A:  User 0           :
:           :                                       :
: Filename Ext Acc Recs Size Access Notes :
+-----+
```

The files will be displayed one file per line. The scrolling of the screen may be stopped at any time by depressing the "CTRL" and "S" keys (CTRL-S) simultaneously. The display may be restarted by a CTRL-S. The display may be aborted by depressing CTRL-C.

In a similar fashion directories may be taken from remote disks by first assigning that remote disk to your local workstation and then taking a directory. For example, you are at Workstation #1 and wish to take a directory of the files which are resident on drive B: of Workstation #5:

```
+-----+
: <A0>ASSIGN C:=B:5<RET> :
: Device C: assigned     :
: <A0>DIR C:/W<RET>     :
+-----+
```

A directory of the B disk at Workstation #5 will now appear on the screen of Workstation #1 in the detailed format.

The DIR command may also be used with an individual file name:

```
+-----+
: <A0>DIR A:MYFILE.DOC/W <RET>      :
+-----+
```

The information relating to the file called MYFILE.DOC on disk A will be displayed in the detailed format.

The DIR command may also be used to print the contents of the directory on a locally attached printer. This printing is done by using the /P switch as follows:

```
+-----+
: <A0>DIR/P<RET>                      :
+-----+
```

Selected directory entries may also be printed using the /P switch such as:

```
+-----+
: <A0>DIR *.COM/P<RET>                 :
+-----+
```

This entry will cause all .COM file names in the directory of the default disk to be printed.

The /W and /P switches may also be used together, for example:

```
+-----+
: <A0>DIR/WP<RET>                      :
+-----+
```

will cause the detailed directory information on the default disk to be printed on the locally attached printer.

You may also use the **FIND.COM** program to locate which logical disks already assigned contain certain files. For example, if you wish to find out which drives contain WS*.* files:

```
+-----+
: <A0>FIND WS*.*<RET>                  :
+-----+
```

THE "LOCATE" COMMAND

The search for files on the network could be quite time consuming if every disk drive is assigned locally one at a time and directories then taken. The LOCATE command is available to

speed up the file search by assigning your workstation the local disk drive assignments of a remote workstation. For example, you are at Workstation #1 and wish to have the disk device assignments of Workstation #5 at your workstation. The entry:

```
+-----+
: <A0>LOCATE 5<RET>      :
: Node 5 located         :
:                         :
: <A0>                   :
+-----+
```

provides that the local disk device assignments specified for Workstation #5 are now the assignments for Workstation #1 and directories may be taken as desired. The primary use of this command is to locate files on remote disks rapidly. If n users locate to remote stations, network traffic is increased in proportion to n. Therefore, due to station, network and disk contentions generated, this command should be used sparingly and a station once having found the desired files should locate back locally. To locate locally, type:

```
+-----+
: <A0>LOCATE<RET>       :
: Located local         :
:                         :
: <A0>                   :
+-----+
```

When the LOCATE command is used, only the disk drives A: and B: are displayed in the table. If you have located to a workstation which is equipped with a hard disk, there may be files on C:. This additional drive will not be displayed in the table of a workstation which has just located to the hard disk workstation. To determine if any files are present on the hard disk Workstation #5's physical drive C:, for example, the operator at the locating workstation enters:

```
+-----+
: <A0>ASSIGN C:=C:5<RET> :
: Device assigned       :
:                         :
: <A0>DIR C:5<RET>     :
+-----+
```

The directory of logical drive C:, the physical C: drive at node 5, will now be displayed at the locating workstation.

GETTING RAM INFORMATION AND PERFORMING A RESET

As indicated previously the default disk may be changed from A: to any other valid disk device, providing the device has already been assigned, as follows:

```
+-----+
: <A0>H:<RET>      :
: <H0>             :
+-----+
```

Now the default (logged) disk will be disk H:.

Other information commands are available:

CORE Tests all RAM memory and displays how much RAM is available for the TPA.

INITIALIZE Performs a BDOS disk reset function (similar to CP/M "warm boot") and displays the version of ULC-OPSnet in use together with the station ID.

Note: This command (the short version is "I" <RET>) should be given each time a diskette is changed.

CHAPTER 6

OTHER ULC-OPSnet OPERATIONS

PRINTING A FILE

Whenever a file is to be printed using the queue command and the spooler, the name of the file along with its physical device location is placed in the "spooler queue" which resides in background partition memory at the node previously designated as the spool node. There are four such queues so that the names of four separate files may reside at the spooler at one time. The spooler outputs each file on a first-in first-out basis to the printer. If the queues are full, the sending station operator will be so informed by a screen message:

? The Queues are full.

The sending operator may elect to use the spool command to set the spooler to some other workstation having a printer attached and reenter the QUEUE, or simply wait and attempt to print later.

The command which initiates queued printing is:

QUEUE <device>:<filename>/<switches><RET>

where <device> is the logical disk on which the file resides, <filename> refers to the name of the file to be printed and the switches are:

- A - Aborts file currently being printed.
- C# - Make # copies (# may be any number from 1 to 9).
- E - Eject and send a form feed to the printing device.
- F - Special Forms:
 - Executes QOFF at the spooler station.
 - Sending operator must send a message to spooler console with Special Forms instructions.

Assume a file called MYFILE.DOC resides on the B: disk of your Workstation #1. The spooler has been set remote to Workstation #4 and the currently assigned list device (LST) at Workstation #4 is LPT:. The command:

QUEUE B:MYFILE.DOC

will cause the file MYFILE.DOC to be printed on the printer at Workstation #4.

The currently assigned LST: device may be changed from LPT: to CRT:, UL1: or TTY: by:

```
+-----+
:  <A0>STAT LST:=CRT:<RET>      :
+-----+
```

```

+-----+
: <A0>QUEUE CRT:<RET>      :
+-----+

```

PRINTING FILES WITH SPECIAL WORD PROCESSING PRINTER DRIVERS

Word processing applications like WordStar have provisions in their installation programs to generate "special" printer drivers. These special drivers generate the codes necessary to activate features like overstrike, bold print, underline, micro-justification, etc. Unfortunately, these special drivers usually can be accessed only by printing to a local printer through an application program with one of the drivers, and generally cannot be built into the CP/M LST: device portion of the BIOS. Since the complex program necessary to perform the ULC-OPSnet Queuing function is a separate system function, and cannot be built into WordStar or other specialized printing applications, a new procedure must be used to activate special word processing printing functions remotely. The following example assumes that the customer is using WordStar, but the procedure is similar for spooled printing from any other application program that provides specialized printing drivers.

NOTE: The print driver in WordStar and other applications must be configured for "any teletype-like printer," or "backspacing teletype-like printer," must address the printer as the CP/M LST: device, and must leave any communications protocol to the BIOS. The SPOOLER will not properly print a file with imbedded print drivers and protocols.

1. Choose a temporary disk file name to which the document file will be printed.
2. "ASSIGN" the LST: device to that file name; e.g.

```

+-----+
: <A0>ASSign LST:=B:TEMP.PRN<RET>      :
: LST: Spooled to B:TEMP.PRN          :
+-----+

```

3. Bring up WordStar; e.g., type:

```

+-----+
: <A0>WS<RET>                          :
+-----+

```

Note: The standard WordStar "NO-FILE MENU" will appear.

4. Type:

```

+-----+
: P                                     :
:                                     :
: NAME OF FILE TO PRINT?              :
+-----+

```

5. Type:

```
+-----+
: <dev>:<filename><RET>           :
+-----+
```

Note: WordStar will now ask you for some information; e.g.

```
+-----+
: For default press RETURN for each question:      :
: DISK FILE OUTPUT (Y/N):                          :
+-----+
```

6. Ignore this list of questions and simply depress the <ESC> key.

7. WordStar will tell you that it is printing <dev>:<filename> when, in reality, it is creating a disk output file of the document with all of the special printer control codes in a file called "TEMP.PRN".

8. When WordStar has completed creating the required output files, they must now be closed. Since WordStar "thought" that the documents were actually being printed it does not know that a disk file must be closed. Closing the special document disk file is accomplished with the **FINISH** command.

9. After exiting WordStar, type:

```
+-----+
: <A0>FINISH<RET>                   :
: LST: file closed as B:TEMP.PRN    :
: <A0>                               :
+-----+
```

10. Now you are ready to Queue the printed file to whatever node you have previously defined as the node for your spooled output.

11. Type:

```
+-----+
: <A0>Queue B:TEMP.PRN<RET>        :
: <A0>                               :
+-----+
```

The spooler will now take over and Queue the print file to the printer at the node specified. The operator may continue with other processing.

12. Two small Submit files, PRINTON.SUB and PRINTOFF.SUB, are supplied if you wish to print without leaving WordStar. These are accessed in WordStar by use of the R command as follows:

- a. Omit steps 1 and 2 and after step 3, above, execute the R function in WordStar and type:

```
+-----+
:  Command? PSUB PRINTON      :
+-----+
```

- b. Next perform steps 4, 5, and 6 above.

- c. WordStar will now have prepared a disk file named WS.PRN on the logged in disk.

- d. Next, execute the R function and type:

```
+-----+
:  Command? PSUB PRINTOFF     :
+-----+
```

- e. Next, execute the R function and type:

```
+-----+
:  Command? QUEUE WS.PRN      :
+-----+
```

INTERSTATION MESSAGES

In Chapter 3 you were introduced to the concept of sending messages over the ULCnet. The general format of the command is:

```
+-----+
:  SEND <station ID> <message>  :
+-----+
```

where station ID may be any currently logged in node ID (or the word "ALL") and the message may be any combination of up to 120 ASCII characters. If an attempt is made to enter more than 120 characters, the first 120 character message is sent upon the 121st keystroke. The message will be displayed at the receiving station's screen. Note that the receiving station does not return to a system prompt after the message since the operator may have been in the middle of processing when interrupted by the message. After the message display, the operator will be free to continue. If a system prompt is desired at the receiving station, the operator simply enters a <RET>.

Under ULC-OPSnet, all stations physically connected to the ULCnet with INET initialized will poll their network ports continuously while the CPU is available. The receiving port detects incoming message, displays it on the screen and sends an acknowledgement back to the transmit station. If acknowledgement is not received within one second or less, depending on CPU clock frequency, a busy or unavailable message is displayed.

If a station operator is executing an application and does not wish to be interrupted by incoming messages on the screen, a:

```
+-----+
: <AØ>TTY GAG<RET>      :
: <AØ>                   :
+-----+
```

command may be issued. While this command is in effect, no messages will be received unless the station is in the monitor mode, i.e., at <AØ>. A "busy or unavailable" message will appear on the sender's screen if the message is not received. To remove the GAG command, enter:

```
+-----+
: <AØ>TTY NO GAG<RET>   :
: <AØ>                   :
+-----+
```

ELECTRONIC MAIL

ULC-OPSnet supports transferring files with electronic mail. The general command format is:

MAIL <NodeID><USER [ID]> <device>:<filename>

For example, to mail a file to workstation #2 from another location the mailing operator would enter:

```
+-----+
: <AØ>MAIL 21 B:MYFILE.DOC<RET> :
+-----+
```

This would cause the file MYFILE.DOC on the mailers' assigned B: disk to be transferred to the USER [1] mailbox at station 2. In the USER [1] mailbox at station 2, the file would be named MAILØ.MAL. If a second file were mailed into the same mailbox it would be named MAIL1.MAL. Up to nine files may be in any one mailbox at the same time. A valuable feature of ULC-OPSnet Electronic Mail is that .COM files may be mailed. At the receiving station, if the operator renames the file it may then be executed. For example, PIP.COM could be mailed from station #1, USER [Ø] to station #2, USER [1] by:

```
+-----+
: <AØ>MAIL 21 PIP.COM<RET>      :
+-----+
```

Then, at station 2:

```
+-----+
: <A1>REN PIP.COM=MAILØ.MAL<RET> :
+-----+
```

The contents of the mailbox can be checked by the command:

```
+-----+
: <AØ>MAIL<RET>             :
+-----+
```

If there is mail, the file names will be displayed. If no mail, then the message:

```
+-----+
: Mailbox is empty      :
+-----+
```

will be displayed.

The receiving station's disk A: is automatically assigned as the transmitting station's logical disk M. Then, automatically via the PIP.COM program, the contents of the file name specified are sent over the net and appended to the receiving station's MAIL.MAL file. The contents of the specified file name are retained at the transmitting station.

FILE TRANSFERS OVER THE NETWORK

To transfer a file from one workstation to another, the command **COPY** is employed. For example, the following sequence at Workstation #1:

```
+-----+
: <A0>ASSIGN C:=B:2<RET>      :
: Device assigned            :
: <A0>COPY A:=C:MYFILE[V]<RET> :
:                             :
: <A0>                       :
+-----+
```

would result in a file called MYFILE residing on disk B: at Workstation #2 being copied onto the A: disk at Workstation #1.

Note - The CP/M command "PIP" may be used in place of COPY.

CHANGING USER [ID]

Depending upon the Privilege Level assigned, certain USER [ID]'s are permitted to change to other USER [ID]'s. For example, assume an operator is currently logged in as USER [3] (name = SUSAN) and wishes to change to USER [1] (disk A is the currently logged disk). At the prompt, type:

```
+-----+
: <A3>USER<RET>              :
: [3] User: SUSAN 7003       :
: <A3>          ^^^+--3=Original Login USER [ID] :
:                :+---0=Reserved                :
:                :+---0=Extended Privilege       :
:                :+---7=Privilege Level          :
+-----+
```

Typing USER without a USER [ID] displays the current status, i.e., USER [3], name SUSAN, Privilege Level "7". Note that Privilege Level "7" permits changing USER ID's. Now type:

```

+-----+
: <A3>USER 1<RET>      :
: [1] User: SUSAN 7003 :
: <A1>                 :
+-----+

```

USER [3] is now logged in as USER [1] and may access all USER [1] files, however, user name and privileges do not change.

If an attempt is made by a user who is not privileged to change USER [ID]'s, an error message is generated. For example, assume an operator is currently logged in as USER [1] (name = FRANK) and wishes to change to USER [4]:

```

+-----+
: <A1>USER 4<RET>      :
: ? Not privileged    :
: <A1>                 :
+-----+

```

To check the user status of USER [1], type:

```

+-----+
: <A1>USER<RET>        :
: [1] User: FRANK 1001 :
: <A1>                 :
+-----+

```

This will verify that USER [1] has a Privilege Level "1" and therefore may not change USER [ID]'s.

ASSISTANCE FROM ULC-OPSnet

Assistance in use of ULC-OPSnet commands is available through the "OHELP" command. For example, if you are experiencing error messages when attempting to use the ASSIGN command, type:

```

+-----+
: <A0>OHELP ASSIGN<RET> :
+-----+

```

Information concerning the ASSIGN command will be displayed. The "OHELP" command may also be abbreviated to simply H. For example, if the command:

```

+-----+
: <A0>H *<RET>         :
+-----+

```

is entered, then a list of subjects to which help is available is displayed. The command:

```

+-----+
: <A0>H<RET>           :
+-----+

```

will display information on how to use the HELP command itself.

BRINGING UP THE NETWORK

In Chapter 3 under the heading "INSTALLATION" you were introduced to the method for bringing up the network. The following sequence should be observed each time the network is made ready for use.

<u>STEP</u>	<u>COMMANDS</u>
1. Make sure all disk drives are empty.	
2. Turn on all microcomputers.	
3. Turn on all Connector Adapters (NET READY lights should be on).	
4. Place a systems disk (contains CP/M and ULC-OPSnet files) in drive A of each microcomputer.	
5. Boot CP/M.	Varies with computer type.
6. Load ULC-OPSnet*.	A>ULCOPS<RET>
7. Log each station onto ULC-OPSnet.	<A0>LOGIN <User ID><RET>
8. Supply password.	Password: ****<RET>
9. Identify each station.	<A0>INET KAYPRO <station ID><RET>
10. Network is ready for use.	

* Note: If a Gatekeeper station--use *ULCOPSG" instead of *ULCOPS". Gatekeeper station must be brought up first. Workstations cannot initialize their network protocols without first receiving authorization from the Gatekeeper. INITIALIZATION is the only instance where the Gatekeeper must be operational. Once all Nodes are "NET READY", operation may continue without the Gatekeeper being on-line.

LEAVING THE SYSTEM

To log off ULC-OPSnet, enter:

```
+-----+
: <A0>LOGOUT<RET> :
+-----+
```

Note that even though an operator at a Node may have Logged-out, the background partition (also known as the serving partition) is still operational.

CHAPTER 7

OPERATIONAL AND APPLICATIONS CONSIDERATIONS WITH ULCnet

INTRODUCTION

Creating an optimum operating environment with ULCnet will take some practice and planning. Since every station on the network acts as both a server to other stations on the net and as an information processor for its operator, the operating policies need to be more stringent than in a stand-alone environment. Plans for applications need to include groupings of employees requiring access to particular programs and data files, as well as consideration for how to store and back up sensitive or confidential data. When planning for the purchase of application software, consideration must be given to the TPA (transient program area) requirements of the application, what multi-user enhancements the application is designed for or which changes must be made to provide for multi-user operation, and how shared devices, such as printers, are to be interfaced to the application. Other considerations in this Chapter include such items as the physical placement of printers for paper changing, setup of systems and device assignments using INITIA.INI and OSUB.COM, and activity tracking using the Gatekeeper.

OPERATING PROCEDURES

1. Power, LOGging IN and LOGging OUT

Power to all systems and peripherals on the network should remain on until the last user leaves at the end of the day. In this way, all users will have access to any of the system resources that may be required. Unauthorized use of the network is prohibited simply by specifying that each operator perform a LOGOUT when finished. When a system is LOGged OUT, the background serving partition is still available to other operators on the network. Only the foreground partition (the partition that permits access to the keyboard and console) is disabled after a LOGOUT.

Suppose Mary normally uses the system specified as "node M", Joe uses "node J", Lisa sits at "node L" and George is the Gatekeeper at "node G". Mary and Joe (nodes M and J) both have printers attached to their systems and Lisa and George (nodes L and G) have data bases on hard disks attached to their systems. When Mary leaves for lunch and George goes home early, each of their systems have resources attached that may be required by other users. If George and Mary simply LOGOUT when they leave their systems, Lisa and Joe still have access to the data base at node G and the printer at node M. They can also MAIL material to George and Mary, even though George and Mary have left. No one else may sit down to use nodes M and G, however, without first going through a LOGIN and having a valid password already on the ACCT.SYS file at each of those nodes; system integrity and full security are thus maintained.

George is the primary user, and, even though he LOG's in as USER [1], he may change to any other USER [ID] because he is a Privilege Level 7. Lisa, Joe, and Mary can all use George's network station, if necessary, but cannot change USER [ID]'s, and therefore cannot have access to files they should not use.

b. At node L:

```

+-----+
:                               React vl.3                               :
:                               Station 0 Local                          :
:  User      Paswrd      Name      Privs      XPRVS                      :
:  ---      -
:  0      Boss      NETWRKMGR      7      00                          :
:  1      Buck      GEORGE      7      00                          :
:  2      ----      -----      -      --                          :
:  3      Sell      MARY      5      00                          :
:  4      ----      -----      -      --                          :
:  5      Lisa      LISA      5      00                          :
:  6      ----      -----      -      --                          :
:  7      ----      -----      -      --                          :
:  8      ----      -----      -      --                          :
:  9      ----      -----      -      --                          :
:  *****                               :
:  * (1) - Add/modify entry *           :
:  * (2) - Delete entry *               :
:  * (3) - Change Station *             :
:  * (4) - Save Changes *               :
:  * (5) - Exit / No changes *          :
:  *****                               :
:  :                                     :
:  Enter selection                       :
+-----+

```

Lisa has her own password as USER [5]. Since Joe can use George's system or Mary's system if his is out of use, he doesn't require a password here. Mary also has a password allowing her access to this system if hers is out of use. All three have Privilege Level 5 which permits them only to use files within their own USER [ID]. Both George and the network manager have access to this and all other nodes with Privilege Level 7. Note that only the network manager can change Passwords, USER [ID]'s within the ACCT.SYS file, and Privilege Levels since the network manager only can LOGIN as USER [0] and therefore access REACT.COM.

The same logic applies for the assignment of USER [ID]'s, Passwords, and Privilege Levels at nodes J and M.

c. At node J:

```
+-----+
:                                     React v1.3                                     :
:                                     Station 0 Local                               :
:  User      Paswrd      Name          Privs      XPRVS                               :
:  ----      -
:  0      Boss      NETWRKMGR      7      00                               :
:  1      Buck      GEORGE          7      00                               :
:  2      ----      ----          -      --                               :
:  3      Sell      MARY            5      00                               :
:  4      ----      ----          -      --                               :
:  5      Hot1      JOE            5      00                               :
:  6      ----      ----          -      --                               :
:  7      ----      ----          -      --                               :
:  8      ----      ----          -      --                               :
:  9      ----      ----          -      --                               :
:  *****                               :
:  * (1) - Add/modify entry *                               :
:  * (2) - Delete entry *                               :
:  * (3) - Change Station *                               :
:  * (4) - Save Changes *                               :
:  * (5) - Exit / No changes *                               :
:  *****                               :
:  :                               :
:  Enter selection                                         :
+-----+
```

d. At node M:

```
+-----+
:                                     React v1.3                                     :
:                                     Station 0 Local                               :
:  User      Paswrd      Name          Privs      XPRVS                               :
:  ----      -
:  0      Boss      NETWRKMGR      7      00                               :
:  1      Buck      GEORGE          7      00                               :
:  2      ----      ----          -      --                               :
:  3      Revn      MARY            5      00                               :
:  4      ----      ----          -      --                               :
:  5      #'s!      JOE/MARY      5      00                               :
:  6      ----      ----          -      --                               :
:  7      ----      ----          -      --                               :
:  8      ----      ----          -      --                               :
:  9      ----      ----          -      --                               :
:  *****                               :
:  * (1) - Add/modify entry *                               :
:  * (2) - Delete entry *                               :
:  * (3) - Change Station *                               :
:  * (4) - Save Changes *                               :
:  * (5) - Exit / No changes *                               :
:  *****                               :
:  :                               :
:  Enter selection                                         :
+-----+
```

In this example, a number of different objectives have been accomplished.

1. All employees have Passwords permitting each one to use any of the systems as required.
2. The Passwords chosen consist of many combinations of upper/lower case letters, numbers, and special characters.
3. USER [ID]'s were chosen to segment applications and application files.
4. Privilege Levels were assigned to limit file access to those employees authorized to work with the files.
5. The Gatekeeper station was assigned to the Chief Financial Officer to permit him to utilize the WHO.COM command and keep track of applications in execution.

APPLICATIONS CONSIDERATIONS

1. Choosing Application Software

The considerations involved in choosing "off the shelf" application software are much more important in the networked environment than in the stand alone, single user environment. Ease of use and operator interface are still necessary ingredients to evaluate a software package, but of more importance are such items as required memory, conformance to CP/M 2.2 standards, ease of custom configuration and availability of some source code modules for custom integration.

a. Memory Required

ULC-OPSnet utilizes about 7K bytes of memory over and above CP/M. It is thus important to determine how much memory is available after loading ULCOPS.COM or ULCOPSG.COM for application programs. CP/M conventions hold that application programs should begin at memory location 0100 Hex and end at an address in memory one byte before the beginning of the resident part of the operating system. CP/M communicates the "termination of TPA" address to the application program by storing this address in memory locations 0006,7 Hex. Since ULC-OPSnet acts as a "shell" to CP/M, ULC-OPSnet alters locations 0006,7 Hex to let applications programs know how much memory is available for the programs to load in and utilize.

The KAYPRO Models 2 and 4, have 50K bytes of memory left for applications programs after ULC-OPSnet takes over. The KAYPRO Model 10 has a larger BIOS, and therefore less memory available for application programs. After ULC-OPSnet is loaded, the Model 10 has approximately 48K bytes of memory for program execution. The available TPA, or Transient Program Area, must be considered when deciding which applications to execute on various machines.

You must first insure that no application program requires more than the net available memory to run. This information should be available from the application supplier or in the application documentation.

Generally, applications written to run under either CP/M or MP/M (the multi-user operating system from Digital Research, Inc.) are good candidates for running under ULC-OPSnet. These applications will, in general, use less memory (MP/M permits only a 48K byte TPA) and will be written to more closely follow Digital Research programming conventions.

b. Conformance to CP/M 2.2 Standards

Digital Research thoroughly documents procedures and standards for creating applications programs under CP/M 2.2. Compilers, like CBASIC and R/M Cobol and interpreters like dBASE-II and MBASIC follow these standards to the extent that the programmer uses only the commands available. Unfortunately, programs written in Assembler or written in compilers and interpreters using Assembler sub-routines do not always follow CP/M standards and conventions. ULC-OPSnet requires that certain of these conventions are followed in order to gain the flexibility of virtual device assignment on the network. Thus, a few application programs that will operate under CP/M will not operate properly under control of the network even though they may not require any more than the available amount of memory.

It is important to establish that the applications you intend to utilize on the network:

- 1) Will run under standard CP/M version 2.2.
- 2) If direct console I/O is performed, the application does so only through BDOS function 6 and not through BIOS calls.
- 3) Do follow CP/M 2.2 BDOS calls for all file operations.
- 4) Do not utilize bits in the File Control Block normally unused by CP/M. (These are used by ULC-OPSnet to specify files as LOCKED/UNLOCKED, PRIVATE/SHARED, etc.)
- 5) Do not use memory locations 0040 and 0041 Hex (normally unused by CP/M) except as documented in this User's Guide, Chapter 8, "Programming Considerations for Multi-User Applications."

Information about how an application has been programmed should be available from your applications supplier.

c. Ease of Custom Configuration

Most professionally written applications provide the purchaser the ability to configure the application to take full advantage of CP/M; i.e., configure input and output for any legal CP/M logical device, configure consoles and CRT's for the attributes of the physical device used, etc. Some application programs, like those produced by Micropro International, go a positive step beyond that. WordStar, for example, even permits the purchaser to custom configure hardware, menus, logical devices for location of overlay files, etc.

It is important to evaluate the designed-in configuration flexibility of an application when considering it for the network environment. For example, if an application program does not permit you to select the logical disk drive on which the program files and overlay files will be located, you may have difficulty assigning logical devices so that multiple users may have access to it. Likewise, if you do not have the flexibility of determining the file extension name of required overlay files (.OV? is the normal CP/M convention, and the extension automatically searched for by ULC-OPSnet) you may be required to waste disk space with multiple copies of such files because ULC-OPSnet will not automatically search for any overlay file extension other than .OV?.

Flexibility in the assignment of logical devices for the data files is also important. If any application, for example, demands to see the data files only on disk B:, then there is little opportunity for the user to determine his own logical device assignments.

Make certain that applications you intend to use on the network can address printing output to the logical CP/M LST: device. In this way, your applications will be able to spool all printed output to some predefined file to actually be printed in a batch mode at some later time.

d. Source Availability for Custom Integration

If some of the applications you are considering do not have an extensive pre-designed custom installation capability, like those available from Micropro International, then it is advisable to establish the availability of some source code modules for customization.

For example, suppose that batch printing of major or summary reports from an application is acceptable, but that it would be desirable to have some short reports or information be submitted to the spooler for immediate printing by an operator. In most cases, this can only be accomplished by having access to the print module source code to enable the user to build in the special commands to these small reports to be printed by the spooler immediately.

2. Configuring an Example Application for ULCnet

Using the example at the beginning of this Chapter, suppose that George (the Chief Financial Officer) has chosen an accounting application. The application system he has decided to buy might be configured as follows:

- a. The application, called "MEGACCOUNTING", contains a main program module, ACCOUNT.COM, five overlay program modules, GL.OVL, AR.OVL, AP.OVL, PR.OVL, AND RPT.OVL, and a program module ACTINSTL.COM, used to install and configure the MEGACCOUNTING system.

- b. George decides to store the program modules as well as the data modules in USER [5] area even though MEGAC-COUNTING provides passwords for access to data files. George knows that by storing the programs and data files in USER [5] area, only those personnel with access to USER [ID] [5] will have access to the application. George further determines that all of the program modules will easily fit on the C: partition of his hard disk, but that the accounting data base will grow to almost 4 Megabytes, so that he must put the data files on partition A: of his hard disk.
- c. Joe and Lisa will run MEGACOUNTING for most of the input, updates, and reports. The printer located at Joe's station (node J) will be used for general ledger reports, statements, checks, etc. The small dot matrix printer at node N, (Norman, the network manager), will be used mainly by George to produce small detail reports and quick reference status reports.
- d. George's first task is to decide on common logical device assignments for the physical disk drives on which the data and programs will reside. This is necessary because MEGACOUNTING does not provide the ability to dynamically assign disk devices during execution; the disk assignments must be pre-determined and installed with the ACTINSTL.COM program. Since MEGACOUNTING will execute separately in each one of the systems, the ACCOUNT.COM program must have a device assignment structure that is common to each system running MEGAC-COUNTING. George decides to install MEGACOUNTING to look for the .COM and .OVL files on logical disk K: (George's physical disk C:) and to look for the data files on logical disk L: (George's physical disk A:).
- e. Now George is ready to build the INITIA.INI files at each node. By building INITIA.INI files at every node in the USER [5] area, every time Joe or Lisa LOGIN at any station, they will be set up to run MEGACOUNTING. George starts at his own station, building an INITIA.INI file in USER [5] in the event either Joe or Lisa must use his system. George uses WordStar to build the INITIA.INI files.

```

+-----+
:  A>ULCOPSG<RET>                                     :
:  ULC-OPSnet v1.70 Gatekeeper - Node 8               :
:  Copyright 1983 (C) by Aquinas Inc.                 :
:  :                                                    :
:  <A0>LOGIN 1<RET>                                     :
:  Password: **** (type Buck)                         :
:  Logged-in on ULC-OPSnet v1.70 Gatekeeper-Node 0    :
:  Copyright 1983 (C) by Aquinas Inc.                 :
:  [1] User: GEORGE      7001                          :
:  :                                                    :
:  <A1>INET KAYPRO                                     :
:  Gatekeeper running...                               :
:  :                                                    :
+-----+

```

```

+-----+
: <A1>USER 5<RET>                                     :
: [5] User: GEORGE          7001                       :
:                                                         :
: <A5>WS<RET>                                           :
+-----+

```

Once into WordStar, George uses the non-document option by typing **N**. When asked by WordStar for a filename to edit, George responds with **A:INITIA.INI**. After the WordStar file editing help menu appears, George begins entering as follows:

```

+-----+
: INET KAYPRO <RET>                                     :
: TTY GAG<RET>                                          :
: ASSIGN C:=C:<RET>                                     :
: ASSIGN D:=D:<RET>                                     :
: ASSIGN E:=E:<RET>                                     :
: ASSIGN F:=A:M<RET>                                   :
: ASSIGN G:=A:J<RET>                                   :
: ASSIGN H:=A:L<RET>                                   :
: ASSIGN I:=A:N<RET>                                   :
: ASSIGN K:=C:<RET>                                     :
: ASSIGN L:=A:<RET>                                     :
: SPOOL J<RET>                                         :
: INITIALIZE<RET>                                     :
: K:<RET>                                              :
+-----+

```

George now enters **^KX**, and the file is stored. Now every time an operator performs a **LOGIN 5** at node G, the system at node G will be set up to:

- 1) Initialize the network as the Gatekeeper.
 - 2) Prohibit messages from appearing on the screen if the foreground partition of node G is executing a program.
 - 3) Address all of the local hard disk partitions and the local floppy disk.
 - 4) Have assigned all of the A: disks at other nodes to be able to access files.
 - 5) Additional addresses for the local C: and A: disks of K: and L: respectively, so that MEGACCOUNTING will run properly.
 - 6) Printed output will be spooled to the printer at node J.
 - 7) The logged disk will be K: so that when **ACCOUNT** is entered, the operating system will look to **ACCOUNT.COM** on the logical K: disk, which is also the physical C: disk locally.
- f. Prior to entering WordStar, George had executed the **USER 5<RET>** command, and was in **USER [5]** area when the **INITIA.INI** file was created and stored. Now George creates the **INITIA.INI** file at Lisa's station, node L. Assuming that power is on and that **ULC-OPSnet** is active

in node L, George can create the INITIA.INI file by performing the following:

```
+-----+
: <A5>ASSIGN F:=A:L<RET>      :
: Device F: assigned         :
:                             :
: <A5>WS<RET>                 :
+-----+
```

Since George's active USER [ID] is [5], and since he has already assigned his F: disk as the physical A: disk at node L, when the WordStar no file menu is displayed, George will type **N**, for non-document option, and **F:INITIA.INI<RET>** for the file to be created. George will create the INITIA.INI file for Lisa on his system, but it will be stored on the physical A: disk at node L in USER [5] area. George creates the file as follows:

```
+-----+
: INET KAYPRO L<RET>          :
: TTY GAG<RET>                :
: ASSIGN C:=C:<RET>           :
: ASSIGN D:=D:<RET>           :
: ASSIGN E:=E:<RET>           :
: ASSIGN F:=A:M<RET>         :
: ASSIGN G:=A:J<RET>         :
: ASSIGN H:=A:G<RET>         :
: ASSIGN I:=A:N<RET>         :
: ASSIGN K:=C:G<RET>         :
: ASSIGN L:=A:G<RET>         :
: SPOOL J<RET>               :
: INITIALIZE<RET>           :
: K:<RET>                     :
+-----+
```

George now enters **^KX**, and the file is stored at node L in USER [5] area. Now every time Lisa performs a LOGIN 5 at node L, the system at node L will be set up to:

- 1) Initialize the network as a Workstation, node L.
- 2) Prohibit messages from appearing on the screen if the foreground partition is executing a program.
- 3) Address all of the local hard disk partitions and the local floppy disk.
- 4) Have assigned all of the A: disks at other nodes to be able to access files.
- 5) Additional device names for the physical C: and A: disks at node G of K: and L: respectively, so that MEGACCOUNTING will run properly.
- 6) Printed output will be spooled to the printer at node J.
- 7) The logged disk will be K: so that when ACCOUNT is entered, the operating system will look to ACCOUNT.COM on the logical K: disk, which is also the physical C: disk at node G.

The procedure and logic for creating the other INITIA.INI files for USER [5] on other nodes is similar, and will not be shown here.

- g. George wants to create one more INITIA.INI file; his own in USER [1] at node G, and any other node George may want to operate. Assume that George has just completed the last INITIA.INI file in USER [5]. He would now:

```
+-----+
: <A5>USER 1<RET>                                     :
: [1] User: GEORGE          7001                       :
:                                                         :
: <A1>WS<RET>                                           :
+-----+
```

Since George is now in USER [1], he enters the non-document option of WordStar with a N and enters the desired filename A:INITIA.INI<RET> knowing that this INITIA.INI file will be stored at his physical disk A:, USER [1]. George completes his INITIA.INI file as follows:

```
+-----+
: INET KAYPRO<RET>                                     :
: TTY GAG<RET>                                         :
: ASSIGN C:=C:<RET>                                     :
: ASSIGN D:=D:<RET>                                     :
: ASSIGN E:=E:<RET>                                     :
: ASSIGN F:=A:M<RET>                                   :
: ASSIGN G:=A:J<RET>                                   :
: ASSIGN H:=A:L<RET>                                   :
: ASSIGN I:=A:N<RET>                                   :
: ASSIGN K:=C:<RET>                                     :
: ASSIGN L:=A:<RET>                                     :
: ASSIGN J:=B:L<RET>                                   :
: ASSIGN N:=B:N<RET>                                   :
: SPOOL N<RET>                                         :
: WHO<RET>                                             :
: INITIALIZE<RET>                                     :
+-----+
```

George now enters ^KX, and the file is stored. Now every time George performs a LOGIN 1 at node G, the system at node G will be set up to:

- 1) Initialize the network as the Gatekeeper.
- 2) Prohibit messages from appearing on the screen if the foreground partition is executing a program.
- 3) Address all of the local hard disk partitions and the local floppy disk.
- 4) Have assigned all of the A: disks at other nodes to be able to access files.
- 5) Additional addresses for the local C: and A: disks of K: and L: respectively, so that MEGACCOUNTING will run properly.
- 6) Access the B: disk at node L and the B: disk at node N.

- 7) Printed output will be spooled to the printer at node N.
- 8) The WHO.COM command will be executed to show George who is on ULCnet and what each LOGged IN operator is doing.

3. Printing in the Network Environment

In concept, printing in the network environment is very much like printing in the large data processing batch environment. Since printers require relatively little processor resource as compared with, for example, engineering, spread sheet, or data base applications, the printing function in large systems is allocated to a low priority background task called "spooling". In the typical stand-alone microprocessor environment, application programs communicate directly with the printer during the execution of the application. Printing represents on the average only ten to fifteen percent of the time used in most microprocessor environments, so the printer is idle most of the time. ULC-OPSnet implements a very powerful facility allowing any printer on the network to be used by any system on the network. The printing function in ULC-OPSnet uses processor cycles only when they are available so as not to adversely impact the more important foreground task or disk serving task. Thus printers connected to systems on ULCnet may be used to print output from many different nodes while operators at the systems with printers attached are performing other tasks. Clearly, this printing architecture can only work if disk resident print files are presented to the background "spooling" task instead of direct printed output from the application. The result is better utilization of printer resources and operator time. It will take some practice and planning to realize the full benefit of the ULC-OPSnet print spooling facility. The print routines in some applications may also require small changes.

In the previous example, suppose that George decides that all major report and statement printing will occur as "spooled" printing. Since the main printer used is at node J, George makes Joe responsible for paper changing where special forms are required. Lisa has a hard disk at node L, so George decides to use the C: disk partition at node L to store all print files prior to actually printing. Recall from the INITIA.INI setup that George decided to address the physical C: disk at node L as the logical J: disk, and that this device designation would be common throughout accounting applications. George now runs the MEGACOUNTING installation program, ACTINSTL.COM, and chooses the options which will:

1. Force all printing operations to address the printer as the CP/M LST: device.
2. Sets up each print module in MEGACOUNTING to call the ULC-OPSnet ASSIGN command, and ASSIGN the LST: device to a filename at disk J:, where the filename ASSIGNED denotes the type of printing to be done.
3. Setup the appropriate print driver for the type of printer physically attached to Joe's station.

For example, suppose that the printer connected to the system at node J is a Diablo 630, and that special forms are required for statements, payroll checks, accounts payable checks, and invoices. George decides to set up the print modules for each of these applications in MEGACCOUNTING to ASSIGN the LST: device to a file name that denotes the type of printing.

1. The module to produce statements will call the ASSIGN command to: ASSIGN LST:=J:STATEMNT.PRN.
2. Likewise, the module to produce payroll checks will call the ASSIGN command to: ASSIGN LST:=J:PAYROLCK.PRN.
3. Each additional print module is set up to ASSIGN the LST: device to a filename on logical disk J: to correspond to the job name or special forms required.

George must now add to his operations procedures for Joe and Lisa the instructions for QUEUEing the files as application print files are completed. An example entry in the operations procedures might be as follows:

a. Under the section for running payroll:

After the payroll job has completed and the main menu is displayed, push the 9 key. This will exit to the system prompt <K5>. Now do the following:

```

+-----+
: <K5>FINISH<RET>                                     :
: LST: file closed as J:PAYROLCK.PRN                  :
:                                                       :
: <K5>QUEUE J:PAYROLCK.PRN/F<RET>                     :
:                                                       :
: <K5>                                                  :
+-----+

```

You may now go on to the next task.

b. Under the section for running printers:

If the printer attached to your station stops printing and the previous printing job is finished, at your first opportunity to stop what you are doing and get back to the system prompt "<K5>", do the following:

```

+-----+
: <K5>QUEUE<RET>                                       :
+-----+

```

The system will tell you if anything has been submitted to the spooler to be printed and what the special requirements are. If the system responds with:

```

+-----+
: <K5>QUEUE<RET>                                       :
: Currently printing: J:PAYROLCKPRN Forms=Special (etc.):
: Queue file pending: X:XXXXXXXXXXXX Forms=Normal (etc.):
:                                                       :
: <K5>                                                  :
+-----+

```

... and the printer is not printing, it means that the print file PAYROLCK.PRN is ready to print, but the payroll check forms must first be inserted correctly into the printer. Insert the check forms, noting the starting check number, and tell the system spooler to begin the printing operation by keying in **QUON** as follows:

```
+-----+
: <K5>QUEUE<RET>                                     :
: Currently printing: J:PAYROLCKPRN Forms=Special (etc.):
: Queue file pending: X:XXXXXXXXXXXX Forms=Normal (etc.):
:                                                       :
: <K5>QUON<RET>                                       :
:                                                       :
: <K5>                                                 :
+-----+
```

The system will now begin to print the checks and you may go on to the next task.

Note that when the **/F** switch is used by the requesting node (i.e., the station from which the QUEUE command was originally issued to cause the file to print), the background spooler is turned off (i.e., put into a QUOFF state) at the node on which the file is to be printed when the file comes to the head of the print queue. This feature is implemented to permit the operator at the printing node to interrogate the queue and load special paper, if required.

It is important to try a variety of configuration techniques and operating procedures to optimize printing with ULC-OPSnet. Your applications supplier should be able to assist you in identifying the particular printing modules that you may want to optimize for spooling in the applications you purchase.

CHAPTER 8

TECHNICAL CONSIDERATIONS FOR PROGRAMMING AND OPERATIONS

PLACEMENT OF .COM AND .OV? FILES

ULC-OPSnet has a designed-in automatic search algorithm for program and overlay files. The rationale for autosearch is to reduce the number of copies of .COM and .OV? files occupying disk space in the network environment. There are three forms of the RUN command which activate autosearch:

1. Implied run (.COM file name without extension).
2. R <dev>:<.COM file name without extension>.
3. RUN <dev>:<.COM file name without extension>.

Each of these forms invokes a different search path for the desired program. The following table delineates the search path for each form of the RUN command looking for the program XX.COM:

```
+-----+
:d=current logged drive :           :           :
:u=active USER[ID]     :1st Search to: :2nd Search to: :
:N=any assigned disk   :           :           :
+-----+-----+-----+
:<du>XX<RET>           :A:USER [Ø]    :d:USER [u]     :
+-----+-----+-----+
:<du>R XX<RET>         :d:USER [Ø]    :A:USER [Ø]     :
+-----+-----+-----+
:<du>R N:XX<RET>       :N:USER [Ø]    :A:USER [Ø]     :
+-----+-----+-----+
:<du>RUN XX<RET>       :d:USER [u]    :A:USER [Ø]     :
+-----+-----+-----+
:<du>RUN N:XX<RET>     :N:USER [u]    :A:USER [Ø]     :
+-----+-----+-----+
```

For example, suppose that you are operating the system at node 7 and desire to execute the program ZERO.COM located on the physical disk C:, USER [Ø], at node 3. You could run ZERO.COM by performing any of the following:

```
+-----+
: <AØ>ASSIGN C:=C:3<RET> :
: Device C: assigned    :
:                       :
: <AØ>R C:ZERO<RET>     :
:                       :
:                       :
: <AØ>C:<RET>            :
: <CØ>ZERO<RET>         :
:                       :
:                       :
: <CØ>RUN ZERO<RET>     :
:                       :
:                       :
: <A1>ASSIGN C:=C:3<RET> :
: Device C: assigned    :
:                       :
: <A1>R C:ZERO<RET>     :
:                       :
:                       :
: <A1>C:<RET>            :
: <C1>R ZERO<RET>      :
+-----+-----+-----+
```

The autosearch algorithm for .OV? files is absolute: .OV? files will always be searched on the same logical disk and from the same USER [ID] as the .COM program that calls for the overlay. While this method makes the decision on the placement of all .COM files and their respective overlays relatively simple, it causes confusion when using the PIP.COM program or any other file copy routine. Since ULC-OPSnet overrides the logical disk location call from a .COM program to the logical disk from which the .COM program was loaded, copying .OV? files requires that the autosearch feature for .OV? files be temporarily disabled. This is accomplished with the OVOFF command. Suppose you desire to copy WS.COM, WSMMSG.OVR, and WSOVLY1.OVR from logical disk D: to logical disk F:. If you were to try this without first turning off the .OV? autosearch, the following would occur:

```

+-----+
: <AØ>PIP F:=D:WS*.*[VØ]<RET>      :
:   COPYING-                        :
:   WS.COM                          :
:   WSMMSG.OVR                      :
:   NO FILE: =D:WSMSG.OVR          :
:                                     :
: <AØ>                                :
+-----+

```

In this example, WS.COM was found, but the first overlay file, WSMMSG.OVR, was not found because ULC-OPSnet overrode the PIP.COM request to find WSMMSG.OVR on the logical D: disk, and instead, searched the disk from which the .COM file (PIP.COM) was loaded, disk A:. The command would have been successful if preceded by the OVOFF command as follows:

```

+-----+
: <AØ>OVOFF<RET>                    :
:                                     :
: <AØ>PIP F:=D:WS*.*[VØ]<RET>      :
:   COPYING-                        :
:   WS.COM                          :
:   WSMMSG.OVR                      :
:   WSOVLY1.OVR                    :
:                                     :
: <AØ>OVON<RET>                    :
:                                     :
: <AØ>                                :
+-----+

```

As the example indicates, do not forget to turn .OV? autosearch on again after completing copying operations.

The Autosearch feature of ULC-OPSnet, in combination with the system security features, can be used to advantage in the operational environment where a variety of employees with differing responsibilities and experience levels have access to the system. If all required .COM and .OV? files are kept in USER [Ø] area, (for example), employees with access to accounting files in USER [7] could not see the .COM and .OV? files in their respec-

tive directories, but would be able to execute the applications when following their written procedures by typing in the appropriate .COM file names. Other unauthorized employees would be able to execute the accounting programs, but would not have access to the accounting data files.

OPERATIONAL PERFORMANCE NOTE: It is always advisable to keep as much of the program code (files ending in .COM, .OV?, .BAS, .CMD, etc.) as possible on locally available disk storage. Access over ULCnet to records in a data file, message switching, and spooling usually require only a small number of network packets per operation. If multiple operators must load program application code over the network as well, user response time may be severely affected, as program loads may require upwards of 400 packets before any operator activity may be accomplished. This situation is particularly exacerbated when a network is organized such that all users must load program code and data from one node. Remember, the concept of local area networking is one of Distributed Processing; since all micro-processors in the networked systems are approximately equal in instruction execution speed, it is best to distribute the probable processing load as much as possible between multiple systems.

MULTI-USER FILE OPERATIONS UNDER ULC-OPSnet

ULCnet is a distributed intelligence architecture, that is, applications execute independently of one another in separate systems. There is no centralized file server, and no MP/M system is required to act as the server controller. In the ULCnet environment, multiple simultaneous executions of an application may also have common file(s) open at the same time.

In this regard, ULC-OPSnet provides a momentary record lock to prohibit two or more requests from issuing simultaneous "writes" to the same physical record. There is not, however, an automatic method with which to ensure proper file appending when two or more systems have a common file open. Since the background serving partition can only provide data and file control block information to the application, there is no way to communicate to the foreground partition of a requesting system the status of a particular record. The CP/M file structure has no provision in the file control block for this kind of dynamic status information. To solve this multi-user data base problem, ULC-OPSnet has implemented a convention which, if followed in application logic, will result in the ability to use dynamically alterable common data bases in a multi-user environment. The convention was designed specifically for dBASE-II (c), but will work with virtually any application generator, compiler or interpreter with the ability to "Peek" and "Poke" a specific memory location.

The multi-user convention is designed around two "flag bytes," the contents of which are determined by both ULC-OPSnet and the application program. The flag bytes are in memory locations 64 (40H) and 65 (41H). Location 64 is the file status byte

the application looks for to determine if the file just opened is "locked" and currently in use by another user, or has just been locked and is available for update by the application. Location 65 is used by the application to tell ULC-OPSnet if the file just requested is to be used to read only, or will be used with the intent to both read and write. Any file intended to be used in a multi-user environment must end in a physical file extension of .DBU. The application program may call for the open of a file with the .DBF extension; ULC-OPSnet will look for the .DBU file extension automatically if it does not find the file with .DBF.

Functionally, the application must POKE location 65 with 1 if the file is to be opened as read only or 0 if the file is to be opened as read/write. After issuing an OPEN (or USE), the application must PEEK at location 64. If location 64 = 0, the file just opened is now locked to other users, and the application may continue with the process, update the file, and close the file. If location 64 is not 0 (≠0) the file just opened has already been opened and locked by another user. If the application had previously POKED a 1 into location 65, signifying to ULC-OPSnet the intent to read only, the application may proceed with a normal read and close the file. If, on the other hand, the application had previously POKED a 0 into location 65, indicating to ULC-OPSnet the intent to write to the file, the application must wait and retry the OPEN prior to proceeding.

If multiple files are to be "used" at the same time, the value of location 64 after the file is opened must be saved. Likewise, before the file is closed the value of location 64 must be restored. For example, in dBASE-II*, after the USE statement to open a file, do a STORE PEEK(64) TO FSTAT1. Then before the closing USE, do a POKE 64,FSTAT1. **Make certain there is a separate variable for each file opened.** If only one file at a time is to be used, this procedure is not necessary. This procedure is necessary when more than one file is to be opened at one time, regardless of whether or not the files are PRIMARY or SECONDARY.

The ULC-OPSnet Gatekeeper release diskette contains a file called APPLNOTE.CMD. This is a example dBASE-II source program file implementing the ULC-OPSnet file lock convention, and utilizes the small files called TEST.NDX and TEST.DBU. The program is a useful example for any application requiring file lock. The file lock convention will also work with applications written in other programming languages. MBASIC** (c), for example, supports the same PEEK and POKE commands as dBASE-II.

OPERATIONAL NOTE: ULCnet creates a truly distributed processing network. Any file may be located anywhere physically in the Net,

* dBASE-II is a trademark of Ashton-Tate.

** MBASIC is a Copyright of Microsoft, Inc.

Note: ULC-OPSnet supports dBASE-II in a multi-user environment with dBASE-II version 2.4 and above only. Previous versions of dBASE-II will not load and run properly over ULCnet.

and (provided the proper Privilege Levels are assigned) may be accessed by any node. The foreground partition of a node on the Net only has access to the File Control Block and the data contained in a file located on some other node. Thus, ULC-OPSnet utilizes the last byte of the filename extension to determine whether a file is locked by another user (.DBU if unlocked, .DBL if locked). Since memory locations 40H-4FH are normally set to 00H (these 16 bytes in page 0 of memory are not used by CP/M), ULC-OPSnet assumes that when accessing a file with a .DBU extension, even if only to PIP the file, the user is opening the file with the intention of reading and writing to the file. Thus you will notice that when PIPing files with the .DBU physical file extension, the file at the destination will be stored with a .DBL file extension. It is necessary to rename files with the .DBL file extension to a .DBU extension before your application will properly handle the file.

RESTRICTED ASCII CHARACTERS AND FILE NAMES IN ULC-OPSnet

ULC-OPSnet uses some ASCII characters as special switches and delimiters. The / character, for example, is used to denote an option switch for the DIR and QUEUE commands. It is important to note which of these ASCII characters cannot be used in filenames. If filenames already exist with restricted characters as part of the filename, the filename must be changed to utilize non-restricted characters. Otherwise, the file will not be found by ULC-OPSnet when accessed.

The table below lists the complete set of ASCII characters with the corresponding hexadecimal values. Characters which cannot be used in filenames are in BRACKETS ([]).

CHAR	HEX	CHAR	HEX	CHAR	HEX	CHAR	HEX
[NUL]	00H	[SP]	20H	@	40H	` *`	60H
[CTL A]	01H	[!]	21H	A	41H	a *	61H
[CTL B]	02H	["]	22H	B	42H	b *	62H
[CTL C]	03H	[#]	23H	C	43H	c *	63H
[CTL D]	04H	[\$]	24H	D	44H	d *	64H
[CTL E]	05H	[%]	25H	E	45H	e *	65H
[CTL F]	06H	[&]	26H	F	46H	f *	66H
[CTL G]	07H	[']	27H	G	47H	g *	67H
[CTL H]	08H	[(]	28H	H	48H	h *	68H
[CTL I]	09H	[)]	29H	I	49H	i *	69H
[CTL J]	0AH	[*]	2AH	J	4AH	j *	6AH
[CTL K]	0BH	[+]	2BH	K	4BH	k *	6BH
[CTL L]	0CH	[,]	2CH	L	4CH	l *	6CH
[CTL M]	0DH	[-]	2DH	M	4DH	m *	6DH
[CTL N]	0EH	[.]	2EH	N	4EH	n *	6EH
[CTL O]	0FH	[/]	2FH	O	4FH	o *	6FH
[CTL P]	10H	[0]	30H	P	50H	p *	70H
[CTL Q]	11H	[1]	31H	Q	51H	q *	71H
[CTL R]	12H	[2]	32H	R	52H	r *	72H
[CTL S]	13H	[3]	33H	S	53H	s *	73H
[CTL T]	14H	[4]	34H	T	54H	t *	74H
[CTL U]	15H	[5]	35H	U	55H	u *	75H
[CTL V]	16H	[6]	36H	V	56H	v *	76H
[CTL W]	17H	[7]	37H	W	57H	w *	77H
[CTL X]	18H	[8]	38H	X	58H	x *	78H
[CTL Y]	19H	[9]	39H	Y	59H	y *	79H
[CTL Z]	1AH	[:]	3AH	Z	5AH	z *	7AH
[ESC]	1BH	[;]	3BH	[5BH	{ *	7BH
[FS]	1CH	[<]	3CH	\	5CH	*	7CH
[GS]	1DH	[=]	3DH]	5DH	} *	7DH
[RS]	1EH	[>]	3EH	^	5EH	~ *	7EH
[US]	1FH	[?]	3FH	_	5FH	[DEL]	7FH

(*) Automatically translated to (-20H) character; i.e., a (61H) is automatically translated to A (41H).

In addition to the restricted characters in the table, .COM filenames are also restricted. Literal sub-sets of ULC-OPSnet system commands cannot be used as .COM file names. For example, if the system were asked to execute INIT.COM, the .COM file would never be seen by the system. Instead, ULC-OPSnet would execute the INITIALize command. Likewise, ULC-OPSnet will load the COPY (PIP) command instead of the COPY.COM program if you attempt to run COPY. Compare your .COM file names with the command summary in Chapter 9, and rename any conflicting filenames. Note that Chapter 9 lists each of the ULC-OPSnet commands with the minimum command entry in CAPS and the remainder of the command in lower case. For example, the minimum entry for the WHERE command is W. Thus if you have files named W.COM, WH.COM, WHE.COM, WHER.COM or WHERE.COM, all must be renamed. Any one of the above entries will execute the WHERE command.

OPERATIONS WITH OSUB.COM, OXSUB.COM, AND PSUB.COM

The ULC-OPSnet equivalent of SUBMIT.COM and XSUB.COM are OSUB.COM and OXSUB.COM respectively. PSUB.COM is a special relocatable form of SUBMIT.COM that does not handle submit operations in the same way as CP/M's SUBMIT.COM, but may be used to execute a submit string within an application. Its primary function is to facilitate the submitted assignment of the LST: device to a file name while in an application like WORDSTAR. Operations with OSUB.COM and OXSUB.COM are, however, handled in the same way as submit operations with the CP/M counterparts - with the following enhancements:

1. OSUB.COM and OXSUB.COM do not require additional memory to process submitted files.
2. OSUB.COM may be called with (a) <A0>SUBmit <filename> <param>....<param><RET> or (b) <A0>OSUB <filename> <param>.. ..<param><RET>.
3. OXSUB.COM may be invoked with (a)<A0>OXSUB ON<RET>, (b)<A0>XSUB ON<RET>, or simply (c)<A0>X ON<RET>.
4. \$\$\$SUB files are created and processed in the same manner, as SUBMIT.COM processes these files in CP/M, except that all legal ULC-OPSnet commands may be embedded in the command file to be submitted, with the exception of the USER command.
5. If a file named INITIA.INI exists on the system disk (A:) in the respective USER [ID] area at the time of LOGIN, OSUB.COM will automatically create and process a \$\$\$SUB file with the contents of INITIA.INI.
6. The file extension .SUB is not required on the file to be submitted.
7. OSUB.COM and OXSUB.COM may be used interchangeably between CP/M and ULC-OPSnet. SUBMIT.COM and XSUB.COM will not work under ULC-OPSnet, however.

OTHER PROCEDURAL AND OPERATIONAL CONSIDERATIONS WITH ULCnet

The RETRY command is used to increase the number of network access retries prior to outputting the console message:

?Node x unavailable - Retry(Y/N)?

...where Node x is the physical location of a virtual disk currently being accessed. ULC-OPSnet utilizes a complex algorithm to determine the optimum number of packet retries prior to printing this message. Among the components of the algorithm are relative network activity, division of processor time between foreground and background, and whether the uncompleted request at Node x was for a read or a write. Clearly, once the message is outputted to the console, foreground processing stops until the operator intervenes and makes a decision. A "N" answer will abort the current task and return the CCP. A "Y" answer will restart the RETRY algorithm and continue current task execution if the packet I/O is successful.

The algorithm provides successful results for most cases, i.e., if the "time-out" retry message appears, it is usually because something is wrong at the location of Node x, and alerts the operator to inquire prior to proceeding. In the case of unattended operation (a large database sort or backup, for example), the operator may want to set the RETRY counter prior to proceeding. This is accomplished through the RETRY command. The command syntax is:

```
<A0>RETRY <0-127><RET>
```

RETRY is also an Information Command:

```
<A0>RETRY<RET>
```

...returns the current value in the RETRY counter. Remember, setting the RETRY counter sets the number of iterative executions of the RETRY algorithm, and not the physical number of retries. For example, suppose the average elapsed time for the RETRY algorithm is 30 seconds prior to "time-out". If the RETRY counter were set to 10, the system would take approximately 5 minutes continually attempting to send the packet prior to printing the "time-out" message.

Another operational consideration that must be discussed is the use of the SEND command. ULC-OPSnet uses a less complicated packet verification procedure in message communications than it does in disk I/O and spooling functions. Since message communications are "non-critical", system overhead is reduced significantly by this simplified procedure. In instances of high network activity, however, a console message sent to a particular Node with the SEND command may appear at the receiving Node more than once. Since SEND to a particular Node requires an acknowledgement at the sending Node, high network activity can create a situation where the sending Node retransmits the message prior to acknowledgement by the receiving Node. This situation will not occur in networked file transfer or spooling operations.

ADDITIONAL XBDOS CALLS IMPLEMENTED IN ULC-OPSnet

ULC-OPSnet utilizes the standard CP/M BDOS (Basic Disk Operating System), and additionally, implements an Extended BDOS (XBDOS) required for networking operations. Many of the calls in XBDOS are available to applications suppliers and assembly language programmers for use in creating or altering applications for optimum performance in the ULCnet environment. The available XBDOS calls, purpose, and resulting return codes are documented as follows:

1. Function 100 - Return address of USER Block

On call: C = 100

On return: HL = USRBLK: address

HL-2 = Retry Setting (decimal 0-127)
HL-1 = OVON/OFF switch ('N'=On, 'F'=Off)
HL = User [ID] binary
HL+1 = User's name in ASCII (9 bytes)
HL+10 = User's displayed Privilege Level
HL+11 = Extended Privileges (2 bytes)

This call may be used to inquire or set the OVON/OFF flag, inquire or change the retry counter, or to get useful information about the user.

2. Function 101 - Initialize System

On call: C = 101

On return: Control is returned to ULC-OPSnet and disk system is initialized with CP/M BDOS call 13.

This is functionally equivalent to exiting through the INITIALIZE command.

3. Function 102 - LOGOUT User

On call: C = 102

On return: User is no longer logged into system, Virtual Device table is reinitialized to local A: and B: drives, Retry Counter is reset to '0', XSUB is turned off, User Privilege Level is reset to '0', User status is reset to '0', disabling foreground processing until a new successful LOGIN is executed.

Upon return the user will no longer have any system access privileges. Upon exit the user is required to execute LOGIN again before using the system.

4. Function 103 - Return Address of QUEUE Block

On call: C = 103

On return: HL = Address of QUEBLK:

HL = Pointer to contiguous 36 byte FCBs

Format of the FCBs are standard except for the following: -

FCB+12 = Upper 4 bits = 0 if normal forms or non-0 for special forms

Lower 4 bits = Number of copies to be queued

FCB+13 = User number of file to be queued

FCB+14 = Physical device of file

FCB+15 = Node address of file (0 = Local or ASCII node - '0' ASCII)

This function may be used to check the queue data or to enter a queue request.

5. Function 104 - Process Command

On call: 0080H = Standard console buffer format

This function processes an ULC-OPSnet command and returns to the program.

NOTE: Use of this call requires that TPA not be destroyed unless the application program is loaded outside of the "danger zone".

6. Function 110 - Return Gatekeeper Information.

On call: C = 110

On return: A = 123 if Gatekeeper or other if workstation.
HL = Pointer to GTAB

This function is useful to determine if a station is a Gatekeeper or a Workstation.

7. Function 120 - Return Network Vector Block

On call: C = 120

On return: HL = Network vector block address

HL thru HL+11 = RESERVED (Do NOT change)

HL+12 = Node ID (ASCII node - '0' ASCII)

HL+13 = 0 for ASYNC, 1 for SYNC

This function may be used for obtaining the Node ID. If the Node ID is 80h+'0' then the station is not INETed and ULCnet access is denied. To translate the node ID into ASCII, add an ASCII '0' to the Node ID. ASYNC or SYNC mode may also be obtained but NOT changed!

8. Function 124 - Send a Packet

On call: A = 2
C = 124
HL = Packet address

This function will transmit a packet over ULCnet.

9. Function 125 - Receive a Packet

On call: C = 125
On return: A = Return code
HL = Address of the received packet

Return codes: 0 ... Good packet
1 ... Bad packet
2 ... No packet - Time out

This call receives a packet into an ULC-OPSnet buffer and returns the packet buffer address and the completion code (Return code). If Return code "1" is encountered, try a re-receive; if Return code "2", then try from 1 to 25 re-transmission retrys (as a function of the priority of the operation) before failing.

10. Function 126 - Return Disk Assignment Table

On call: C = 126
A = Logical disk number
On return: HL = Pointer to assignment vector
HL = Physical disk number
HL+1 = Location (Node id) of disk

This function is useful in checking assignments or making assignments. The physical disk is 0 for not assigned or the physical number (A:=1, B:=2,...) if assigned. The location is 0 for local or the Node ID if remote.

11. Function 127 - Return Last Command Issued

On call: C = 127
On return: HL = Pointer to an image of the last command buffer

This function points to an image of the command buffer. Hence it is possible to DMA to 0080H and later still find the command line.

12. Function 128 - Set Spooler Location

On call: C = 128
A = Node id of spooler, 0 = local

This function changes the path of the QUEUE service to either the local device or a remote device.

13. Function 130 - Get Spooler Location

On call: C = 130

On return: A = Node ID of current spooler

This call returns 0 if the spooler is local or the remote Node ID if the spooler has been assigned to a remote Node.

These calls should only be used by experienced programmers. Careful attention must be paid to specific memory locations which if used, may generate unpredictable results. Used as documented, XBDOS, in combination with OSUB, OXSUB, File Lock, and the entire ULC-OPSnet security scheme, form the base of powerful application potential in a truly distributed processing environment.

XBDOS CALL EXAMPLES

The following is an example of how an application (or system) program can enter a file into the print queue.

;CALL CONVENTION EXAMPLE:

```
LD      HL,FCB2QU      ;FCB TO QUEUE
LD      DE,FCB1       ;ROUTINE USES FCB1
LD      BC,16         ;ONLY FIRST 16 BYTES
LDIR                    ;TRANSFER
LD      A,(COPIES)    ;PLACE # OR COPIES IN A
AND     10H           ;IF SPECIAL FORMS
CALL    QUEIT         ;ENTER INTO QUEUE
AND     A             ;ANY ERRORS?
JP      Z,QOK         ;NO, OK
CP      1             ;REMOTE BUSY OR QUEUES FULL?
JP      Z,QFORB       ;YES
JP      QFULL        ;ELSE QUEUES ARE FULL
```

On entry:

THE FCB TO QUEUE IN FCB1:
IN THE HI 4 BITS OF A ZERO FOR NORMAL FORMS OR ONE FOR SPECIAL
IN THE LO 4 BITS OF A THE NUMBER OR COPIES-1 (I.E. 0 = 1 COPY)

Upon return:

A = 0 - Queue was entered.

A = 1 - Remote station was busy or unavailable, also occurs if
the remote station's queues are full.
A = 2 - The local queues are full.

```
;*****
;*          SET FORMS AND COPIES          *
;*****
```

```
QUEIT: LD      (FCB1+12),A      ;SET FORMS AND COPIES
```

```
;*****
;*          DECIDE TO QUEUE LOCAL OR REMOTE  *
;*****
```

```
LD      C,81H      ;CALL 129 - GET SPOOLER LOCATION
CALL    BDOS      ;GET SPOOLER LOCATION
AND     A          ;TEST A FOR ANY BITS ON
JP      Z,QLOCAL  ;IF A = 0 IT'S LOCAL - ENTER QUEUE
```

```
;*****
;*          SET UP PACKET FOR TRANSMISSION  *
;*****
```

```
;WHERE TO GO
LD      (PDEST),A      ;PRIME PACKET FOR SENDING WITH
;DESTINATION NODE ID
```

```
;WHAT FILE
LD      HL,FCB1      ;FCB1 IS TO FILE TO BE QUEUED
LD      DE,PDATA     ;MUST BE PLACED IN PACKET DATA
LD      BC,16        ;ONLY FIRST 16 BYTES
LDIR    ;PLACE FCB IN Q REQ PACKET
```

```
;WHAT USER
LD      E,0FFH      ;E MUST BE 0FFH TO RETURN USER #
LD      C,32        ;CALL 32 - GET/SET USER #
CALL    BDOS        ;FETCH OUR USER #
LD      (PUSER),A   ;SAVE USER ID IN PACKET
```

```
;WHAT PHYSICAL DEVICE
LD      A,(PDATA)    ;FETCH LOGICAL DEVICE FILE IS ON
LD      C,07EH      ;CALL 126 - DEVICE TRANSLATE
CALL    BDOS        ;CHANGE LOGICAL TO PHYSICAL DEVICE
LD      A,(HL)      ;FETCH PHYSICAL DEVICE
LD      (PDATA),A   ;REPLACE WITH PHY DEV:
```

```
;WHERE THE FILE IS TO PRINT
INC     HL          ;BUMP TO DEVICE LOCATION
LD      A,(HL)      ;GET NODE ID OF DEVICE
AND     A          ;TEST A FOR ANY BITS
JR      Z,RESEND    ;IF LOCAL OPSNET WILL PLACE OUR
;NODE ID IN AUTOMATICALLY
LD      (PSOURC),A  ;IF REMOTE OVERRIDE WITH REMOTE NODE
;ID SO THE SPOOLER WILL LOOK THERE
```

```

;*****
;*   TRANSMIT PACKET AND WAIT FOR ACK   *
;*****

```

```

XOR    A           ;ZERO A
LD     (RTRY),A   ;ZERO RETRY COUNTER

```

```

RESEND: LD     A,2           ;STX PROTOCOL
        LD     C,07CH       ;CALL 124 - SEND PACKET
        LD     HL,PACKET    ;POINT AT BUILT PACKET
        CALL   BDOS         ;TRANSMIT IT OVER THE NET

```

```

RERCV: LD     C,07DH       ;CALL 125 - RECEIVE PACKET
        CALL   BDOS         ;GET ACK

```

```

CP     1           ;ADR PROBLEM?
JR     Z,RERCV    ;YES, WAIT
CP     2           ;TIME OUT?
JR     NZ,CHKACK  ;NO, GOOD PACKET - GO CHECK IF ACK

```

```

LD     A,(RTRY)   ;GET RETRYS
INC    A          ;COUNT ANOTHER
LD     (RTRY),A  ;UPDATE
CP     5          ;TOO MANY?
JR     NZ,RESEND ;NO, RETRY

```

```

LD     A,1        ;FLAG QUEUES FULL OR OTHER NODE BUSY
RET

```

```

RTRY:  DEFB      0           ;RETRY COUNTER DEFINITION

```

```

;*****
;*   ACK PACKET CAME MAKE SURE IT'S CORRECT   *
;*****

```

```

CHKACK: LD     DE,7        ;ADD OFFSET FOR PACKET TYPE
        ADD    HL,DE       ;GET PACKET TYPE
        LD     A,(HL)      ;ACK?
        CP     103         ;NO, TRY AGAIN
        JR     NZ,RESEND

```

```

XOR    A          ;GOOD QUEUE
RET    ;DONE, RETURN TO CALLER

```

```

;*****
;*   SECTION TO ENTER A LOCAL QUEUE REQUEST   *
;*****

```

```

QLOCAL: LD     C,67H       ;CALL 103 - GET QUEUE BLK ADR
        CALL   BDOS         ;FETCH FIRST QUEUE ENTRY ADDRESS
                               ;IN PAIR HL

```

```

;*****
;*      FIND AN EMPTY QUEUE ENTRY      *
;*****

```

```

FINDQ:  PUSH    HL          ;SAVE IN CASE THIS ONE IS EMPTY
        INC     HL          ;BUMP TO FILENAME OF QUEUE
        LD      A,(HL)      ;FETCH 1ST CHR OF FILENAME
        AND     A           ;TEST ANY BITS IN A
        JR      Z,QFULL     ;END OF LIST, QUEUES ARE FULL
        CP      20H         ;EMPTY ENTRY? *****
        JR      Z,ENTERQ    ;YES, GO ENTER QUEUE * NOTE: ADR *
                          ;*****
                          ;* OF EMPTY ENTRY PUSHED ON STACK *
                          ;*****
        POP     HL          ;NOT THIS ONE
        LD      DE,24H
        ADD     HL,DE        ;BUMP TO NEXT ONE
        JR      FINDQ       ;KEEP LOOKING

```

```

;*****
;*  MODIFY FCB FOR QUEING AND ENTER THE QUEUE *
;*****

```

```

ENTERQ: LD      E,0FFH      ;0FFH MEANS RETURN USER #
        LD      C,32        ;CALL 32 - GET/SET USER #
        CALL   BDOS         ;GET USER ID
        LD      (FCB1+13),A ;SAVE USER ID IN FCB FOR QUEUER
        LD      A,(FCB1)    ;FROM DISK WHATEVER
        LD      (FCB1+14),A ;SAVE LOGICAL DISK FOR QUEUER
        XOR     A           ;LOCAL IS ZERO IN A
        LD      (FCB1+15),A ;TELL QUEUER IT'S A LOCAL REQUEST
        LD      HL,FCB1     ;POINT AT FCB TO QUEUE
                          ;*****
        POP     DE          ;***** POP QENTRY ADDRESS *****
                          ;*****
        LD      BC,16       ;ONLY 16 BYTES NEEDED
        LDIR                    ;QUEUE FILE LOCAL
        XOR     A           ;GOOD RETURN CODE
        RET                      ;BACK TO CALLER

```

```

QFULL:  LD      A,2         ;QUEUES ARE FULL RETURN CODE
        RET                      ;BACK TO CALLER WITH BAD NEWS

```

```

;*****
;*  SKELETON OF QUEUE REQUEST PACKET      *
;*****

```

```

PACKET: DEFB    0           ;REQUEST PACKET
PDEST:  DEFB    0,0,0       ;ADR OF SPOOLER
PSOURC: DEFB    0,0,0       ;OUT ADR
PTYPE:  DEFB    102         ;THIS IS A QUEUE REQ
PLEN:   DEFW    19          ;LENGTH OF DATA
PDATA:  DEFS    16          ;QUEUE REQUEST DATA
        DEFB    0,0
PUSER:  DEFB    0           ;USER ID OF REQUESTER

```


CHAPTER 9

SUMMARY OF COMMANDS AND ERROR MESSAGES

COMMAND SUMMARY

The command structure of ULC-OPSnet is very similar to CP/M's command structure. "TSP's", or Transient System Processes, overlay the contents of TPA; "RSP's", or Resident System Processes, are commands which remain memory resident and do not affect the program in the TPA. Some of the TSP's are contained in the generalized utility modules, UTIL.COM and NETUTIL.COM. Others, like SEND.COM, QUEUE.COM and LOG.COM, are stand alone programs which will run only under the control of ULC-OPSnet. The major differences between CP/M commands and ULC-OPSnet commands are:

1. ULC-OPSnet has many more commands than CP/M.
2. CP/M commands are enhanced to run in the network environment.

CLASSIFICATION OF COMMANDS

ULC-OPSnet supports three types of commands:

- 1) The General Commands.
- 2) The Enhanced CP/M Commands.
- 3) The Network Commands.

The General Commands are subdivided into:

- 1) The queue/spool commands.
- 2) The information commands.
- 3) The system commands.

The queue/spool commands are:

ASSIGN LST:	-	Assign the LST: device to a disk file.
FINISH	-	Finish (close) the disk file the LST: was assigned to.
QON	-	Enables printing from remote stations.
QOFF	-	Disables printing from remote stations.
QUEUE	-	Queuer/spooler control.
SPOOL	-	Assigns node address for spooled output.

The information commands are:

CORE	-	Tests and displays the available TPA.
FIND	-	Finds the logical disk location of file(s) requested from assigned disks.
OHELP	-	Displays help information on commands.
WHO	-	Displays information about other nodes on ULCnet. (Gatekeeper command)

The system commands are:

GET - Loads a .COM program file.
INITIALIZE - Initializes (resets) the disk system.
LOGIN - Gain access to ULC-OPSnet.
LOGOUT - Give up access to ULC-OPSnet.
OVOFF - Turns off automatic .OV? search.
OVON - Turns on automatic .OV? search.
PROTECT - Change file attributes.
QUEUE -
REACT - Assigns USER [ID]'S, Passwords, and Privilege Levels.
R - Run a .COM file from system area of a Named disk.
RUN - Run a .COM file in user area of a Logged disk.
START - Executes last .COM program loaded.
TTY - Set terminal parameters for message display.
ULCOPS - Loads the Workstation operating system.
ULCOPSG - Loads the Gatekeeper operating system.

The Enhanced CP/M Commands are:

COPY (PIP) - Peripheral Interchange Program; operates on physical and logical devices.
d: - Change default (logged) disk.
DIR - Displays file directory information.
ERA - Delete file(s).
OSUB - Group commands (submit) for batch processing. Equivalent to CP/M SUBMIT.COM.
PSUB - SUBMIT COMMAND which may be used within Wordstar.
OXSUB - Obtain variable parameters for submitted commands from command line.
RENAME - Renames a file.
SAVE - Saves user memory image to .COM file.
STAT - List system statistics.
SUBMIT - (same as OSUB).
TYPE - Type file to CRT.
USER - Change user areas.

The Network Commands are:

ASSIGN - Assign, reassign or deassign disk devices.
INET - Initializes network and assigns node ID.
LOCATE - Changes logical station location.
MAIL - Transmits file to remote station's MAIL file in named USER [ID].
SEND - Transmits message to remote console device.
SPOOL - Selects station for spooling operations.
WHERE - Displays device assignments and locations.

Forms and examples of each command follow:

ASSign A: ;Deassigns A:
ASSign C:=G: ;Reassigns C: to be G: locally
ASSign D:=A:5 ;Assigns D: to physical A: on node 5
ASSign LST:=D:FOO.LPT ;Assigns allLST: output to file
D:FOO.LPT
;Use the FINish command to close the
file and assign LST: to LST:

CORE ;Display available TPA

COPY A:DOG=C:CAT ;Copy C:CAT to A: and name it DOG
COPY XX.FUN=C:FOO,F:XX ;Copy C:FOO, then F:XX to A: and name
entire file XX.FUN.

Directory ;Show all files on the default disk
Directory A: ;Show all files on disk A:
Directory *.COM ;Show all .COM files on the default disk
Directory *.DOC/W ;Show a detailed directory for all .DOC
files

Directory B:/P ;Show all files on disk B: and Print
the directory locally

ERase B:*.BAS ;Erase all files on logical B: disk with
the extension .BAS

FIND *.ASM ;Search the active USER [ID] of all disk
drives currently in WHERE table for all
files with the .ASM extension

Finish ;Closes spooled LST: file and assigns
LST:= [Current I/O Byte]

Get EDITOR ;Load EDITOR.COM into the TPA

INET XEROX 8 ;Initialize network for a XEROX computer,
node 8
INET KAYPRO K ;Initialize network for a KAYPRO com-
puter, node K
INET TV 3 ;Initialize network for a TELEVIDEO
computer, node 3

Initialize ;Reinitialize the disk system; used when
changing diskettes (BDOS call 13)

LOCate ;Locate devices local
LOCate 7 ;Locate devices at node 7

LOGin 7 ;Login to system as user 7 (Password
required)

LOGout ;Give up access to the system

MAIL ;Check mailbox
MAIL 52 A:LETTER ;Mail A:LETTER to node 5, USER [2]
MAIL 7 A:LETTER ;Mail A:LETTER to node 7, Sender's
USER[ID]

OHelp or H	;Displays this text
OHelp or H *	;Displays all subjects available
OHelp or H ASSIGN	;Gives information on the ASSIGN command
OSUBmit JUNKDIR	;Submit JUNKDIR. (or if not found JUNKDIR.SUB)
SUBmit X.X A B C	;Submit X.X with A, B, and C for arguments
PSUB PRINTON	;SUBMIT PRINT ON.SUB
OVOFF	;Turn off automatic .OV? search
OVON	;Turn on automatic .OV? search (default condition at LOGIN)
PROtect MYFILE RO	;Protect MYFILE Read/Only
PROtect A:FILE LOCK	;Lock A:FILE
QQueue	;Display queues and spooler status
QQueue FILE.LPT	;Print FILE.LPT to default queue device
QQueue CRT:	;Set spooler device default to CRT:
QQueue ULL:=FOO.LPT	;Spool FOO.LPT to device ULL:
QQueue/Abort	;Stop current file from spooling
QQueue/Eject	;Set printer to top of form
QQueue C:MYFIL/C3	;Spool C:MYFIL and make three copies
QQueue H:TACOS/F	;Spool H:TACOS and set special forms message at current spooler node
QOFF	;Turn off background spooler; print local
QON	;Turn on background spooler; (default condition at LOGIN)
R PIP	;Run the PIP.COM program from the logged disk, active USERfirst, then search the A: disk, USER [Ø]
R H:WS	;Run the WS.COM program from the H: disk
REACT	;Establish or reset Passwords, Privilege Levels and USER [ID]'s
REName XYZ=ABC	;Rename file ABC to XYZ
RUn FOO	;Run the FOO.COM program looking to the default disk, active USER [ID] first, then looking to the A: disk, USER [Ø]
SAVE 6 B:XYZ.COM	;Store the contents of the first six records (128 bytes each) of the TPA on drive B: and name it XYZ.COMx
SEND 1 MESSAGE	;Send a message to node 1
SEND ALL MESSAGE	;Send a message to all nodes
SPOOL	;Displays spooler location
SPOOL Ø	;Use local spooler and locally attached list device
SPOOL 5	;Use spooler at node 5 andlist device attached to node 5

```

Start                               ;Start execution of the program in the
                                     TPA
Start APPLE PEAR                     ;Start with APPLE and PEAR program
                                     arguments

TTY Crt                              ;Terminal is a CRT
TTY Gag                              ;Don't receive messages if busy
TTY No Gag                           ;Receive a message any time
TTY Tty                              ;Terminal is a teletype

Type J:MYFILE.DAT                   ;Display the contents of J:MYFILE.DAT on
                                     the CRT

User                                 ;Display current user information
User 7                               ;Change user number to 7 (If privileged)

Where                                ;Display device assignments
Where C:                             ;Display C: assignment and location

WHO                                  ;Display information about each node at
                                     the Gatekeeper

Xsub ON                              ;Turns on OXSUB [XSUB active]
Xsub OFF                             ;Turns off OXSUB [XSUB inactive]

```

ERROR MESSAGES

ULC-OPSnet displays a number of error messages under a variety of conditions. These messages together with the probable causes are discussed in this chapter.

One class of error message relates to a .COM file not being found physically on a disk. The message:

```

+-----+
:      ?<Program name>?      :
+-----+

```

is generated when ULC-OPSnet attempts to call a certain program (.COM file) from the disk and is unable to locate that program. Immediately take a directory of the system disk (drive A:) and verify that the particular program name is resident if not, insert the system disk which came with this manual in drive B: and take a directory. If the program is on the drive B: directory, make up a new system disk with both the CP/M files and the ULC-OPSnet files (refer to Chapter 3). The new system disk should remedy the problem. If the particular program is missing from the original ULC-OPSnet system disk, consult your dealer.

The following list describes the most common error messages and their probable causes.

MESSAGE

PROBABLE CAUSES

% Node <ID> is busy
or unavailable.

1. TTY GAG was set at receiving
station.

MESSAGEPROBABLE CAUSES

Retry (Y/N)?

2. CPU is unavailable (bound) at the instant the message was sent.
3. Receiving station is not physically connected to network.
4. Receiving station has not initialized network with INET.

?NET NOT READY

1. Transmitting station is not physically connected to network.
2. Transmitting station has not initialized network with INET.
3. Hardware failure.

?Device X not assigned

A non-assigned device has been specified.

?Unknown system type

Incorrect computer type specified in an INET command.

?File protected

Displayed when an attempt is made to access a file which is protected as private or has been locked and is open.

?No such file(s) as
<file name>

Displayed if specified file does not exist.

?Bad user number
-or
?Bad user #

Displayed if user ID is not in the range 0 to 9 upon LOGIN.

?Not privileged

Displayed if an attempt is made to access a file by a non-privileged user.

% Directory is empty
for DSK <disk ID:
[User ID]>

Displayed if an attempt is made to take a directory of an empty diskette.

?No such files on DSK
<disk ID: [user ID]>

Displayed when an attempt is made to take a directory for a specific file and that file is not found.

?Bad <switch/switches>

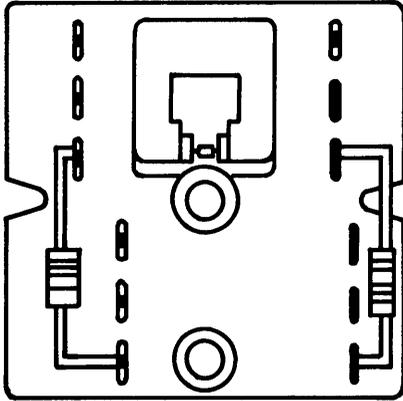
Displayed when a switch other than a "P" or "W" is specified in the DIR command or other than "C", "F", "A" or "E" is specified with QUEUE command.

?Too few arguments

Displayed when an insufficient number of arguments are specified for a given command.

MESSAGEPROBABLE CAUSES

% No info on <subject>	Displayed if a HELP command is entered with a subject for which help is not available.
?Invalid password - Please LOGIN again	Displayed if an invalid password is entered.
<TTY><argument>?	Displayed if an invalid argument is entered with a TTY command.
BAD LOAD	Displayed if the CP/M system is too small to hold ULC-OPSnet.
?The queues are full.	Displayed if an attempt is made to print a file when all 4 queues are full.
?Cannot print a binary file	Displayed if an attempt is made to print a binary file (normally those with a .BIN or .COM extension).
?Device <Dev:> cannot be spooled	Displayed if an invalid device was specified for printing.
%Dir Error	Displayed whenever network traffic causes incomplete or erroneous directories.
?Invalid file attribute	Displayed when the Protect command is used with a wrong attribute.
?Disk or directory full	Displayed when the selected disk is full.
?Form is: 'MAIL' or 'MAIL<node><user> <file spec>'	Displayed when MAIL is used with the wrong attributes.
?Login please	Displayed when an attempt is made to use ULC-OPSnet without logging in.



CONNECT TWO 100 Ω
1/4 WATT RESISTORS
AS SHOWN

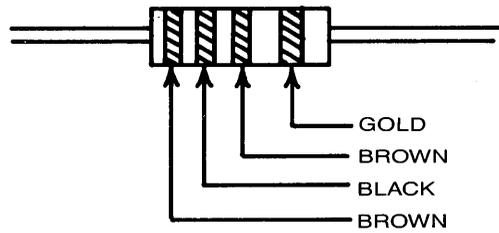
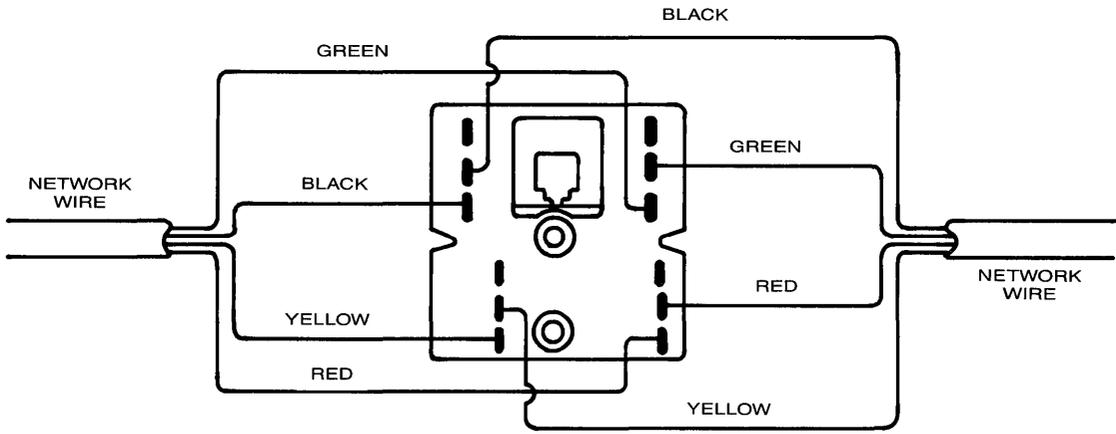


Figure 2-1. Making a Terminated Tap Socket.



KAYPRO INTERNAL

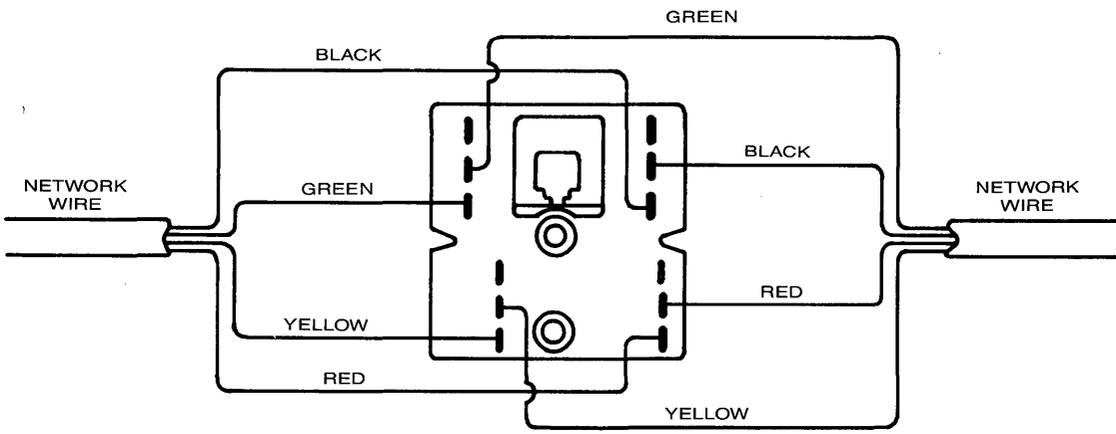


Figure 2-2. Placing a RJ-11 Tap Socket into the Network.

ORIGINAL EXTERNAL BOX TO KAYNET

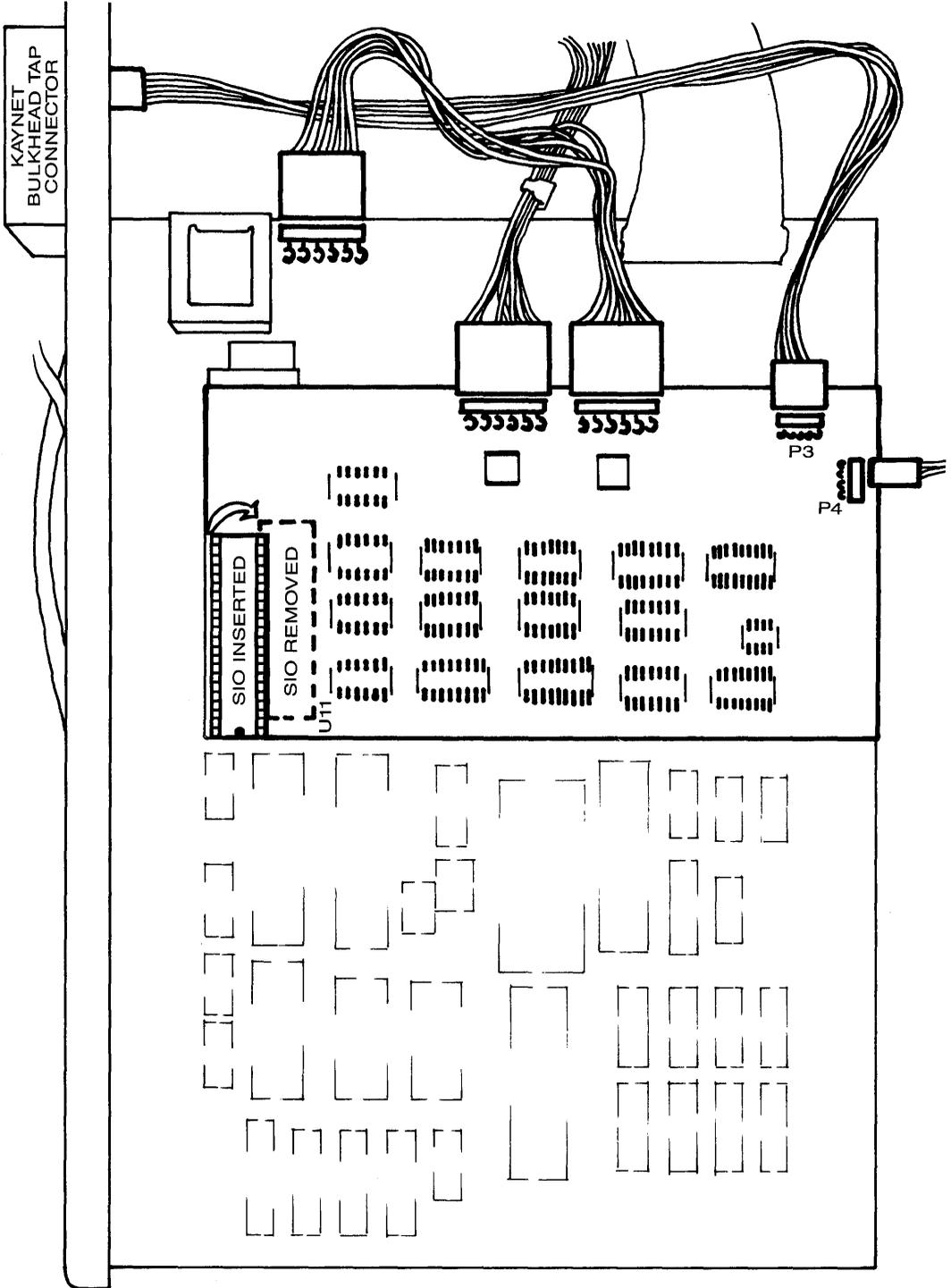


Figure 2-3. Installing the Network Circuit Board.

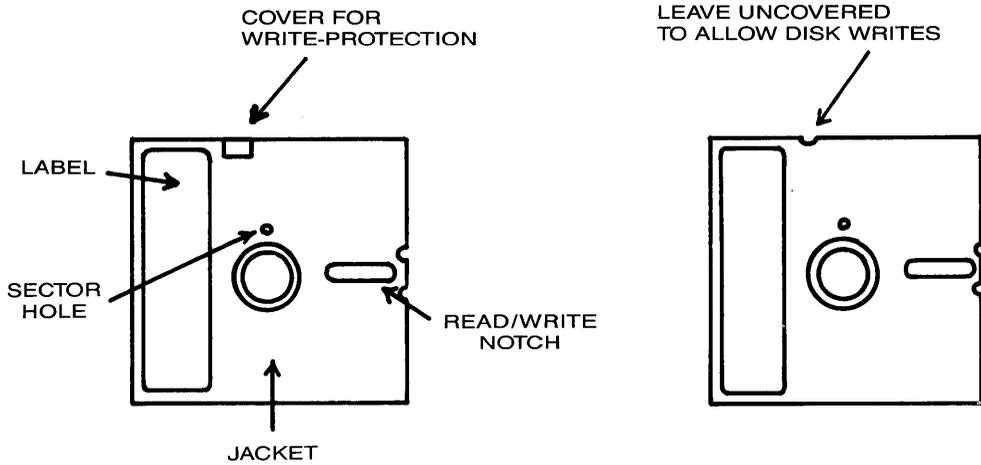


Figure 3-1. Write Protection for a 5 1/4" Diskette.

