INTRODUCTION

NineCom allows communications between an OS-9 based computer system and any remote computer system using a modem or a direct hardwired connection. The remote computer does not have to be an OS-9 computer so NineCom can be used to interface your OS-9 system to timesharing systems, information utilities, videotex services, etc.

NineCom works by interchanging data between your terminal and a designated I/O port which is connected to the remote system. NineCom can transmit text files from your system to the remote system or can store incoming data from the remote system on a disk file on your system.

INSTALLATION

The NineCom program file called "ninecom" should be copied onto your system's CMDS directory so it can be run simply by typing the program name.

THE COMMUNICATIONS INTERFACE HARDWARE

NineCom is designed to communicate with a remote system using an an RS-232 serial port. Most OS-9 Level One systems have an extra serial port with the device name "/T1", which will be used in all examples in this manual. However, any other compatible I/O port can also be used.

You must make sure that the I/O port to be used is properly wired to the modem or remote computer and is set to the correct baud rate. If you are connecting two computer using a hardwire connection you may need a "null modem" device. You can use NineCom to help test your connections.

The default configuration of your terminal and the I/O port (as given in device descriptors and displayed by the TMODE command) are not important to NineCom the configuration is automatically set by NineCom to appropriate values.

IMPORTANT NOTES

1. The communications port and your terminal **must** be interrupt-driven for NineCom to work properly (almost all OS-9 serial I/O ports are normally interrupt-driven).

2. Your terminal must be able to operate at a baud rate equal to or faster than the communications port baud rate.

3. You may discover a maximum speed at which your OS-9 system can receive data without "dropped characters" or read errors. The maximum data rate depends on CPU clock speed, the type of I/O interface, and the number of active tasks on the system.

RUNNING NINECOM

The command used to call NineCom is:

ninecom <devicename> [<memsize>]

The parameter <devicename> is the name of the communications I/O port to be used during the session. You must give this name or a fatal error message will be be displayed and NineCom will abort. The <memsize> parameter is optional and may be used to increase the size of the file download buffer which is discussed later. Here are some example command lines which call NineCom:

```
ninecom /t1

ninecom /t2 #20k

ninecom /modem
```

After you run NineCom, you should see the following message:

```
% NineCom   Copyright 1983 Microware
% Type CTRL-Y for help
% You are on line.
```

Notice the %"character at the left side of each line. NineCom always puts it at the beginning of any message it gives you so they are not confused with data from the remote computer.

At this point, your terminal is directly connected to the communications port. This is called "communications mode" which is one of NineCom's two modes. At this time you should dial the remote system if you are using a modem. If you are using a hardwired connection or after the modem connection is made you may immediately perform any log-in procedure that may be required by the remote system.

COMMUNICATIONS MODE

In communications mode, all data sent by the remote computer is immediately displayed on your terminal, and anything you type on your keyboard is immediately transmitted to the remote system. Communications both ways is done on a character-by-character basis.

The usual OS-9 keyboard control keys (such as backspace, line delete, etc.) **do not** work within NineCom. Also your "Tmode" settings (such as echo, auto line feed, screen pause, etc.) also do not apply within NineCom. Instead, your terminal will respond only to the control characters supported by the remote system except for two special NineCom control keys:

CONTROL Y displays a help menu

CONTROL Z switches to Escape Mode

All other control keys are passed directly to the remote computer for processing without interference by NineCom or OS-9.

Similarly, all data recieved from the remote system passed directly to your terminal except for ASCII null (hex 00) and rubout (hex 7F) characters which are disposed of.

This "transparency" of data transmission eliminates possible conflicts between terminal control functions of OS-9 and the remote computer system.

ESCAPE MODE

Escape Mode is entered from Communications Mode any time you type a CONTROL-Z key. It is used to give commands to NineCom without sending data to the remote system.

While you are in Escape Mode the data link is kept open, but it is always wise to halt any output from the remote system before entering Escape Mode to prevent possible data loss. Most computers stop output when they recieve a CONTROL-S (X-OFF) character and resume output when a CONTROL-Q (X-ON) is recieved.

A summary of the Escape Mode commands are shown below:

C - Upper case only lock on/off
D - Download file from remote system
F - Full Duplex Mode (Keyboard echo off)
H - Half Duplex Mode (Keyboard echo on)
R - Return to Communications Mode
S - Run OS-9 Shell Command
U - Upload File to Remote System
Q - Quit NineCom Program
? - Display Help Menu

When you enter Escape Mode, NineCom will display the following message:

% Enter command or ? for help:

You can then enter any of the command codes in upper or lower case. The R command can be used to return to Communications mode at any time. If an error occurs in an Escape Mode Command, an error message will be displayed along with the corresponding OS-9 error number.

Case Lock

The C command will alternately turn the upper case lock on and off. When the case lock is on, all lower case characters recieved from the remote system are automatically converted to upper case. Characters sent from your keyboard are **not** converted. The default setting is off.

Half/Full Duplex

Most computers automatically echo back characters from the terminal keyboard to the display screen. This is referred to as "full duplex" operation. A few systems do not echo characters back so the terminal must echo locally. This is known as "half duplex" operation. The F and H commands allow you to select the appropriate mode for the system you communicate with. The default setting is full duplex, but if the remote

system responds to your input but what you type is not shown on the screen, you should switch NineCom to half duplex.

Return to Communications Mode

The R command is used to leave Escape mode to resume communications with the remote system.

OS-9 Shell Command

The S command can be used to run any OS-9 command or program. After the S command is recieved, NineCom will prompt you for a command line as follows:

```
% Enter command or ? for help: S
% Shell command: dir

   directory of .  11:56:19
questions       mail            notes           members
seesion1        session2

% Enter command or ? for help:
```

If a single **RETURN** key is entered for the shell command, a shell is started that can accept multiple commands. An **ESCAPE** (EOF) key will exit this shell and return to NineCom.

Quit Command

The Q command closes any open files and terminates the NineCom program. You should log-off the remote system (and hang up the phone line) before using this command.

UPLOADING AND DOWNLOADING FILES

An important feature of NineCom is its ability to transfer data between the remote computer and files on your OS-9 system. The Escape Mode U and D cammands are used for these functions.

"Downloading" refers to copying data from the remote system to a file on your system. The downloaded data can be a text file, the output of a program, or anything else transmitted.

"Uploading" refers to copying data from a file on your system to the remote computer. The data transmitted can be any type of text. Normally, the data file to be transmitted is created with a text editor or generated by a program.

The only restriction on uploading and downloading is that the data **must** be text. Binary files cannot be transmitted because certain bytes would be mistaken for control characters.

Uploading Files

The **U** command is used to upload files. After you give this command, NineCom will ask you for the name of the file to be transmitted. You can then enter the name of any legal OS-9 file name (path list). If NineCom can locate and open the file without error, it automatically switches to Communications Mode and begins sending the contents of the file to the remote system. After the file has been transmitted, NineCom notifies you with a special message.

If the communications link is in full duplex mode (the usual case), you will see the transmitted data echoed back to your terminal. If you want to abort the upload, type **CONTROL-Z** to reenter escape mode, give the **U** command again and type **RETURN** instead of a file name.

Here is a example upload session:

```
% Enter command or ? for help: U
% File name: message.to.tom
Dear Tom,
  I got your message today.  I will be visiting you
on June 12th so we can finalize our plans.  I'm looking
forward to seeing you then.
        Regards,
        Steve
% Upload complete.
```

If you want the remote computer to save the uploaded file, you must give the correct command for that system to store a file before starting the upload. You may also have to give the correct command after the

upload to tell the remote system to close the file. On most computers you can use the system's text editor program to recieve uploaded files if it does not have any other special upload command.

The upload command can also be used to send short commonly used command to the remote system such as log-on sequences, etc.

Downloading Files

The D command is used to download files. After you give this command, NineCom will ask you for the name of the file to be created for holding received data. You can then enter the name of any legal OS-9 file name (path list). If NineCom can open the file without error, it automatically switches to Communications Mode and stores all data received from the remote system on the file. If the communications line is operating in full duplex mode, the data stored will include any data typed on you keyboard that was echoed back from the remote system.

To terminate the download, type **CONTROL-Z** to reenter escape mode, give the D command again, and type **RETURN** instead of a file name.

Here is a sample download session:

```
% Enter command or ? for help: D
% File name: stock.prices
run summary
The Dow-Jones average closed up 7-1/2 points today at
1225 in heavy trading, fueled by Wall Street rumors of
a lower third quarter inflation forecast.
[CTRL-X]
% Enter command or ? for help: D
% File name: [RETURN]
```

Download Data Buffering.

When data is being downloaded, NineCom saves the received text in a memory buffer holds about 3000 characters. When this buffer is full (or when the download is terminated, if earlier) its contents are written to the disk file. The size of this buffer can be automatically expanded if NineCom is given more memory in its OS-9 command line when it is started, for example:

```
OS9: ninecom /t1 #32k
```

The example above will give NineCom a buffer of about 31K characters (NineCom uses about 1K for internal purposes). Just before the contents of the buffer is stored on the disk, NineCom transmits an XOFF character

USING NINECOM TO CONNECT OS-9 SYSTEMS

NineCom is also useful as a way to connect OS-9 computers to each other. It allows for file transfers or use of smaller systems as "intelligent terminals" for larger systems.

Binary files can be transferred easily between OS-9 systems if they are first converted to "S1" hex format using the OS-9 BINEX command before transmission and the EXBIN command after transmission.

Almost all OS-9 Level 1/Level 2 Systems Version 1.2 and later support the XON-XOFF protocol for 6850, 6551, and intelligent IOP type interfaces.

APPENDIX

NINECOM TERMINOLOGY GLOSSARY

BAUD RATE The speed (in bits per second) of a data link. Most common speeds over phone lines are 110, 300, and 1200 baud. Divide baud rate by ten to determine characters per second (i.e., 300 baud = 30 c.p.s).

DATA LINK A communications connection between two computers or between a computer and a terminal.

DOWNLOADING Transmission of data from a remote computer to a file on the local computer.

FULL DUPLEX A transmission mode where data is echoed back over the data link.

HALF DUPLEX A transmission mode where data is not echoed back over the data link.

HARDWIRED A direct wired connection between two devices.

MODEM A device that converts digital data to audio tones for transmission over telephone lines.

NULL MODEM A device that reverses transmit and recieve lines for hard-wired connection of two computers.

UPLOADING Transmission of data from a file on a local computer to a remote computer.

XON a control character (decimal value = 17) which is used to tell a remote system to stop transmitting.

XOFF a control character (decimal value = 19) which is used to tell a remote system to resume transmitting.