

NIAKWA PROGRAMMING LANGUAGE

NOVELL NETWARE ADDENDUM



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PREFACE

This Niakwa Programming Language (NPL) Addendum for Novell NetWare is designed as an addition to the NPL Supplement for MS-DOS. This Addendum discusses the installation, operation, and Novell NetWare specific features of the Niakwa Interpreter and RunTime Program. For more information refer to the appropriate NPL documentation and the Novell NetWare documentation.

P.1 Prerequisite Knowledge

This Addendum assumes at least a basic knowledge of the IBM Personal Computer, the Microsoft Disk Operating System (DOS) Version 3.10 or greater, and Novell NetWare Version 2.10 or greater.

This Addendum also assumes an understanding of the information contained in the NPL MS-DOS Supplement.

P.2 How to Use this Addendum

This addendum should be used by the developer as a guide to understand how to create and modify applications for use with NPL for Novell NetWare.

All chapters should be reviewed thoroughly by the developer. Below is a summary of the topics discussed in each chapter.

Chapter 1 introduces the Novell NetWare RunTime, discusses the Development and Run-Time Package diskette contents, and the specific features of the RunTime under Novell NetWare.

Chapter 2 discusses the installation procedures necessary for NPL under Novell NetWare.

Chapter 3 discusses the exact configuration requirements for NPL under Novell NetWare.

Chapter 4 discusses the differences in device support for NPL under Novell NetWare.

Chapter 5 discusses multi-user capabilities made available under Novell NetWare.

Chapter 6 discusses operating environment-specific language features and settings under Novell NetWare.

Appendix A provides information on the common problems that may occur using the Novell RunTime.

NOTE: This addendum is intended to cover environment-specific differences from the generic NPL information provided in the NPL Programmer's Guide and Statements Guide or the operating system-specific information contained in the main MS-DOS Supplement.

TABLE OF CONTENTS

PREFACE

Prerequisite Knowledge	P-1
How to Use this Addendum	P-1

INTRODUCTION

Overview	1-1
Contents of the NPL Development Package	1-2
Contents of the NPL RunTime Package	1-2
Novell NetWare Specific Features of NPL	1-2

INSTALLATION

Overview	2-1
Novell NetWare and Hardware Requirements	2-2
NPL & NetWare Configuration Requirements	2-3
Novell NetWare Search Path	2-3
Novell NetWare Search Mode Considerations	2-3
NPL Issues	2-5
Recommended Actions	2-5
Multiple File Server Configurations	2-6
Installing the NPL Development Software	2-7
Installing the Development Package	2-7
Installing the NPL BESDK	2-7
NPL RunTime Security for Novell NetWare	2-8
The Security Check	2-8
Network Wide Once-a-Day Security	2-9
Using the Gold Key to Pass Security	2-10
Field-level Resets	2-10
Installing the NPL RunTime Package	2-10
Installing the RunTime Package	2-11
Installing the Security Fingerprint	2-11
Recalling the Security Fingerprint	2-11
Installing the NPL Upgrade RunTime Package	2-12

CONFIGURATION

Configuring Additional Users	3-1
Maximum Number of Users.....	3-1
Unique Terminal Identification.....	3-3
Configuring User's Workstations.....	3-3
Required Access Privileges	3-3

DEVICE SUPPORT

Overview	4-1
Diskimage Files	4-2
Creating or Expanding Diskimage Files under Novell.....	4-2
Printers	4-2
Local Printers.....	4-3
Novell Print Queues	4-3

MULTI-USER CAPABILITIES

Overview	5-1
Device Sharing and Hogging.....	5-2
Read Only Option.....	5-2
Terminal Identification	5-2
#TERM and #PART	5-3
TERMINAL.TBL File.....	5-3
The /T RunTime Startup Option	5-4
#ID Determination.....	5-4
\$NETID	5-6
Inter-Task Communications	5-7
\$PSTAT	5-7
\$BREAK.....	5-7
DATE and TIME.....	5-7
Use of MS-DOS Single User RunTimes.....	5-8

PLATFORM SPECIFIC LANGUAGE FEATURES

Overview	6-1
Environment Specific Statements.....	6-2
\$MACHINE	6-2

\$OPTIONS	6-2
\$PSTAT	6-3
\$SHELL	6-3
Background Partition Support	6-3
Memory Management.....	6-3

COMMON PROBLEMS

Overview	A-1
RunTime Problems	A-1
Problem 1: The message:"Access Denied" appears on the screen when executing the RunTime Program.	A-2
Problem 2: While executing the RunTime Program, the Error Screen appears with the message "/dev/network not ready".	A-2
Problem 3: The message: "Authorized User Limit Exceeded, Ac- cess Denied." appears when executing the RunTime Program. ..	A-2
Compiler Problems	A-2



CHAPTER 1

INTRODUCTION

1.1 Overview

The NPL Addendum for Novell is intended as an aid in the correct installation and use of the NPL Interpreter, Compiler and RunTime Program on IBM-compatible PCs connected to a Novell NetWare 2.x or greater network.

Section 1.2 describes the contents of the NPL Development Package.

Section 1.3 describes the contents of the NPL RunTime Package.

Section 1.4 discusses the main features of the RunTime Program which are specific to Novell NetWare.

1.2 Contents of the NPL Development Package

The NPL Development Package for Novell NetWare is identical to the MS-DOS version. Refer to Section 1.2 of the NPL MS-DOS Supplement for a complete description of contents.

1.3 Contents of the NPL RunTime Package

The Niakwa RunTime Package and Upgrade RunTime Package for Novell NetWare are identical to the MS-DOS packages. Refer to Section 1.3 of the MS-DOS Supplement for a complete description of contents.

1.4 Novell NetWare Specific Features of NPL

The NPL RunTime Package for Novell NetWare on IBM-compatible PCs supports multi-user operation on PCs connected together in a Novell NetWare network. Multi-user features include:

- The ability to identify workstations (individual PCs) on the network under program control.
- The ability to reserve temporary exclusive access to diskimage files and devices under program control.
- Logic internal to the RunTime necessary to ensure data integrity.
- Provisions for a network wide once-a-day security check by the network supervisor. Refer to Section 2.5.2 for details.

All features specific to MS-DOS, as discussed in the MS-DOS Supplement, are also supported under Novell NetWare. Refer to Section 1.4 of the MS-DOS Supplement for more details.



CHAPTER 2

INSTALLATION

2.1 Overview

This chapter provides instructions for installing the Niakwa Interpretive RunTime (RTI), Non-Interpretive RunTime (RTP), and Compiler (B2C) programs on an IBM-compatible file server running Novell NetWare.

Section 2.2 discusses the configuration requirements, including hardware and operating system requirements for use of NPL on the file server and individual PCs used as workstations.

Section 2.3 discusses required modifications to the CONFIG.SYS file and establishing the alternate search directory under Novell NetWare.

Section 2.4 discusses the installation of the NPL Development Package diskettes.

Section 2.5 discusses the NPL RunTime security mechanism under Novell NetWare.

Section 2.6 discusses the installation of the NPL RunTime package.

Section 2.7 discusses the installation of the NPL Upgrade RunTime Package.

2.2 Novell NetWare and Hardware Requirements

The Novell version of NPL is designed to operate on a Novell network using Novell NetWare 2.10 or greater, with IBM compatible PCs as workstations using PC-DOS or MS-DOS Operating System 3.1 or greater.

NOTE: If an application requires access to more than 15 files at one time, MS-DOS 3.3 must be used. Prior versions of MS-DOS have a maximum open file limit of 20 (NPL uses five open file handles itself).

Any type of file server supported by Novell NetWare may be used, including multiple file server configurations. Any network boards supported by the network software may be used.

Specific hardware requirements that differ from those documented in Chapter 2 of the MS-DOS Supplement include:

- No local hard drive is required. However, a local hard drive can be accessed by NPL.
- One diskette drive must be present on at least one workstation, other than a non-dedicated file server.
- MS-DOS 3.1 or higher is recommended for use with Novell NetWare.
- Novell minimum requirements are NetWare 2.10 or higher.

2.3 NPL & NetWare Configuration Requirements

For proper operation of the NPL Interpreter and RunTime programs, it is recommended that the following modifications be made to the CONFIG.SYS file and Login script file on each PC which will use the RunTime Package. The CONFIG.SYS file is located in the root directory of the disk which is used to boot the PC (this will usually be the hard drive, if present). The Login script file is set up under Novell NetWare using the SYSCON utility.

The CONFIG.SYS file is used by MS-DOS to establish critical default parameters to be used during operation and to load device drivers. Refer to section 2.3 of the MS-DOS Supplement for a detailed discussion of the CONFIG.SYS file.

The LOGIN script file contains commands that are automatically executed whenever one logs into Novell. This allows the automatic setup of an alternate search path. Refer to Section 2.3.1 for a discussion of alternate search paths under Novell NetWare.

2.3.1 Novell NetWare Search Path

The installed NPL directory (as specified with NIAKWA_RUNTIME) must be established in the Novell search path for each workstation which will be using the RunTime. An alternate search path is the directory in which NetWare searches for executable programs and other files, should it not find the desired program in the currently selected directory. The RunTime Programs (RTP.EXE and RTI.EXE), compiler program (B2C.EXE) and all batch files used to invoke these programs should be located in the same NPL directory so that they can be executed by NetWare even if the current directory is not set to it.

Search paths may already exist in the Login script file. If so, then additional entries may be added to the Login script file. Refer to the Novell NetWare documentation for details on how to set search paths using the NetWare Login script (this varies by NetWare revisions).

Novell NetWare Search Mode Considerations

The following provides an in depth discussion of the use of the Niakwa Programming Language with NetWare's search command option versus those of MS-DOS.

When file name specifications are used that have no specific drive or path designation (e.g., "FILENAME.EXT"), there is an incompatibility between the results returned to programs by Novell NetWare compared to MS-DOS when a program attempts to open the file and it does not exist in the default directory on the current drive.

Under MS-DOS, the file open fails, returning an error code to indicate the file does not exist.

Under Novell NetWare, the operating system may decide to search for the file in other locations. If the file is found, a code indicating a successfully opened file is returned. Novell NetWare only returns an error code if the file is not found in any of the alternate search locations.

The other locations searched under Novell NetWare depend on the current SEARCH MODE. There are eight different search modes, documented under the SMODE command (Command Line Utilities) and under the SEARCH MODE configuration file options (Supervisor Reference Appendix B).

The search mode used by any particular executable file stored on the file server (e.g., RTI.EXE) can be set by the SMODE command. This does not apply to executables stored on local drives.

The default search mode value is 0, which causes NetWare to use a value that can be specified in the user's SHELL.CFG file used at NetWare's start up. If no value is specified in SHELL.CFG, the default value used is 1.

Search Mode 1 causes Novell NetWare to look at all mapped search drives if a file is opened that does not exist in the current directory and the current drive is a network drive.

Search Mode 2 causes Novell NetWare to look only at the default drive -- this mode is fully compatible with MS-DOS.

For example:

```
Current drive\directory is D:\LOGIN (K: is a network drive)
PATH is Z:.
There is NO file "README." in the current directory
There IS a file Z:\README
Using MS-DOS 3.30 COMMAND.COM shell, and Novell's EMSNET3.COM shell
```

The command:

```
TYPE README
```

displays the Z:README file.

However, the command:

```
TYPE .\README
```

displays a "File not found" message as expected.

NPL Issues

It is unlikely that the automatic searching of paths will be useful to Niakwa RunTime users and could pose a potential hazard to applications, especially if a large number of mapped drives are in the search path.

For example:

Current drive\directory is K:\LOGIN (K: is a network drive)

PATH is Z:

There is NO file "PLATTER1.BS2" in the current directory

There IS a file Z:PLATTER1.BS2

The program fragment:

```
10 DIM A$256
   :$DEVICE(#0)="PLATTER1.BS2"
   :DATALOAD BAT(0)A$
   :ERROR DO
   : SCRATCH DISK T LS=1, END=99
   :ENDDO
30 REM
```

intends to use an existing "PLATTER1.BS2" diskimage in the current directory or create a new one if necessary, but would effectively find and use Z:PLATTER1.BS2! This could cause problems if the "current directory" is supposed to be different for different users.

Recommended Actions

For all copies of the Niakwa RunTime installed on the network drive, use the SMODE command to set the search mode for the RunTime to mode 2 (fully MS-DOS compatible).

For example:

```
SMODE K:\BASIC2C\RTI.EXE 2
SMODE K:\BASIC2C\RTP.EXE 2
SMODE K:\BASIC2C\B2C.EXE 2
```

If any users have copies of the RunTime on local drives (e.g., for faster program start up), the SMODE command cannot be used on these local copies. Here, the recommended action is to add the following lines to the SHELL.CFG file (used when the network shell is started) for those users:

```
SEARCH MODE = 2
```

NOTE: This may effect applications other than the Niakwa RunTime if those other applications depend on the Novell NetWare search mode extension to work.

Under MS-Windows, the programs RTIWIN.EXE and RTPWIN.EXE are loaded and executed as protected mode applications by the MS-Windows kernel. This does not recognize the SMODE settings, consequently there is no point in setting SMODE bits when using RTIWIN.EXE or RTPWIN.EXE. All applications in the windows session use the search mode associated with the WIN.COM program, which is the parent executable and was loaded by MS-DOS. The search mode could also be inherited from a program chained to by WIN.COM, such as SYSTEM\DOS.EXE (which runs in MS-Windows real, standard, or 386 mode). Only adding the SEARCH MODE= 2 line to the user SHELL.CFG files works for the MS-Windows RunTimes.

2.3.2 Multiple File Server Configurations

Some network configurations under Novell NetWare may have multiple file servers. Each file server has a unique name. If logical drive designations are established, they must be unique within the multiple file server environment.

We recommend that the directory containing NPL software be located on only one server. Furthermore, being logged into that server when executing the NPL software is required. However, application programs and data may be located on servers other than the one containing the NPL directory. Other servers can be accessed by use of the unique drive designation.

For example, if selected to drive F: (which is mapped to a volume on the file server containing NPL), and the RunTime Program is to execute a boot program in the \AP directory of a second file server (drive S:), could be done by entering:

```
RTI S:\AP\APBOOT
```

This executes the RunTime Program from the \BASIC2C directory on drive F: and instructs the RunTime to load and execute the startup boot program APBOOT located in the \AP directory on drive S:, which is the second file server.

This is only one possible method of accessing programs and data stored on a file server other than the one where NPL is located. Many choices are available, including using BOOT programs stored on the primary server with \$DEVICE statements including drive designations pointing to another server. The method best suited to the application depends on the requirements and the nature of the specific installation.

2.4 Installing the NPL Development Software

The installation of the NPL Development Software under Novell NetWare is identical to that documented in Section 2.4 of the MS-DOS Supplement, with the exception of the drive designations used.

The following installation instructions assume that the installation is being performed from a workstation logged in as SUPERVISOR and "A:" is the drive letter of the diskette drive and "F:" is the drive letter mapped to the file server volume. If the drive designations are different on the system being used, be sure to use the proper drive designations instead. These instructions also assume that the directory \NPL is the chosen name.

2.4.1 Installing the Development Package

Refer to Section 2.4.1 of the MD-DOS Supplement.

2.4.2 Installing the NPL BESDK

The BESDK diskette (NPL, formerly Basic-2C, External Subroutine Development Kit) has a separate installation procedure described in Chapter 11 of the MS-DOS Supplement.

2.5 NPL RunTime Security for Novell NetWare

The NPL RunTime Security for Novell NetWare consists of the same components as described in Section 2.5 of the MS-DOS Supplement. Differences related to Novell NetWare are outlined below.

2.5.1 The Security Check

The security check under Novell NetWare differs from the MS-DOS implementation. The logic flow under Novell NetWare is as follows:

1. The Network Wide Once-a-Day driver (refer to Section 2.5.2) is checked to see if security has been previously passed for that day. If security has been passed, execution continues, if not, the standard security checks take place as shown below.
2. If the NPL_SECURITY variable is set to a drive letter (A-Z), then only that drive is used for the security check. NPL does not check the current drive, the NIAKWA_RUNTIME directory, or drive C in this case. If security fails on the indicated drive, the "Mount Gold Key" screen is displayed. If this screen displays, refer to step #6 below.
3. If the NPL_SECURITY variable is not set, then the current drive is checked first for hard disk protection. If hard disk protection is found, execution continues.
4. If the hard disk protection check fails on the current drive, the drive specified in the NIAKWA_RUNTIME environment variable is checked for hard disk protection. If hard disk protection is found, execution continues.
5. If the hard disk protection check fails on the drive specified by the NIAKWA_RUNTIME environment variable, the C: drive on the executing workstation is checked for hard disk protection. If hard disk protection is found on the C: drive, execution continues.
6. If the hard disk protection check fails, the "Mount Gold Key" screen displays. The security check can then be performed from any available drive (A-Z) containing the protection. The default drive is A:. The security check is then performed on the specified drive. If protection is found, execution continues. Refer to Section 2.5.3 for details on the diskette-based security check.

7. If the security check fails, the "Mount Gold Key" screen is redisplayed.

If an error occurs reading the NIAKSER.DAT file, an error code is displayed. Refer to Section 2.5 of the MS-DOS Supplement for information on possible error codes and causes.

NOTE: For Novell installations, an error of 0 or 1 may indicate that the user does not have Read or Open (or File Scan under NetWare 3.xx or greater) access to NIAKSER.DAT. All users must have Read and Open (or Read and File Scan under NetWare 3.xx or greater) access to NIAKSER.DAT as well as Read, Open and Search (or Read and File Scan) access to the NPL and \LOGIN directory. Refer to Section 3.2 for further details on required access privileges for users.

In addition, the RunTime will generate an error message if the internal revision level in the RunTime does not match the revision level contained in NIAKSER.DAT.



Attempting to perform the security check on a non-dedicated file server will likely cause the system to hang. Non-dedicated file servers are not supported as a workstation for use with NPL

2.5.2 Network Wide Once-a-Day Security

In the event that the installed Gold Key security is lost or damaged, a network-wide "Once-a-Day" security feature can be used to avoid requiring each user to use the Gold Key diskette (to pass security). This feature is built in to the RunTime package and does not require any special installation steps. The network wide security feature requires that the first workstation to execute the RunTime after booting the system must be logged in as SUPERVISOR and must have a diskette drive (other workstations do not need a diskette drive and do not need to be logged in as SUPERVISOR). If security is passed in this manner, the security check is passed for that day--subsequent executions of the RunTime, for that day, will not invoke the security check procedure.

NOTE: The Network Wide Once a Day security check will be reset if the file server is re-booted or shut off. This will cause the RunTime program to again check for valid security.

2.5.3 Using the Gold Key to Pass Security

If the network wide Once-a-Day security feature is not used, or is unavailable, security may still be passed using the Gold Key diskette. The Gold Key may be used by any workstation with a compatible floppy drive.

NOTE: Without the Once-a-Day feature active, every user must insert the Gold Key each time the RunTime is executed.

Use of the Gold Key diskette for passing security is the same as for MS-DOS systems. Refer to Section 2.5.9 of the MS-DOS Supplement for more details on how to use the Gold Key diskette to pass security.

2.5.4 Field-level Resets

Field-level Resets are performed in the same manner as for MS-DOS. Refer to Section 2.5.10 of the MS-DOS Supplement for instructions on how to perform a Field-level Reset.

2.6 Installing the NPL RunTime Package

Installing the NPL RunTime Package on a Novell NetWare file server is very similar to installing the standard MS-DOS RunTime Package documented in Section 2.6 of the MS-DOS Supplement. When finished, all systems software necessary for execution of the RunTime will be in a directory on the file server. The Development Package must still be installed to facilitate development of application programs. The installation of the NPL Development Package is covered in Section 2.4.

NOTE: For installations with multiple file servers, NPL software should be installed on only one file server, refer to Section 2.3.2 for details.

The following installation instructions assume that the installation is being performed from a workstation logged in as SUPERVISOR and "A:" is the drive letter of the diskette drive and "F:" is the drive letter mapped to the file server volume. If the drive designations are different on the system being used, be sure to use the proper drive designations instead. These instructions also assume that the directory \NPL is the chosen name.

2.6.1 Installing the RunTime Package

Refer to Section 2.6 of the MS-DOS Supplement.

2.6.2 Installing the Security Fingerprint

Refer to Section 2.6 of the MS-DOS Supplement.

NOTE: The program which is called by NIAKINST will place the Security Fingerprint into the \LOGIN directory. Therefore, all users must have Read, Open and Search (or Read and File Scan) access privileges to the \LOGIN directory. Refer to Section 3.2 for further details on required access privileges for users.

The Gold Key security must be installed to an actual drive, not a mapped drive.

If any problems occur during installation, refer to Appendix A, "Common Problems", for help.

NOTE: This installation must be performed under the SUPERVISOR login. No other logins will work, even with supervisory equivalence.

2.6.3 Recalling the Security Fingerprint

Recalling of security is the same procedure as described in Section 2.6.8 of the MS-DOS Supplement. However, this must be performed by the network SUPERVISOR (supervisory equivalences are not acceptable) from a network workstation.

2.7 Installing the NPL Upgrade RunTime Package

The concept of the Upgrade RunTime Package is the same as that for MS-DOS. Refer to Section 2.7 of the MS-DOS Supplement for more details on installing the Upgrade RunTime Package. Specific Novell considerations are outlined below.

- Installation must be performed when logged in as SUPERVISOR. No other logins, even with supervisory equivalence, will work.
- Copy the Upgrade RunTime files to the file server before executing the upgrade procedure.



CHAPTER 3

CONFIGURATION

3.1 Configuring Additional Users

The Novell NetWare operating environments are designed to support multi-user configurations. When using the NPL RunTime under Novell NetWare, there are several configuration requirements which should be considered. A discussion of those requirements follows:

3.1.1 Maximum Number of Users

The maximum number of users able to invoke the RunTime at any given time is shown on the Gold Key diskette label.

RunTime programs are available to support:

- 1 user
- 1-4 users
- 1-8 users
- 1-16 users
- 1-32 users
- 1-64 users
- 1-127 users
- 1-255 users
- 1-512 users

The following points apply to the user limit:

- The user limit is dynamic. That is, users are not restricted to using the RunTime Program from specific terminals. Rather, any terminals on the system may be used as long as the total number of terminals in use at any one time does not exceed the limit.
- If the limit is exceeded, a message to that effect is displayed when the RunTime is invoked and execution of the RunTime for that user is aborted.
- Multiple executions of the RunTime (i.e., using a task switcher, RunTime tasks executed in a DOS task under MS-Windows, or \$SHELL, etc.) from the same terminal count toward the maximum number of users. For example, in a four-terminal system with a 1-4 user RunTime, if terminals 1, 2, and 3 are all using the RunTime and one of those terminals has started a second execution of the RunTime, terminal 4 will not be able to execute the RunTime.
- The user limit feature operates on a system-wide basis. For example, if multiple RunTime Packages are used on two remotely connected file servers, the user limit of the lowest RunTime license is enforced. It is not possible to add a second 1-4 user RunTime to a system with a 1-4 user RunTime already installed to achieve 8 users. Instead, the 1-4 user RunTime must be upgraded to the next level. Upgrades to a higher number of users are available. Contact Niakwa or an authorized distributor for details.

- Single-user RunTimes that are installed locally on a workstation may execute without affecting the network-wide user limit. The security check must pass from the workstation's local drive for this to work. Refer to Section 5.5 for more information.

3.1.2 Unique Terminal Identification

Novell NetWare is a distributed logic environment, where multiple PCs share common resources (disks, printers, etc.). For applications to be able to identify users, they must employ the use of some unique identification value. NPL for Novell NetWare provides several mechanisms for establishing unique values for #ID, #TERM, and #PART. Refer to Section 5.3 for details.

3.1.3 Configuring User's Workstations

Each user on a Novell Network requires an IBM compatible PC. Therefore, it is necessary that each user meet the configuration requirements outlined in Section 2.3 of this addendum and Section 2.3 of the MS-DOS Supplement. In addition, where Novell NetWare requirements exceed NPL requirements, the Novell requirements should be considered.

Serial terminals are supported for use with the Redirect feature of the HELP facility. Refer to Section 4.4.9 of MS-DOS Supplement for details on the Redirect feature.

3.2 Required Access Privileges

Novell NetWare provides a complex security system which allows the System Administrator to grant each user "access privilege" to specific directories or files on the network file system. The RunTime can be operated under this security system, providing that the users on the network who need access to the RunTime are granted necessary access privileges to the following directories:

<u>Directory Path</u>	<u>NetWare 2.x</u>	<u>NetWare 3.x</u>
\LOGIN	R O S	R F
\NPL	R O S	R F

The NPL directory can be any name specified at installation.

Where:

R = Read
O = Open
S = Search
F = File Scan

NOTE: R, O, and S (or R, F) are default access privileges for the \LOGIN directory on the SYS: volume. On secondary volumes, the \LOGIN directory is created by the NPL installation, and no rights are granted. Access privileges must be manually granted by the SUPERVISOR.

Lack of proper access to the \LOGIN directory may result in failure of the security check for "installed" security.

Lack of proper access to the \NPL directory may result in failure to be able to execute the RunTime or failure of the RunTime due to inability to access the required files such as NIAKSER.DAT or ENABLED.

Novell NetWare security (not to be confused with the NPL RunTime's Gold Key security) may be used with diskimage files. The RunTime fully respects Novell NetWare's access privileges and will generate an I/O error if illegal access is attempted. For more details on the implementation and use of the Novell NetWare security, refer to the Novell NetWare documentation.



CHAPTER 4

DEVICE SUPPORT

4.1 Overview

This chapter discusses areas where device support under Novell NetWare differs from device support under MS-DOS as documented in the MS-DOS Supplement. Included in the discussion are any special requirements or implications for the programming of NPL code.

Section 4.2 discusses naming conventions for diskimage files.

Section 4.3 discusses the use of printer devices for both local printing and printing to a network print queue.

4.2 Diskimage Files

Diskimage files can be defined as any valid MS-DOS filename in any valid Novell or MS-DOS directory on any valid Novell or MS-DOS drive designation. Any type of physical disk media supported by the MS-DOS operating system on an IBM-compatible PC may be used for the storage of diskimage files. However, there are some special considerations involved in the use of diskimage files on removable media (refer to Section 5.3.4 of the NPL MS-DOS Supplement). All features of diskimage files described in Section 7.3 of the Programmer's Guide are fully supported on IBM-compatible PCs.

4.2.1 Creating or Expanding Diskimage Files under Novell

To circumvent a known bug in Novell Advanced Netware 2.0 standard file allocation routines, the RunTime Program for Novell NetWare includes special provisions to ensure that physical space is properly allocated when diskimage files are created or expanded.

This special provision provides that, whenever a diskimage file is created using SCRATCH DISK or extended using MOVE END, all new sectors on the diskimage are actually being written to. This makes operation of these statements considerably slower than it would be otherwise.

NOTE: The special provisions for SCRATCH DISK and MOVE END have no impact on application programs other than the slower execution speed of these commands.

The RunTime only invokes the special provisions for SCRATCH DISK and MOVE END when executed on a Novell NetWare network. Operation on stand-alone MS-DOS based systems is not affected.

4.3 Printers

Printer support is much the same for Novell NetWare as it is for MS-DOS. Under Novell NetWare, local print output can be directed to the local parallel port, the local serial port, an ASCII file, a standard file handle or a Novell print queue. Because Novell uses a "CAPTURE" utility to trap output to a printer device, this operation is transparent to the RunTime.

4.3.1 Local Printers

Local printers on a workstation are treated the same as a printer on a stand-alone MS-DOS system. Refer to Section 5.5 of the MS-DOS Supplement for information on the support of printers connected to the PC.

4.3.2 Novell Print Queues

Novell supports print spooling to system printers attached to the file server. The print spooler uses the same device names as local printers so no change is required to \$DEVICE statements in order to take advantage of this feature.

For example:

```
$DEVICE(/215)="LPT2"
```

Refer to Section 5.5 of the NPL MS-DOS Supplement for details on specifying device equivalences.

Novell NetWare provides a command to allow normal print output to be directed to the print spooler. This is the CAPTURE (or SPOOL on older versions of NetWare) command. If printing to the print spooler is desired, the CAPTURE command must be issued before any printing. This can be done prior to entering the RunTime Program (using a batch file), or from within the RunTime Program by use of the \$SHELL statement or the MS-DOS function of the HELP processor.

For example, if using \$SHELL, the syntax is:

```
$SHELL "CAPTURE L2 Q=LASER NB NFF TI=15"
```

Where:

L2	Device to capture (LPT2)
Q=	Queue destination for print output
NB	No banner
NFF	No Form Feed
TI=	Timeout (in seconds)

An example of incorporating this command into a batch file would be as follows:

```
REM ** Change directory to \AR **
CD \AR
REM ** set up spooling so that all print output directed **
REM ** to device LPT2 will be directed to the queue "laser" **
CAPTURE L2 Q=LASER NB NFF TI=15
REM ** execute RTP using ARBOOT as "BOOT" program **
RTP ARBOOT
REM ** after leaving NPL return to ROOT directory **
CD \
REM ** END capture so that all output directed to device LPT2 **
REM ** will now print to local parallel port. **
ENDCAP
REM ** clear the screen **
CLS
REM ** all done **
```

The use of the REMark lines is not required for proper execution, but is displayed here for purposes of clarity.

The above are just two of many possible spooling possibilities. For more information regarding Novell NetWare queue parameters, refer to the Novell NetWare documentation.



CHAPTER 5

MULTI-USER CAPABILITIES

5.1 Overview

Multi-user capabilities are available with the Novell NetWare version of the RunTime installed on a Novell NetWare network.

Section 5.2 discusses the sharing and "hogging" of devices through the use of \$OPEN and \$CLOSE operations.

Section 5.3 discusses the NPL statements used to return information identifying each terminal within the multi-user system.

Section 5.4 discusses inter-task communications between workstations within the network.

Section 5.5 discusses the use of the single-user MS-DOS RunTimes on Novell NetWare networks.

5.2 Device Sharing and Hogging

Device sharing and hogging is most commonly performed by use of the \$OPEN and \$CLOSE statements. In some cases, \$GIO statements may also be used. The \$OPEN and \$CLOSE statements are fully implemented and functional with the Novell NetWare version of NPL. \$GIO statements which perform device hogging are not supported.

Refer to the NPL Statements Guide, \$OPEN, \$CLOSE for details on the exact syntax and use of the \$OPEN and \$CLOSE statements.

5.2.1 Read Only Option

For diskimages that are set to read only at the operating system level by use of the DOS ATTRIB +R command, an implicit \$OPEN is not performed on any disk operations. This applies to all other operations for single or multiple sectors. This can improve performance significantly in configurations where a high number of users make frequent read requests to the same diskimage--a program diskimage for example. If a diskimage file's attributes are set in this manner, the diskimage file is no longer be hogged by a single user while data is being read or programs loaded forcing other users to wait to gain access. On multi user systems, this feature yields significant performance increases (Novell 386 NetWare based systems take advantage of the read cache features of 386 NetWare).



WARNING--Diskimages set up in this manner should contain files (program or data) that are not modifiable under program control. If an attempt is made to modify information to a diskimage set up in this manner, the attempt will fail. The attributes of the file must be changed to non-read only (ATTRIB -R command) before changes can be made to this file. The attribute of the file should never be changed while NPL users are accessing the file.

5.3 Terminal Identification

Under Novell NetWare, NPL has the ability to uniquely identify individual workstations through the use of system variables #TERM, #PART, #ID, and \$NETID. This allows multi-user applications to share information, while maintaining data integrity, by having control over individual workstations.

5.3.1 #TERM and #PART

NPL under Novell NetWare allows unique values to be assigned to #TERM and #PART by two methods:

- By the use of a simple lookup file (TERMINAL.TBL) in the default NPL directory.
- By the use of the /T RunTime startup option.

TERMINAL.TBL File

If the TERMINAL.TBL file exists in the default NPL directory, the RunTime scans through the lines of the file until an entry exactly matching the current #ID is located. The line number of this entry then determines the value of #TERM and #PART.

For example, if the #ID value is on the first line, then #TERM and #PART are set to 1; the second line, #TERM and #PART are set to 2; etc. If a workstation's #ID is not found in TERMINAL.TBL then the RunTime refuses to allow the workstation to execute the RunTime and displays the message:

```
Cannot determine terminal number for #ID=xxxxx
```

where xxxxx is the current workstation's #ID value.

Each line of TERMINAL.TBL should contain only one number with no leading or trailing spaces or tabs, and no leading zeroes. No other blank lines or other information should appear in the file.

For example, assuming that TERMINAL.TBL contains the following lines:

```
1234
856
25674
23452
```

Then the following #TERM and #PART assignments would occur:

<u>#ID</u>	<u>#TERM/#PART</u>
1234	1
856	2
25674	3
23452	4

Workstations with #ID values other than those listed in the table above would not be permitted to use the RunTime. Refer to the next section for details of how the values for #ID are determined.

NOTE: If the TERMINAL.TBL is not present, the default value of 1 is returned for both #TERM and #PART.

The /T RunTime Startup Option

The /T RunTime startup option can be used to directly set a workstation's #TERM value. Refer to Section 4.4 of the MS-DOS Supplement for more information.

5.3.2 #ID Determination

NPL under Novell NetWare allows unique values to be assigned to #ID by one of three methods:

- Physical Station address. This is the address which corresponds to the Network Interface Card (NIC) address.
- The BASIC2C_ID environment variable set returned for #ID.
- Use of NETID.TBL (refer to Section 5.3.3 for details).

By default, #ID is determined by the four least-significant digits of the network interface card node address. Using this approach, #ID may have a value between 1 and 65535. It is possible that #ID may be the same for two workstations. Most of today's network interface cards use 8-digit or 12-digit node addresses, and in rare instances, more than one board may have the same last four digits, thus creating identical #ID values. Network terminal concentrators may also produce duplicate address values.

For example,

<u>NIC address</u>	<u>#ID</u>
C0358254	33364
C0A98254	33364

The last four digits "8254" are hexadecimal, and the decimal equivalent is 33364. If it is not possible to override the node address through dip switches or the NET.CFG file, the BASIC2C_ID environment variable may be used to specify a particular #ID value. Developers may also wish to use \$NETID (refer to Section 5.3.3).

Setting the BASIC2C_ID value is optional and is intended to be used where duplicate #ID values have occurred. When it is necessary to use the BASIC2C_ID environment variable, a unique value must be specified that differs from all other generated values, either by the network interface card or other BASIC2C_ID assignments.

The setting of the BASIC2C_ID environment variable is done by using the MS-DOS SET command. It is recommended that this command be placed in the AUTOEXEC.BAT file or Login Script of the workstation. This ensures that a consistent value for #ID is generated from one RunTime session to the next.

To generate the BASIC2C_ID value, add the following line to the AUTOEXEC.BAT file of the each workstation requiring the override generation of the standard #ID.

```
SET BASIC2C_ID=xxxxxx
```

where xxxxx is in the range of 1 to 65535.

The same line in a Novell NetWare Login script would appear as:

```
DOS SET BASIC2C_ID="xxxxxx"
```

where xxxxx is in the range of 1 to 65535, and is in quotes.

For example, on a node which has a physical NIC address of 4323 (which would generate a corresponding #ID value of 4323), which conflicts with another station, entering the following into the AUTOEXEC.BAT file:

```
SET BASIC2C_ID=5
```

would set the #ID value to 5 for this node when the system is booted.

NOTE: No checking for duplicate #ID numbers is performed. It is the responsibility of the developer or installer to insure that the BASIC2C_ID environment variable is used and unique values are assigned to all nodes. Any desired value must be set before executing the RunTime.

The #ID value cannot change once NPL has started.

If the BASIC2C_ID environment variable is not set, then #ID contains the value of the physical terminal number, as described in Section 5.3.1.

5.3.3 \$NETID

\$NETID is an additional system variable that returns the entire 12-byte network interface card node address. The \$NETID variable may be used where any string literals are legal (i.e., PRINT \$NETID). The value contained in \$NETID is equivalent to the node address listed with a USERLIST /A command, except that digits are zeroes, instead of blanks.

It is also possible to set #ID values directly by using the \$NETID values in a configuration table, NETID.TBL, created in the default NPL directory.

Entries in the NETID.TBL file must be in the form:

```
$NETID-code #ID-value [; comment]
```

The \$NETID code must start in the first column of the line and contain all 12 characters (use leading zeroes). The #ID code must be separated by at least one space or tab and be specified in decimal (between 1 and 65535). Comments are permitted, and must start with a semicolon, and be separated from the #ID value by at least one space or tab.

For example:

```
0000000000C3 101 ; Cheryl (Arcnet)
0000C056A44A 102 ; Homer (Ethernet)
0000C0368254 103 ; Julie (Ethernet)
10005A72CCA8 104 ; Bill (Token Ring)
```

NOTE: It is the developer's responsibility to ensure that #ID values assigned to different nodes in this way are unique. NPL does not check for this.

When the NETID.TBL file exists, an entry corresponding to the \$NETID value must be located in the file or the following error occurs:

```
Cannot determine #ID value for $NETID=xxxxxxxxxxxx
```

If the value for #ID is out of range, is not separated from \$NETID with spaces, or is followed by unrecognized non-comment information, the following error is displayed:

```
Configured value for #ID in NETID.TBL is out of range.
```

NOTE: Any value specified by a local environment variable BASIC2C_ID is ignored when the NETID.TBL file is defined.

The assignment of #ID by this configuration file occurs before any assignment of #TERM/#PART from the TERMINAL.TBL configuration file. Refer to Section 5.3.1 for more information on determining #TERM and #PART.

5.4 Inter-Task Communications

Because a Novell NetWare network is a distributed logic platform, tasks are running independently of one another on separate workstations. As such, inter-task communication is somewhat limited.

5.4.1 \$PSTAT

Some NPL applications use \$PSTAT to pass information between partitions. This technique is not effective in a network environment because \$PSTAT is maintained in local memory. That is, the value of \$PSTAT is maintained separately for every workstation on the network.

Refer to the NPL Statements Guide, \$PSTAT, for details on the exact syntax and use of this statement.

5.4.2 \$BREAK

\$BREAK with an expression specified performs no operation under Novell NetWare. This is also related to the fact that Novell NetWare networks are shared logic systems and the RunTime Program is being executed in local memory on each workstation. Therefore, the concept of relinquishing timeslices is meaningless.

5.4.3 DATE and TIME

The NPL DATE and TIME functions operate normally. However, their effect is local to the workstation. That is, only the DATE and TIME on the workstation are set, the network system clock is unaffected. It is recommended that the workstations have their clocks synchronized to the network clock. Refer to the Novell NetWare documentation for details on how to do this. Refer to the NPL Statements Guide, DATE, TIME for details on the use of these NPL functions.

5.5 Use of MS-DOS Single User RunTimes

The single user MS-DOS RunTime can be used on a Novell NetWare network, however, if installed to the file server, only one user on the network may execute it at any one time.

If a single user MS-DOS RunTime is installed locally on a workstation, as long as security is passed from the local hard drive (i.e., C:), NPL does not count this RunTime toward the network user count.

When a single user MS-DOS RunTime is executed in this fashion, all Novell NetWare features described in this addendum are available.



CHAPTER 6

PLATFORM SPECIFIC LANGUAGE FEATURES

6.1 Overview

There are a series of NPL language statements and system environment considerations which are specific to the operating environment in which they are executed. This chapter discusses these language features specific to IBM-compatible PCs operating under Novell NetWare.

Section 6.2 discusses the NPL statements which are particular to Novell NetWare.

Section 6.3 discusses background partition support.

Section 6.4 discusses memory management features available to NPL under Novell NetWare.

6.2 Environment Specific Statements

The following NPL statements are specific to the Novell NetWare operating environment.

6.2.1 \$MACHINE

The \$MACHINE system variable contains information about the hardware environment in which the RunTime Program is executing. Under the Novell NetWare operating environment, the following values are different from those under MS-DOS (refer to Section 8.2.1 in the MS-DOS Supplement):

Byte 6	The number of NPL users in the RunTime before this task executed the RunTime.
Byte 13	The maximum number of authorized users (in binary).
Byte 25,26	Extended field equivalent to \$MACHINE byte 6 (number of active users in the RunTime before this task started). For systems with 256 or more users, these bytes must be used to get an accurate user count.
Byte 27, 28	Extended field equivalent to \$MACHINE byte 13 (maximum number of authorized users). For systems with 256 or more users, these bytes must be used to determine the maximum user count.

NOTE: \$MACHINE is a 64 byte variable. The above bytes are specific to the Novell NetWare RunTime. For a complete description of all bytes specific to MS-DOS or within the \$MACHINE system variable, refer to Section 8.2 of the MS-DOS Supplement or to the NPL Statements Guide, \$MACHINE.

6.2.2 \$OPTIONS

The NPL Runtime allows for the inspection or modification of the \$OPTIONS system variable, which consists of a variety of options. The options available to Novell NetWare are the same as those available on MS-DOS systems. Refer to Section 8.2 of the MS-DOS Supplement for details on specific \$OPTIONS bytes.

NOTE: \$OPTIONS is a 64 byte variable and must be treated as such or unpredictable results may occur. Refer to the NPL Statements Guide, \$OPTIONS, for details on the exact syntax and use of this statement, as well as the contents of the remaining bytes of the variable.

6.2.3 \$PSTAT

Refer to the NPL Statements Guide, \$PSTAT, for details on the exact syntax and use of this statement.

6.2.4 \$SHELL

The operation of \$SHELL under Novell NetWare is identical to that under MS-DOS. Refer to Section 8.2.4 of the MS-DOS Supplement.

NOTE: The COMSPEC must be set to a valid COMMAND.COM file for \$SHELL for function correctly. Refer to the MS-DOS documentation for details.

6.3 Background Partition Support

Background partitions are not supported under Novell NetWare. \$RELEASE TERMINAL performs no operation in this operating environment. For information regarding background partitions, refer to the NPL Statements Guide, \$RELEASE TERMINAL.

6.4 Memory Management

Memory management on workstations under Novell NetWare is much the same as that for stand-alone MS-DOS systems. The only difference is that Novell NetWare workstations require network drivers that may occupy more memory, resulting in less available base RAM for NPL. Refer to Section 8.4 of the MS-DOS Supplement for more information on memory management.



APPENDIX A

COMMON PROBLEMS

A.1 Overview

Many of the problems discussed below relate to the manner in which files and devices are accessed under the Novell operating system.

A.2 RunTime Problems

This section describes specific problems you may encounter in using the NPL RunTime under Novell NetWare, along with possible solutions.

NOTE: All problems documented in Appendix A of the MS-DOS Supplement apply, but, in addition, the user must also have proper access privileges for the default NPL directory and the \LOGIN directory. Make sure that access rights to these directories are Read, Open, and Search (or Read and File Scan). Improper access rights will cause failure of the RunTime. Refer to Section 3.4 for details.

Problem 1: The message: "Access Denied" appears on the screen when executing the RunTime Program.

Proper access privileges are not set for the default NPL directory and \LOGIN directory. Make sure that access rights to the default NPL directory and \LOGIN directory are Read, Open and Search (or Read and File Scan). Improper access rights will cause failure of the RunTime. Refer to Section 3.4 of this Supplement for details.

Problem 2: While executing the RunTime Program, the Error Screen appears with the message "/dev/network not ready".

This is a trap of a Novell Shell error, and usually indicates difficulty with communication over the network. Check the status of the connection on the file server console for more diagnosis of the problem. Refer to the Novell documentation or a Certified NetWare Engineer for assistance.

Problem 3: The message: "Authorized User Limit Exceeded, Access Denied." appears when executing the RunTime Program.

Too many users have logged on to the RunTime for the license installed. Upgrade to the next higher user license, or wait until one of the users logs out.

Multiple RunTimes may be installed or operating on the network. The network-wide user limit takes on the lowest user license installed.

A single-user RunTime executed without the NIAKWA_RUNTIME variable set to the local hard drive causes the network-wide user limit to be "one", thus causing this error. Set the NIAKWA_RUNTIME variable on the workstation to point to the local NPL directory.

A.3 Compiler Problems

Refer to Appendix A of the MS-DOS Supplement for common problems encountered when using the B2C Compiler.