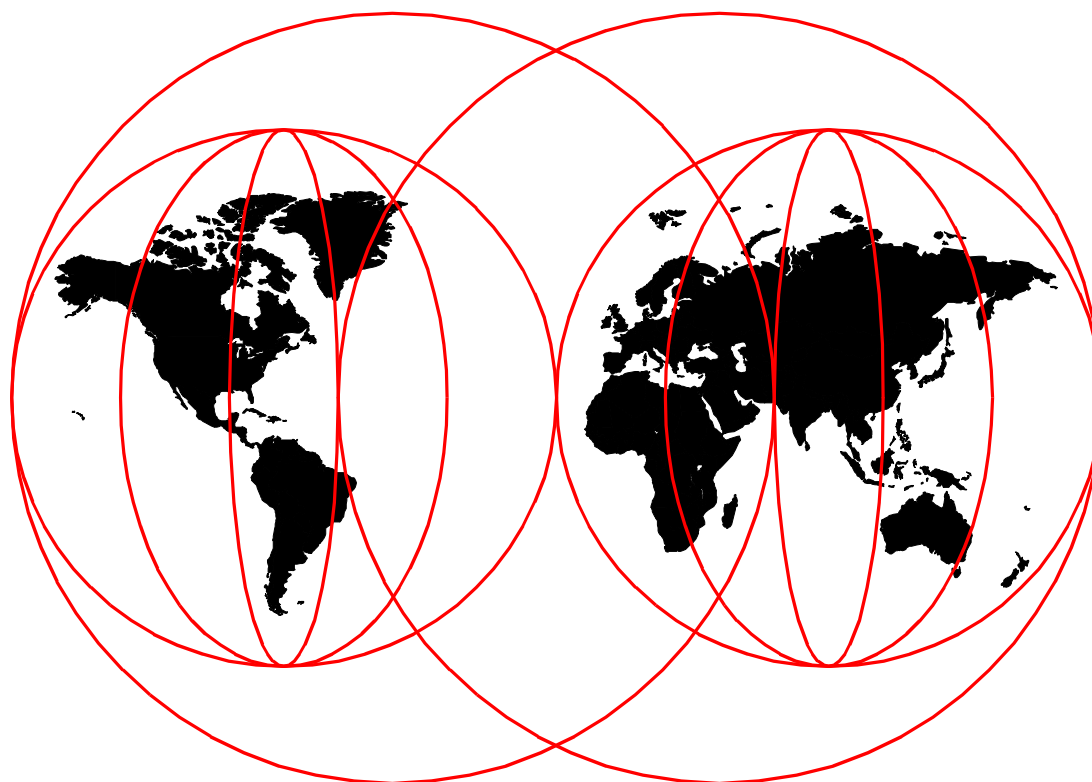


TCP/IP Solutions for VM/ESA

*Erich Amrehn, Jim Elliott, Kevin Hubbard
Josef Minderlein, Mary Sue Record, Heinz Ulbrich*



International Technical Support Organization

www.redbooks.ibm.com

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix F, "Special notices" on page 225.

First Edition (December 1999)

This edition applies to the IBM Transmission Control Protocol/Internet Protocol Feature for VM/ESA (TCP/IP Function Level 320), Program Number 5645-030.

Comments may be addressed to:
IBM Corporation, International Technical Support Organization
Dept. HYJ Mail Station P099
2455 South Road
Poughkeepsie, NY 12601-5400

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

Chapter 10. Enterprise printing

The combination of TCP/IP for VM/ESA and RSCS provide facilities for enterprise printing in a TCP/IP environment. Enterprise printing can be defined as providing consolidated print services for all users in an enterprise on both host and network printers.

VM/ESA users can print on host-attached printers, network printers, printers attached to LAN servers and printers attached to workstations with print serving software. Workstation users can print on host-attached printers, network printers, printers attached to LAN servers and printers attached to workstations with print serving software using VM/ESA as an enterprise print server.

10.1 Print server consolidation

Print server consolidation using VM/ESA can simplify your print management.

10.1.1 Before consolidation

In Figure 58, a sample LAN environment has four network print servers, each controlling six cut sheet printers. There are several workstations, some of which have attached printers. The cut sheet printers are depicted as logically attached to the print server although physically they attach directly to the network with their own network adapters. They each have TCP/IP-based Line Printer Daemon (LPD) support. Each print server has its own hard disk drive which holds the print requests until printing can be completed. The capacity on the hard drives must be monitored and managed individually. If additional printing capacity is needed, not only are new printers purchased, but additional servers may be needed as well. The operating systems of the workstation servers might be from different vendors. Those that are the same are often at different maintenance levels. Should a user need to print at a location different from his default, the results can be troublesome.

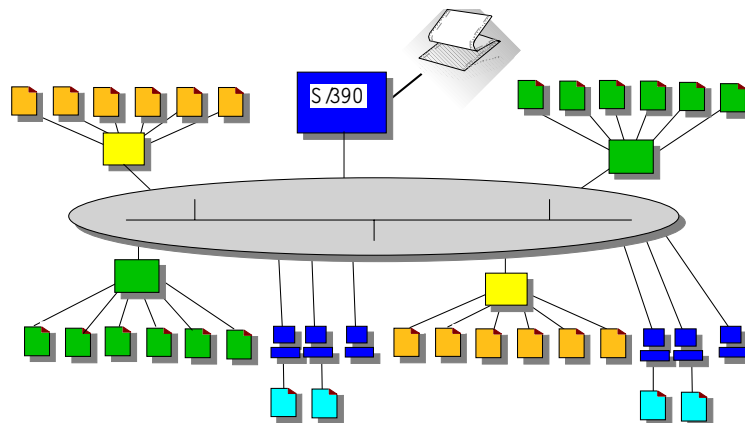


Figure 58. Print serving before consolidation

Like your environment perhaps, this sample configuration includes a S/390 with a high speed printer — but it is only being used for S/390 applications. Workstation users with 3270 sessions need to transfer (often large) files to the host before submitting them to the high speed printer. To print host files on their locally

attached printer or even on one of the LAN printers, they first need to receive them onto their own workstation hard drive (assuming there is enough spare room) prior to selecting a destination and printing. Host files may also require conversion or reformatting.

10.1.2 The decision to consolidate

Realizing there are significant administration, support, operational, and user challenges in a purely distributed print server environment, you might search for a better solution. Certainly you will have noted the numerous press articles about the “drive to consolidation” which is underway in many organizations. Under all the hype is a basic truth that still applies: there are economies of scale. By leveraging your large systems to help with the management of print queues, you eliminate numerous points of administration and many management tasks.

10.1.3 Print server environment — after consolidation

As shown in Figure 59, after consolidation the network print servers are eliminated, the queue management function is conducted by VM/ESA on the mainframe, and the print queues themselves reside on large, reliable, S/390-attached disk. Any TCP/IP user, on a workstation or the host, anywhere in the enterprise can now print on any desired printer. All printers can be managed centrally by a single, reliable server: VM/ESA.

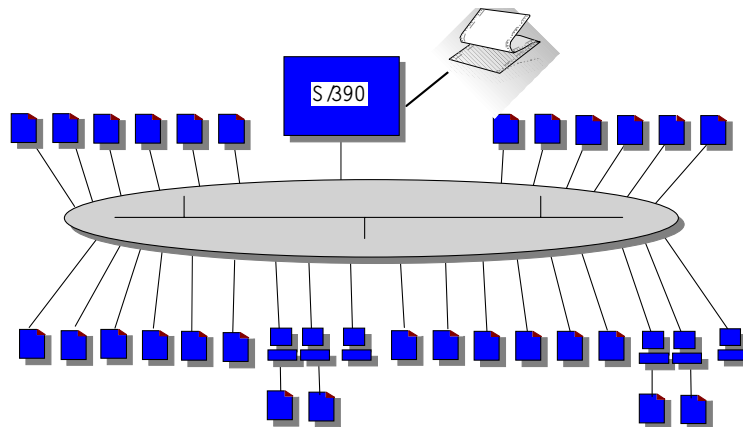


Figure 59. Print serving after consolidation

10.2 Concepts

Implementation of enterprise printing requires configuring of both TCP/IP for VM/ESA and RSCS. While TCP/IP does provide an LPD print server through the LPSERVE virtual machine, we recommend that the LPD server in RSCS be used instead as it provides more functionality, particularly in the area of PostScript and PCL printer support.

The LPD server provided by RSCS serves workstation requests to print a file. The RSCS server looks for the printer specified by the Line Printer Requestor (LPR) client and attempts to print the document. The printer itself is not dedicated to TCP/IP and it may receive output from other sources as well. The LPD server supports three types of printer connections:

- Local printers

Local printers are physically attached to the VM/ESA system. These are typically high capacity printers such as the IBM Infoprint 4000 Advanced Function Printing System.

- Remote Network Job Entry (NJE) printers

Any printer available through the NJE network can be accessed, with the remote RSCS printer support. This printer could be attached to any system in an NJE network (such as OS/390, VM/ESA or VSE/ESA) without a TCP/IP connection.

- rRemote TCP/IP printers

Any printer controlled by another LPD server can be made available to a user through the LPR driver in RSCS. This includes printers which contain an internal LPD server, such as the IBM Network Printer family, printers attached to a workstation with an LPD server function and printers attached to a network interface, such as the Hewlett-Packard JetDirect external print server. This support is provided by the RSCS LPR driver. RSCS will redirect inbound LPR requests to the desired printer, end users do not need to know the IP address or host name and queue name of the real printer.

VM/ESA users have three options for printing to TCP/IP printers. A detailed comparison of these may be found at:

<http://www.ibm.com/s390/vm/related/rscs/rsvslpr.html>

Briefly, the available printing options can be described as follows:

- Printing synchronously using the LPR command. The LPR command, running in the CMS user's virtual machine, connects directly to the TCP/IP printer's LPD server. Using this option ties up the CMS user's virtual machine for the duration of the time it takes the TCP/IP printer to process the request.
- Printing asynchronously using the LPR command. The LPR command sends the print file to RSCS for printing. This option is described further in 10.7, "Printing from VM/ESA to a network printer" on page 168.
- Printing asynchronously using the print PostScript (PPS) command to send the print file to RSCS for printing. PPS is a sample command provided with RSCS for which more information may be found at:

<http://www.ibm.com/s390/vm/related/rscs/>

The LPR driver provided by RSCS sends workstation print files received by the RSCS LPD driver and host print files to remote TCP/IP printers. You have two non-exclusive options in how you can set up the LPR driver. One option uses a pool of links for PostScript printers (the LPRP link pool) and a pool of printers for non-PostScript printers (the LPR link pool). The other option uses dedicated links for each printer. With the first option a form identifier is used in conjunction with a set of control files to direct a file to a specific printer; with the second option the form identifier is only used to specify printer control information (such as the separator). We will describe both options in this document.

The primary advantage to the option with defined links is that you can define a pool of printers to which RSCS can direct output. We describe how we used this capability later in this chapter.

10.2.1 Required documentation

Before attempting to implement enterprise printing on VM/ESA, obtain the current publications and related material. Some of this material is not available in printed form and must be downloaded from the Internet. Table 10 on page 148 lists the material that may be required and gives Internet sites and other sources for the information.

Table 10. Publications which may be required for enterprise printing

Title	Source
<i>VM RSCS Planning and Installation</i> , SH24-5219	http://www.ibm.com/s390/vm/pubs/pdf/ Hardcopy available from IBM.
<i>VM RSCS Operation and Use</i> , SH24-5220	http://www.ibm.com/s390/vm/pubs/pdf/ Softcopy only.
<i>VM RSCS Exit Customization</i> , SH24-5222	http://www.ibm.com/s390/vm/pubs/pdf/ Softcopy only.
<i>VM RSCS Program Directory</i> , GI10-4665	http://www.ibm.com/s390/vm/related/rscs/ Hardcopy available from IBM.
<i>PCL5e/PostScript Technical Reference</i> , S544-5344	http://www.printers.ibm.com/R5PSC.NSF/Web/nprefm Hardcopy available from IBM.
<i>PostScript Language Reference</i> , by Adobe Systems, Inc. ISBN 0-201-37922-8	Adobe Systems, Inc.
<i>Technical Reference Bundle</i> , by Hewlett-Packard, Inc. part number 5021-0377	Hewlett-Packard, Inc.

While all PCL and PostScript implementations have much in common, every printer vendor has differences in implementation. It is very important that you have available the appropriate PCL and/or PostScript reference publications for your printers. The publication *PCL5e/PostScript Technical Reference*, S544-5344 provides information on differences in PCL and PostScript implementations for IBM Network Printers and IBM InfoPrint LAN printers. The *PostScript Language Reference*, by Adobe Systems, Inc. ISBN 0-201-37922-8 provides the definition of the PostScript language and the *Technical Reference Bundle*, by Hewlett-Packard, Inc. part number 5021-0377 provides the definition of the PCL language.

A short reference to PCL Commands, Basic Page Formatting, and Font Selection is available on the Hewlett-Packard Web site at:

<http://www.interactive.hp.com/cgi-bin/cspt/ljxxx/dyndocwrap.pl?lid=general&fid=bp102705>

10.3 Security

There are no security services provided in the IP printing environment. If required, an installation could provide control over which printers a user could direct print to through the use of RSCS exits.

10.4 Configuring Windows

In this section we describe how to configure Windows to receive print from VM/ESA for printing on a workstation-attached printer and how to configure Windows to send print output to a printer managed by VM/ESA.

10.4.1 Configuring Windows to receive print from VM/ESA

If you wish to print to a printer that is attached directly to a Windows workstation from the VM/ESA host or from another workstation, you will need to set up an LPD on that workstation. Windows NT 4 does include an LPD server as a service called "TCP/IP Print Server". However, we found that this was not very robust. Windows 95/98 do not include an LPD server.

There are many third-party LPD servers available for the Windows platforms and we chose NIPrint from Network Instruments, Inc. for this residency. More information and a demonstration version of NIPrint can be found at the Network Instruments Web site at:

<http://www.netinst.com/>

NIPrint also provides an LPR function; however, it does not operate as a port monitor. We therefore recommend other solutions, which are described in 10.4.2, "Configuring Windows NT 4 as a print client" on page 151 and 10.4.3, "Configuring Windows 95/98 as a print client" on page 153.

10.4.1.1 NIPrint configuration for local print

Once you have installed NIPrint, using the instructions on the Network Instruments Web site, perform the following steps to configure NIPrint as a local print server.

1. Click the **Start** menu, select **Programs**, select **NIPrint**, then **NIPrint32**.
2. On the NIPrint32 window, select **Configuration** from the menu, then select **General Settings** from the pull-down list.
3. On the General Settings window, shown in Figure 60 on page 150, select **ENABLE LOCAL PRINT SERVER** and **Confirm on close**, then click **Ok**.

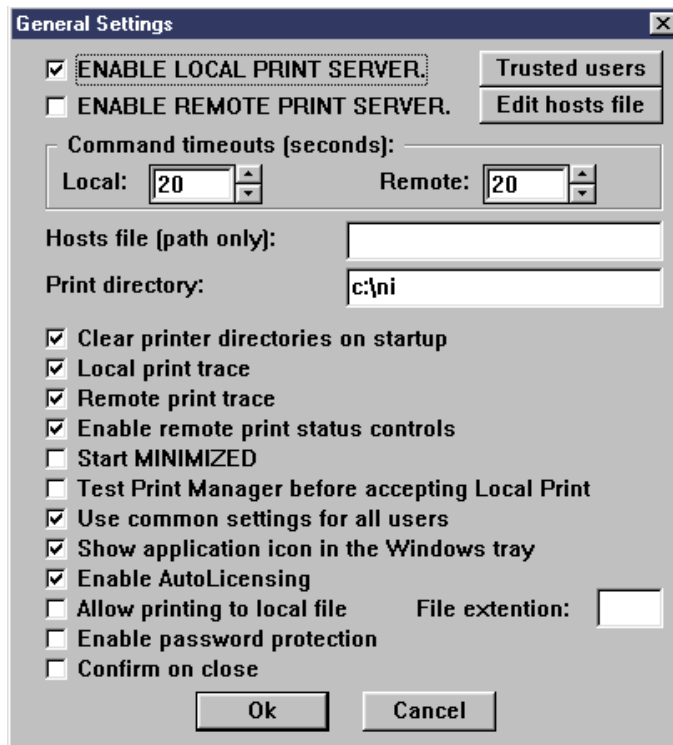


Figure 60. NIPrint General Settings window

4. On the NIPrint32 window select **Configuration**, then **Local Print Configuration** in the pull down list.
5. On the LOCAL Print Configuration window select **Add Printer**.
6. On the Add/Edit LOCAL Printer window, shown in Figure 61, enter a **Printer Name** that you wish the printer to be known as on the network and select the printer in the **Installed Printers** list. The printer name you enter should contain no blanks or special characters.

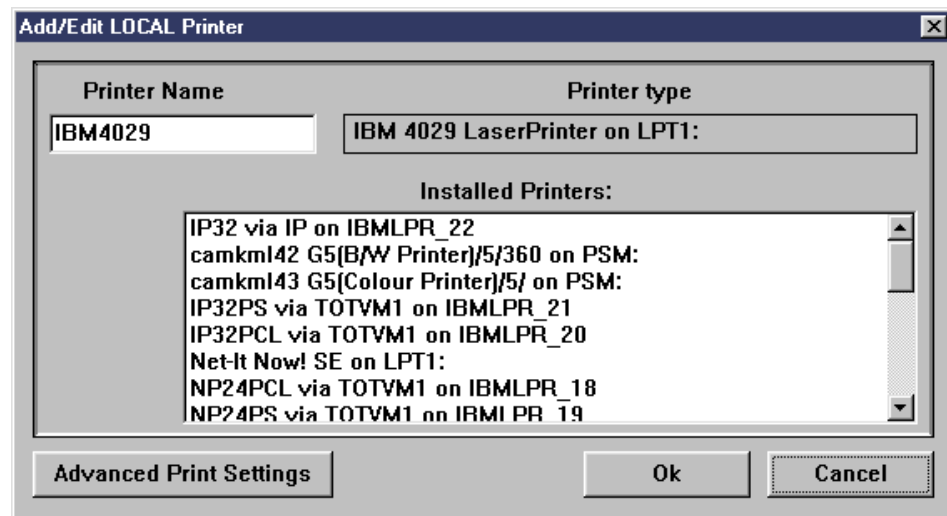


Figure 61. NIPrint Add/Edit Local Printer window

7. Click **Advanced Print Settings**. On the LOCAL Print Advanced Settings window click the **Wait for remote LPR to close connection** radio button, then click **Ok**.
8. On the Add/Edit LOCAL Printer window, click **Ok**.
9. On the LOCAL Print Configuration window, click **Save**.

You should now be able to use the local printer you have defined from any LPR client, including RSCS on VM/ESA, by specifying the domain name or IP address of the Windows workstation as the LPD server and the printer name (IBM4029 in this example) as the printer or queue name to LPR.

10.4.2 Configuring Windows NT 4 as a print client

Windows NT 4 includes an LPR port monitor, which provides a TCP/IP print monitor port driver for seamless Windows NT network printing. This port driver can be used on Windows NT to automatically direct print jobs from Windows NT to any printer or print server that runs a TCP/IP LPD print server, such as VM/ESA.

1. Click **Start->Settings->Printers**.
2. Double-click **Add Printer**. The Add Printer wizard leads you through the installation process of setting up and configuring a printer.
3. Select **My Computer**, then click **Next**.
4. If the port you are going to print to is listed on under **Available ports**, select the check box beside it, otherwise click **Add Port**.

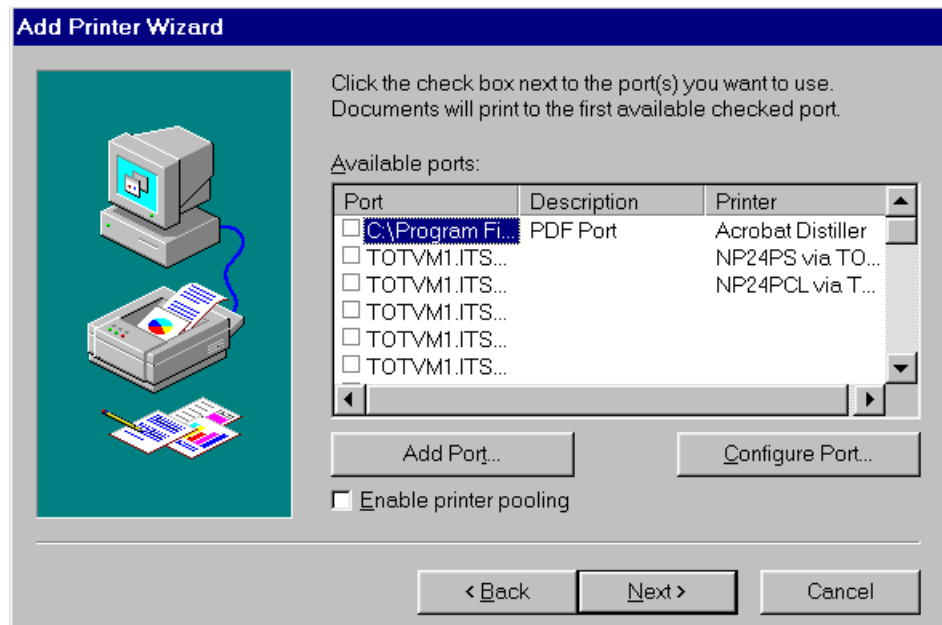


Figure 62. Windows NT Add Printer Wizard port selection

5. In the list of **Available Printer Ports**, select **LPR Port** and click **New Port**.

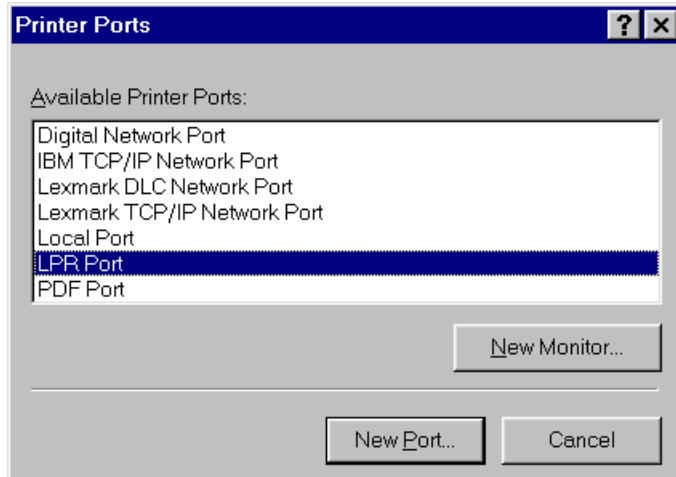


Figure 63. Windows NT Printer Ports selection

6. On the Add LPR compatible printer window, shown in Figure 64, enter the domain name or IP address of the VM/ESA system that provides the print services and the name of the printer queue as defined in LPDXMANY CONFIG (see 10.6.2, “Setting up the LPD server in RSCS” on page 157).



Figure 64. Windows NT Add LPR compatible printer specification

Windows NT also includes an LPR command for printing jobs directly. The LPR command provides standard RFC 1179 interfaces. Figure 65 on page 153 shows the options available on the LPR command. When using the LPR command to send a job to a printer managed by VM/ESA, the `-s` option specifies the host name or host IP address of the VM/ESA system and the `-P` option specifies the printer queue name as specified in the LPDXMANY CONFIG file. The `-C` and `-J` options can be used to specify the class and jobname to VM/ESA. The `-o` option is generally ignored, but you should not specify it as the results are unpredictable. You should not specify the `-d` option as the output is also unpredictable. For more information on the options supported by VM/ESA, see Chapter 9 in *VM RSCS Exit Customization*, SH24-5222. The options are case sensitive with the Windows NT LPR command.

```
Usage: lpr -S server -P printer [-C class] [-J job] [-o option] [-x] [-d]
      filename
```

Options:

-S server	Name or ipaddress of the host providing lpd service
-P printer	Name of the print queue
-C class	Job classification for use on the burst page
-J job	Job name to print on the burst page
-o option	Indicates type of the file (by default assumes a text file) Use "-o l" for binary (e.g. postscript) files
-x	Compatibility with SunOS 4.1.x and prior
-d	Send data file first

Figure 65. Windows NT LPR command line requester

An example of using the LPR command is:

```
lpr -Stotvm1.itso.ibm.com -Pnp24ps output.ps
```

where "totvm1.itso.ibm.com" is the server and "np24ps" is the name of the print queue.

10.4.3 Configuring Windows 95/98 as a print client

Windows 95/98 does not include a LPR port monitor. However, IBM does provide an LPR port monitor for Windows 95/98, known as the *IBM LPR Remote Printing Client*, at no charge. This IBM LPR Remote Printing Client is restricted by its license to use with IBM network printers.

The IBM LPR Remote Printing Client is available from the IBM Printing Systems Web site at:

<http://www.ibm.com/printers/>

On the IBM Printing Systems Web site select **Support** in the menu on the left side; on the next page select **Fixes, printer drivers and updates** on the left side and then select **Network Printers Utilities and Microcode**. Follow the instructions on this Web page under the heading IBM LPR Remote Printing Client Version 2.30 for Windows 95 to retrieve the IBM LPR Remote Printing Client.

For printers other than IBM network printers, the University of Texas at Austin provides the *ACITS LPR Remote Printing Windows 95/98 and NT 4.0* product, with equivalent function. Additional information about this product is available at:

<http://www.utexas.edu/academic/otl/software/lpr/>

There are also many other products available for Windows and other platforms which provide LPR function.

The IBM LPR Remote Printing Client utility provides a TCP/IP print monitor port driver for seamless Windows 95 network printing. This port driver can be used on Windows 95/98 to direct print jobs from Windows 95/98 to the IBM network printers or any other printer or printer server that runs a TCP/IP LPD print server. The port driver can be used on mobile systems for remote printing or it can be used on department print servers in an unattended print server mode.

This package also includes a command line LPR program for printing files directly. The IBM LPR program, called IBMLPR, provides standard RFC 1179 interfaces and allows the `-S` and `-P` parameters to be set by way of environment variables so that drag-and-drop printing can be enabled for a default printer.

Figure 66 on page 154 shows the options available on the IBMLPR command. When using the LPR command to send a job to a printer managed by VM/ESA, the `-S` option specifies the host name or host IP address of the VM/ESA system and the `-P` option specifies the printer queue name as specified in the LPDXMANY CONFIG file. The `-C` and `-J` options can be used to specify the class and jobname to VM/ESA. The `-O` option is generally ignored, but you should not specify it as the results are unpredictable. You should not specify the `-D` option as the output is also unpredictable. For more information on the options supported by VM/ESA, see Chapter 9 in *VM RSCS Exit Customization*, SH24-5222. The options are case sensitive with the Windows NT LPR command.

An example of using the IBMLPR command is:

```
ibmlpr -Stotvm1.itso.ibm.com -Pnp24ps output.ps
```

where “totvm1.itso.ibm.com” is the server and “np24ps” is the name of the print queue.

```
Usage: ibmlpr [-S <server> ] [ -P <printer> ] [ -C <class> ]
           [ -J <job name> ] [ -L <option> ] [-O <filter> ]
           [-R <remote port> ] [ -T <timeout> ] [ -D ] [ -B ]
           [-#<copies>] filename1 filename2 ... filename(###)

Options:
  S -- Print server or printer hostname or ip address
      (The environment variable LPRSERVER may be used instead)
  P -- Printer or printer queue name
      (The environment variable LPRPRINTER may be used instead)
  C -- Class name on banner page
  J -- Job name on banner page
  L -- Option to use for local port -- [S]trict, [D]efault,
      [E]xtended
      The default option is [D]
  O -- Filter option: Ascii [f], HPGL, PCL, Postscript, etc... [l]
      The default option is [l]
  R -- Remote port to attempt connection on (default is 515)
  T -- Timeout value (default is 120 seconds, 0 = INFINITE)
  D -- Send data file before control file
  B -- Disable the banner control flag (L)
      By default this flag is sent.
  # -- Number of copies (1 to 10) to print (default is 1 copy)
filename(s) -- file(s) to print - may include wildcards (*,'?')
```

Figure 66. Windows 95/98 IBM LPR command line requester

10.4.3.1 Installation of the IBM LPR Remote Printing Client

Double-click the program named INSTLPR.EXE to begin installing the program. After the installation process has completed, your system is ready to use the IBM LPR Remote Printing Client. Refer to the online documentation located in the IBM

LPR Remote Printing Client group for information about configuring and using an IBM LPR Remote Printer.

10.4.3.2 Adding an IBM LPR Remote Printer

1. Click **Start**, select **Settings**, then select **Printers**.
2. Double-click **Add Printer**. The Add Printer wizard leads you through the installation process of setting up and configuring a printer.
3. Add a Local printer and select the print driver for the IBM LPR Remote Printer you are installing.
4. Select LPT1: for the printer port or an IBM LPR Remote Printer if you have already created a remote printer.
5. Type a name for the printer. The name can be anything you find convenient to remember.
6. Click the **NO** radio button when prompted about **Printing a Test Page**, then click **Finish** to install any required print drivers and create the printer.
7. Right click the newly created printer icon in the **Printers Folder** and select **Properties**.
8. Click the **Details** menu tab, then the **Add Port** push button. Click the **Other** radio button and select **IBM LPR Remote Printing Client**.
9. Fill out the printer information. If you are unsure about some of the settings, consult your network administrator. Click **OK** when you are finished. You may create up to 32 different IBM LPR printer entries: IBMLPR_1 through IBMLPR_32.
10. Click **OK** to return to the **Properties** dialog and then click **OK** to save your printer settings. The printer is now configured for the IBM LPR Remote Printing Client.

Note: In order for the IBM LPR Remote Printing Client to work correctly, the spooler settings for the associated printer must be set to the following values:

- Start printing after last page is spooled
- Disable bidirectional support for this printer

The IBM LPR Remote Printing Client sets these values correctly when you send the first file to the printer. You can change the spooler settings manually as follows:

1. Right click the **Printer** icon.
2. Click **Properties**.
3. Click **Details**.
4. Select **Spooler settings**.

Note: On some Windows systems, you may need to set the spooler data format to RAW in order to print correctly. If you have a problem when you first try to print, try setting this value to RAW as described above.

10.5 Configuration of TCP/IP for VM/ESA for network printing

In the PROFILE TCPIP on TCPMAINT's 198 disk, comment out the LPSERVE statement in the AUTOLOG section:

```
; LPSERVE PASSWORD ; LP Server
```

In the PROFILE TCPIP on TCPMAINT's 198 disk, change the statement for port 515 in the PORT section from LPSERVE to RSCS:

```
; 515 TCP LPSERVE ; LP Server  
515 TCP RSCS ; LP Server
```

Changes were made to RSCS support of LPR printing as a result of this residency. The changes are documented in APAR PQ29745 and the fix is available as PTF UQ33885 for TCP/IP for VM/ESA Function Level 320. We strongly suggest that users install the PTF for this APAR and any others related to LPR available for TCP/IP.

10.6 Configuration of RSCS for network printing

There are several steps to take in configuring RSCS for IP printing. A new service virtual machine (RSCSDNS) must be defined, changes must be made to the RSCS CONFIG file, the PROFILE GCS for RSCS must be updated, and new configuration files (LPDXMANY CONFIG and LPRXFORM CONFIG) must be created.

Issue the following to make sure the RSCS server is running at the 9803 (or higher) RSU service level:

```
SMSG RSCS QUERY SYSTEM LEVEL
```

A response from RSCS indicating it is at the appropriate level would be:

```
RSCS Networking Version 3, Release 2.0-9803
```

If RSCS is not at or beyond this level, we recommend that you install the latest RSU before proceeding with these instructions, otherwise some steps may not produce the desired results otherwise.

Several changes were made to RSCS support of LPR printing as a result of this residency. The changes are documented in APAR VM62277 and the fix is available as PTF UV60455. We strongly suggest that users install the PTF for this APAR and any others related to LPR or LPD available for RSCS.

10.6.1 Setting up the RSCSDNS server

The RSCSDNS server should already be defined for you if you are installing VM/ESA Version 2 Release 4. As delivered, this server will be autologged for you automatically at GCS startup. If you do not have the RSCSDNS server in your directory, you will need to define one as shown in Figure 67 on page 157.

```

USER RSCSDNS XXXXXXXX 8M 16M G
  IPL CMS PARM AUTOCR
  MACHINE ESA
  OPTION SVMSTAT LANG AMENG
  XAUTOLOG GCS
  CONSOLE 001F 3215 T OPERATOR
  SPOOL 000C 2540 READER A
  SPOOL 000D 2540 PUNCH A
  SPOOL 000E 1403 A
  LINK P684096K 0403 0403 RR
  LINK MAINT 0190 0190 RR
  LINK MAINT 019E 019E RR
  LINK TCPMAINT 0592 0592 RR
  MDISK 0191 3390 2798 001 240RES MR

```

Figure 67. RSCSDNS server virtual machine directory entry

On the RSCSDNS virtual machine's 191 disk you will need to have a PROFILE EXEC as shown in Figure 68.

```

/* RSCSDNS Profile Exec */
'ACCESS 403 B' /* access mdisk with GETHOSTC module */
'ACCESS 592 C' /* access tcpmaint disk */
'GLOBAL LOADLIB SCEERUN' /* SCEERUN is part of RUNTIME LIBRARY */
'GETHOSTC' /* invoke the Domain Name Server code */

```

Figure 68. PROFILE EXEC for RSCSDNS

10.6.2 Setting up the LPD server in RSCS

1. Change RSCS's PROFILE GCS so it can load the LPD-type link exit routine. On the RSCS install ID's (P684096K) 401 minidisk (also the RSCS ID's 191 minidisk), locate the line:

```
GLOBAL LOADLIB RSCS
```

and change it (if required) to:

```
GLOBAL LOADLIB RSCS RSCSEXIT
```

2. Change RSCS's PROFILE GCS so it can load a configuration file for the LPD-type link exit routine. First locate a line containing a FILEDEF statement, then add the following line:

```
FILEDEF LPD DISK LPDXMANY CONFIG
```

3. Copy the LPDXMANY CONFSAMP file from the RSCS install ID's 406 minidisk to its 401 minidisk as LPDXMANY CONFIG.
4. Define the LPD-type links in the RSCS CONFIG file (located again on the install ID's 401 minidisk) by adding the lines in Figure 69 on page 158. We have defined four links; you may need to define more to ensure that a link is always available to your workstation users. We have also increased the default timeout from 60 seconds to 300 seconds to allow for network congestion.

```

LINKDEFINE LPD1 TYPE LPD
LINKDEFINE LPD2 TYPE LPD
LINKDEFINE LPD3 TYPE LPD
LINKDEFINE LPD4 TYPE LPD
PARM LPD1 EXIT=LPDXMANY EP='C=LPDXMANY' TIMEOUT=300
PARM LPD2 EXIT=LPDXMANY EP='C=LPDXMANY' TIMEOUT=300
PARM LPD3 EXIT=LPDXMANY EP='C=LPDXMANY' TIMEOUT=300
PARM LPD4 EXIT=LPDXMANY EP='C=LPDXMANY' TIMEOUT=300

```

Figure 69. RSCS CONFIG changes to enable LPD support

5. Define printer queue names within the LPD configuration file (LPDXMANY CONFIG). We have defined four printers in our configuration and a default printer definition. Two of the printers (HP890C and NP17PS) will use the LPR/LPRP pool and two will use groups of dedicated printers (NP24PS and POK3130).

```

DEFAULT      1280 * * NPPS      * * *   ASISCC ASCII * *
HP890C       1280 * * HP890C   * * *   ASISCC ASCII LPR *
NP24PS       1280 * * NPPS      * * *   ASISCC ASCII * *
POK3130      1280 * * IPPS      * * *   ASISCC ASCII * *
NP17PS       1280 * * NP17PS   * * *   ASISCC ASCII LPRP *

```

Figure 70. LPDXMANY CONFIG definitions

The format of the LPDXMANY CONFIG file is documented in *VM RSCS Exit Customization*, SH24-5222, but we found that the structure shown in Figure 70 worked for all of our printers.

Table 11 contains more information on each of the tokens in the LPDXMANY CONFIG file.

Table 11. LPDXMANY CONFIG tokens

Token	Description
1	A printer queue name up to 32 characters. A queue name of DEFAULT can be used to define parameters for any printer queue not defined by a configuration file record. When a printer queue name arrives, LPDXMANY first looks for a configuration record of that name; if not found it will look for a configuration record using DEFAULT; if not found it will use existing LPDXMANY defaults. We recommend that the printer queue name not exceed 8 characters (see token 5).
2	The logical record length 1-1280; default is 255. We recommend the maximum setting of 1280.
3	The number of lines per page 1-99; default is 66. We recommend that this be specified as "*" which gives the default.
4	The one character spool file class; default is blank. We recommend that this be specified as "*" which gives the default.

Token	Description
5	<p>The one- to eight-character spool file form; default is blank.</p> <p>This name is used to associate a printer with an entry in the LPRXFORM CONFIG file by the RSCS LPR function.</p> <p>If you are using the LPR/LPRP pool option, we recommend that this value be the same as the printer queue name in token 1.</p> <p>If you are using dedicated links for your printers, this value should be set to a form which defines the desired print processing.</p>
6	<p>The one- to eight-character job name; default is SYSTEM.</p> <p>We recommend that this be specified as "*" which gives the default.</p>
7	<p>The one- to eight-character PSF destination; default is blank. When using a PSF destination, LPDXMANY will set the user ID field of the tag to SYSTEM. When using a PSF destination, the printer queue name can be in the form SYSTEM@nodeid. Alternatively, the printer queue name can be anything unique as long as the user ID field is SYSTEM or * and the node ID field is specified.</p> <p>We recommend that this be specified as "*" for non-PSF printers.</p>
8	<p>Either PAGE or NOPAGE; default is NOPAGE. This parameter determines how pagination will be performed as follows:</p> <p>PAGE will cause LPDXMANY to always paginate regardless of the control file print filter.</p> <p>NOPAGE will cause LPDXMANY to paginate only as defined by the 'f' or 'p' control file print filters. To be effective, the control file must be received prior to the data file.</p> <p>We recommend that this be specified as "*" which gives the default.</p>
9	<p>Either TRAN, NOTRAN, or ASISCC; default is TRAN. Translation specifies whether or not to translate the data file prior to spooling as follows:</p> <p>TRAN: Translate data received into EBCDIC removing any CR/LF/FF (carriage return, line feed, form feed) control characters.</p> <p>NOTRAN : Do not translate data received into EBCDIC, but remove any CR/LF/FF control characters.</p> <p>ASISCC: Leave the data received as is, do not translate nor remove any control characters. ASISCC would be desired when data received is destined to be printed by a LPR-type link.</p> <p>We recommend that "ASISCC" be specified if the final destination is a workstation or network printer.</p>
10	<p>The one- to eight-character user ID to which the file should be spooled; default is derived from the printer queue name. Note: If a PSF destination is provided (see token 7), then the userid field can only be set to SYSTEM.</p> <p>We recommend that "ASCII" be specified if the final destination is a workstation or network printer.</p>
11	<p>The one- to eight-character destination node ID to which the file should be spooled; default is derived from the printer queue name.</p> <p>If you are using the LPR/LPRP pool option we recommend that this be specified as "LPRP" for PostScript printers and "LPR" for all other workstation or network printers. If you are using dedicated links for your printers, this option should be specified as "*".</p>

Token	Description
12	<p>The filename of a TCP/IP TCPXLBIN translate table to be used for this printer queue name. The file must exist on any accessed disk. If not specified, the translation table used will either be the default one within LPDXMANY or the override specified within the LPDXMANY configuration file.</p> <p>We recommend that this be specified as "*" which gives the default.</p>

6. Start the LPD-type links in RSCS's PROFILE GCS by adding the following lines after the 'RSCS INIT' statement (one for each link defined in Figure 69 on page 158):

```
START LPD1
START LPD2
START LPD3
START LPD4
```

7. Next time RSCS is recycled (IPLed), the LPD links will be available for use. Note that RSCS can be quickly recycled by entering the command:

```
RSCS SHUTDOWN QUICK CP IPL GCS
```

from the RSCS console.

10.6.3 Setting up the LPR function in RSCS

1. Change RSCS's PROFILE GCS so it can load the LPD-type link exit routine. On the RSCS install ID's (P684096K) 401 minidisk (also the RSCS ID's 191 minidisk), locate the line:

```
GLOBAL LOADLIB RSCS
```

and change it (if required) to:

```
GLOBAL LOADLIB RSCS RSCSEXIT
```

2. Change RSCS's PROFILE GCS so it can load the configuration files for the LPR-type link exit routine. First locate a line containing a FILEDEF statement, then add the following lines:

```
FILEDEF LPR DISK LPR CONFIG
FILEDEF LRP DISK LRP CONFIG
FILEDEF LPRXFORM DISK LPRXFORM CONFIG
```

3. Define the LPRXFORM exit in the RSCS CONFIG file (located on the install ID's 401 minidisk) by adding the following lines.

```
EXIT      0   ON LPRXFM00
EXIT      1   ON LPRXFM01
```

4. Create an LPRXFORM CONFIG file on the install ID's 401 minidisk. There should be an entry for each form specified in the LPDXMANY CONFIG file. Figure 71 shows the LPRXFORM CONFIG lines for a shared Hewlett-Packard DeskJet 890C (attached to a Windows NT workstation); Figure 72 shows the LPRXFORM CONFIG lines which can be used by any IBM Network Printer 24s which meet a standard configuration and are LAN attached; Figure 73 shows the LPRXFORM CONFIG lines for a single-user IBM Network Printer 17 (attached to a Windows workstation); Figure 74 on page 161 shows the LPRXFORM CONFIG lines which can be used by an IBM 3130 printer which meets a standard configuration. We would also suggest a definition of an entry for a STANDARD form to be used for printing EBCDIC files from VM/ESA. In

our case we used the NPPS entry with the specification of PostScript output (FORMSUB=P+ASCII) removed (Figure 75 on page 162).

For more information on the content of the LPRXFORM CONFIG file see 10.6.4, "Setting up the LPRXFORM CONFIG file" on page 163.

```
FORM=HP890C
HOSTNAME=TOT48.ITSO.IBM.COM
PRINTER=HP890C
SEP=YES
PREFIX=1B45
PREFIX=1B28733050
PREFIX=1B2873313248
PREFIX=FF04
PREFIX=1B45
SUFFIX=1B45
```

Figure 71. LPRXFORM CONFIG for HP DeskJet HP890C

```
FORM=NPPS
FORMSUB=P+ASCII
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
```

Figure 72. LPRXFORM CONFIG for IBM Network Printer 24 printing PostScript files

```
FORM=NP17PS
HOSTID=9.130.58.99
PRINTER=PASS
FORMSUB=P+ASCII
SEP=NO
```

Figure 73. LPRXFORM CONFIG for an IBM Network Printer 17

```
FORM=IPPS
FORMSUB=P+ASCII
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A
```

Figure 74. LPRXFORM CONFIG for an IBM 3130 for use in printing PostScript files

```

FORM=STANDARD
SEP=YES
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2066616C7365207365746475706C
PREFIX=65786D6F646520322073657470617065727472617920656E640D0A
PREFIX=FF04
PREFIX=252150532D41646F62650D0A
PREFIX=7374617475736469637420626567696E2074727565207365746475706C65
PREFIX=786D6F646520332073657470617065727472617920656E640D0A

```

Figure 75. LPRXFORM CONFIG for IBM Network Printer printing non-PostScript files

- Define the LPR-type links in the RSCS CONFIG file (located on the install ID's 401 minidisk). The LINK and PARM statements are used to define eight PostScript (Figure 78 on page 163) and eight non-PostScript (Figure 79 on page 163) LPR links that are pooled on the ROUTE GROUP statements for improved performance. As shown here, on each of these links a separator page will be printed for each print request. This can be suppressed in LPRXFORM CONFIG file for specific printers. Figure 76 shows the definitions for a group of three IBM Network Printer 24s; Figure 77 on page 162 shows the definitions for a group of three IBM 3130 printers. The printers in these two groups can either be addressed directly by the linkid or by the groupid. RSCS will direct print output to any one of the printers in the group when the groupid is used. This allows the user to set up a pool of like printers for use in a printer room, for example.

```

LINKDEFINE NP24PSA TYPE LPR FORM * AST
LINKDEFINE NP24PSB TYPE LPR FORM * AST
LINKDEFINE NP24PSC TYPE LPR FORM * AST
PARM NP24PSA EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.5 PR=PASS
PARM NP24PSB EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.6 PR=PASS
PARM NP24PSC EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.8 PR=PASS
ROUTE GROUP NP24PS TO LINK NP24PSA NP24PSB NP24PSC

```

Figure 76. RSCS CONFIG changes for a group of IBM Network Printer 24s

```

LINKDEFINE C16 TYPE LPR FORM * AST
LINKDEFINE POK3130D TYPE LPR FORM * AST
LINKDEFINE POK3130E TYPE LPR FORM * AST
PARM C16 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.2 PR=afccu2
PARM POK3130D EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.3 PR=afccu2
PARM POK3130E EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP' HOST=9.12.2.4 PR=afccu2
ROUTE GROUP POK3130 TO LINK C16 POK3130D POK3130E

```

Figure 77. RSCS CONFIG changes for a group of IBM 3130 printers

```

LINKDEFINE LPRP1 TYPE LPR FORM * AST
LINKDEFINE LPRP2 TYPE LPR FORM * AST
LINKDEFINE LPRP3 TYPE LPR FORM * AST
LINKDEFINE LPRP4 TYPE LPR FORM * AST
LINKDEFINE LPRP5 TYPE LPR FORM * AST
LINKDEFINE LPRP6 TYPE LPR FORM * AST
LINKDEFINE LPRP7 TYPE LPR FORM * AST
LINKDEFINE LPRP8 TYPE LPR FORM * AST
PARAM LPRP1 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP2 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP3 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP4 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP5 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP6 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP7 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
PARAM LPRP8 EXIT=LPRXPSE ITO=0 US=Y SYS=Y EP='S=Y EH=N C=LPRP'
ROUTE GROUP LPRP TO LINK LPRP1 LPRP2 LPRP3 LPRP4 LPRP5 LPRP6 LPRP7 LPRP8

```

Figure 78. RSCS CONFIG changes to enable PostScript LPR support

```

LINKDEFINE LPR1 TYPE LPR FORM * AST
LINKDEFINE LPR2 TYPE LPR FORM * AST
LINKDEFINE LPR3 TYPE LPR FORM * AST
LINKDEFINE LPR4 TYPE LPR FORM * AST
LINKDEFINE LPR5 TYPE LPR FORM * AST
LINKDEFINE LPR6 TYPE LPR FORM * AST
LINKDEFINE LPR7 TYPE LPR FORM * AST
LINKDEFINE LPR8 TYPE LPR FORM * AST
PARAM LPR1 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR2 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR3 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR4 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR5 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR6 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR7 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
PARAM LPR8 EXIT=LPRXONE ITO=0 US=Y SYS=Y EP='S=Y FF=N C=LPR'
ROUTE GROUP LPR TO LINK LPR1 LPR2 LPR3 LPR4 LPR5 LPR6 LPR7 LPR8

```

Figure 79. RSCS CONFIG changes to enable non-PostScript LPR support

10.6.4 Setting up the LPRXFORM CONFIG file

The structure of the LPRXFORM CONFIG file is documented in *VM RSCS Operation and Use*, SH24-5220. While the basic structure is quite simple, the specification of the PREFIX and SUFFIX tag values is very dependent on the

specific printer being defined. There should be no blank lines in the file: use a comment line (a line starting with “*”) to separate printer definitions.

Table 12. LPRXFORM CONFIG description

Tag name	Tag description
FORM	This value is used to relate this printer definition to an entry in the LPDXMANY CONFIG file and is also used by the VM/ESA LPR command to specify a printer. The FORM parameter on the VM/ESA LPR command correlates with the name specified here. If you will be supporting workstation LPR client printing via VM, this value should match the fifth token of an entry in LPDXMANY CONFIG.
HOSTNAME	This value is used to specify the fully qualified host name of either a workstation running an LPD or a network printer, and is mutually exclusive with the HOSTID keyword.
HOSTID	This value is used to specify the host IP address of either a workstation running an LPD or a network printer, and is mutually exclusive with the HOSTNAME keyword. If HOSTNAME and HOSTID are both specified, the HOSTID is used.
PRINTER	This is either the name of the printer on the LPD server or the queue name in a network printer. The queue name in a network printer is printer- dependent and should be provided in the documentation that came with the printer.
SEP	A value of YES indicates a VM/ESA separator page; NO indicates no VM/ESA separator page; 2P indicates 2 separator pages (for duplex printing). In general, we suggest a value of YES for shared printers and a value of NO for personal workstation attached printers.
FORMSUB	For PostScript printers, specify this as P+ASCII, which indicates to the LPRXPSE exit that the file is ASCII PostScript data. For all other printers, do not specify this tag.
PREFIX	ASCII control sequences (in hex) that are sent to the printer before the print data. If there is prefix data that should be sent after the separator page, a prefix string of “FF04” should be used to indicate the separator page location. “FF04” is recognized by the LPR exits which insert the separator page at the specified location. If more than one PREFIX tag is present, they are concatenated.
SUFFIX	ASCII control sequences (in hex) that are sent to the printer after the print data. If more than one SUFFIX tag is present, their values are concatenated.

10.6.4.1 PCL prefix and suffix strings

All PCL controls must be preceded by the Escape (esc) character (hex 1B). Each set of PCL controls should be preceded by a reset character “E” (hex 1B45). The prefix and suffix strings in Figure 71 on page 161 for the Hewlett-Packard DeskJet 890C are explained in Table 13 on page 164. The prefix strings will result in a monospace font at 12 characters per inch for the separator page.

Table 13. PCL prefix and suffix strings for HP890C

ASCII representation	Text representation	Description
1B45	^{esc} E	Reset
1B28733050	^{esc} (sOP	Monospace font

ASCII representation	Text representation	Description
1B2873313248	<code>esc(s12H</code>	Pitch 12 CPI
FF04		Separator placement

The sample exec in Figure 80 will convert PCL commands in a file to strings for use on PREFIX and SUFFIX tags in LPRXFORM CONFIG. The exec adds the escape sequence (esc above) to the beginning of each line. The separator string of FF04 is inserted by having an input line containing the string "separator".

```

/* PCPREFIX - Change PCL strings to ASCII HEX for LPRXFORM          */
                                                                    */
Arg ifn ift ifm .                                          /* Get arguments          */
                                                                    */
If ifm = '' then ifm = '*'                                  /* Filemode default to "*" */
If ift = '' then ift = 'PCL'                              /* Filetype default to "PCL" */
If ifn = '' then Exit 4                                    /* No filename, exit!     */
                                                                    */
'PIPE state' ifn ift ifm ,                                /* Get file info          */
  '| specs w1 1 w2 nw w3 nw' ,                            /* Get fname, ftype, fmode */
  '| var ifile'                                           /* Store in ifile        */
                                                                    */
ofile = ifn 'PCPREFIX A'                                  /* Set output file name   */
                                                                    */
If rc <> 0 then Exit 4                                     /* File not found, exit   */
Say ''
Say 'PCPREFIX: Input from' ifile                          /* Put header on console  */
                                                                    */
'PIPE (endchar ?) <' ifile ,                              /* Read input             */
  '| strip' ,                                             /* Remove blanks          */
  '| console' ,                                           /* Display on console     */
  '| a: casei nlocate /separator/' ,                     /* Find separators        */
  '| xlate from 037' ,                                    /* Translate to CP 500    */
  '| xlate e2a' ,                                         /* Translate to ASCII     */
  '| specs 1-* c2x 1' ,                                   /* Convert to hex         */
  '| specs /1B/ 1 1-* n' ,                               /* Prefix with escape x1B */
  '| deblock fixed 60' ,                                  /* Split to shorter records */
  '| b: faninany' ,                                       /* Join streams together  */
  '| buffer' ,
  '| >' ofile ,                                           /* Save in "fn" PCPREFIX A */
  '| literal PCPREFIX: Output to' ofile ,                /* Build header          */
  '| console' ,                                           /* Display on console     */
  '? a:' ,                                                /* Process separator      */
  '| specs /FF04/ 1' ,                                    /* Insert "hex" separator */
  '| b:'                                                  /* Go to join streams    */

```

Figure 80. PCPREFIX exec to convert PCL strings for LPRXFORM CONFIG

The following is an example of use of the PCPREFIX exec.

```

pcprefix hp890c

PCPREFIX: Input from HP890C PCL A1
E
(sOP
(s12H
separator
E
PCPREFIX: Output to HP890C PCPREFIX A
1B45
1B28733050
1B2873313248
FF04
1B45

```

10.6.4.2 PostScript prefix and suffix strings

The prefix and suffix strings in Figure 72 on page 161 for the IBM Network Printer 24 in PostScript mode (FORM=NPPS) are explained in Table 14. PostScript strings are converted from ASCII text to hex for use as a prefix or suffix string. Each complete command string should be terminated by a Carriage Return Line Feed (CRLF) sequence (“OD0A”). The separator will be printed from paper tray 2 and the print data will be printed from paper tray 3. The paper tray values were obtained from the *PCL5e/PostScript Technical Reference*, S544-5344.

Table 14. PostScript prefix and suffix strings for IBM Network Printer 24

ASCII representation	Text representation	Description
252150532D41646F6265 OD0A	%!PS-Adobe ^{CRLF}	PostScript header
737461747573646963742 0626567696E2066616C7 365207365746475706C6 5786D6F6465203020736 574706170657274726179 20656E640D0A	statusdict begin false setduplexmode 0 setpapertray end ^{CRLF}	Paper tray 0, duplex off
737461747573646963742 0626567696E207472756 5207365746475706C657 86D6F646520312073657 470617065727472617920 656E640D0A	statusdict begin true setduplexmode 1 setpapertray end ^{CRLF}	Paper tray 1, duplex on
FF04		Separator placement

PostScript control sequences are in reverse Polish notation. Between the start sequence of “statusdict begin” and the end sequence “end”, the control information is in the format “value keyword”. The sample exec in Figure 81 on page 167 will convert PostScript commands in a file to strings for use on PREFIX and SUFFIX tags in LPRXFORM CONFIG. The exec adds the carriage return and line feed (CRLF above) to the end of each line. The separator string of FF04 is inserted by having an input line containing the string “separator”.


```

/* PSPREFIX - Change PostScript strings to ASCII HEX for LPRXFORM */
Arg ifn ift ifm . /* Get arguments */
If ifm = '' then ifm = '*' /* Filemode default to "*" */
If ift = '' then ift = 'PS' /* Filetype default to "PCL" */
If ifn = '' then Exit 4 /* No filename, exit! */

'PIPE state' ifn ift ifm , /* Get file info */
'| specs w1 1 w2 nw w3 nw' , /* Get fname, ftype, fmode */
'| var ifile' /* Store in ifile */

ofile = ifn 'PSPREFIX A' /* Set output file name */

If rc <> 0 then Exit 4 /* File not found, exit */

Say ''
Say 'PSPREFIX: Input from' ifile /* Put header on console */

'PIPE (endchar ?) <' ifile , /* Read input */
'| strip' , /* Remove blanks */
'| console' , /* Display on console */
'| a: casei nlocate /separator/' , /* Find separators */
'| xlate from 037' , /* Translate to CP 500 */
'| xlate e2a' , /* Translate to ASCII */
'| specs 1-* c2x 1 /0D0A/ n' , /* Convert to hex */
'| deblock fixed 60' , /* Split to shorter records */
'| b: faninany' , /* Join streams together */
'| buffer' ,
'| >' ofile , /* Save in "fn" PSPREFIX A */
'| literal PSPREFIX: Output to' ofile , /* Build header */
'| console' , /* Display on console */
'? a:' , /* Process separator */
'| specs /FF04/ 1' , /* Insert "hex" separator */
'| b:' /* Go to join streams */

```

Figure 81. PSPREFIX exec to convert PostScript strings for LPRXFORM CONFIG

The following is an example of the use of the PSPREFIX exec.

```

psprefix np24ps

PSPREFIX: Input from NP24PS PS A1
%!PS-Adobe
statusdict begin false setduplexmode 0 setpapertray end
separator
statusdict begin true setduplexmode 1 setpapertray end
PSPREFIX: Output to NP24PS PSPREFIX A
252150532D41646F62650D0A
7374617475736469637420626567696E2066616C7365207365746475706C
65786D6F646520302073657470617065727472617920656E640D0A
FF04
7374617475736469637420626567696E2074727565207365746475706C65
786D6F646520312073657470617065727472617920656E640D0A

```

10.7 Printing from VM/ESA to a network printer

Printing from VM/ESA CMS to a network printer uses the LPRSET and LPR commands to send the print file to the network printer through RSCS and TCP/IP. A detailed discussion of the LPRSET and LPR commands is available in Chapter 10 of the *TCP/IP Function Level 320 User's Guide*, SC24-5848.

The LPRSET command can be used to set defaults for further processing by the LPR command. We recommend that permanent defaults be set to simplify end user printing. These permanent defaults could be set in SYSPROF EXEC, if you wish to set site level defaults.

Initially the default values are as shown in the following screen.

```
lprset (query
Printer and host values have not been defined
Server is defined as: RSCS (Default)
Printer is connected on link: LPR(P) (Default)
Printer is connected on node: TOTVM1 (Default)
LPR mode: SYNCHRONOUS (Default)
Ready; T=0.03/0.03 11:31:41
```

If you will be printing files through the RSCS LPR support, then this LPRSET command could be used:

```
LPRSET (PERM ASYNCH
```

This will result in the following defaults:

```
lprset (perm asynch
Ready; T=0.03/0.04 11:32:10
lprset (query
Printer and host values have not been defined
Server is defined as: RSCS (Default)
Printer is connected on link: LPR(P) (Default)
Printer is connected on node: TOTVM1 (Default)
LPR mode: ASYNCHRONOUS
Ready; T=0.03/0.03 11:32:12
```

With these defaults set, you could print an EBCDIC file to our pool of IBM Network Printers using one of the following commands:

```
PPS filename filetype (PRINTER NP24PS FORM NP
PPS filename filetype (PRINTER NP24PS
LPR filename filetype (RSCS NP24PS,TOTVM1 FORM NP
LPR filename filetype (RSCS NP24PS,TOTVM1
```

Using the LPR command, you must specify the RSCS node of the system on which the printer is defined (in our case TOTVM1). Form NP is defined in LPRXFORM CONFIG identical to form STANDARD.

With the above defaults set, you could print an ASCII PostScript file to our pool of IBM Network printers using one of the following commands:

```
PPS filename filetype (PRINTER NP24PS FORM NPPS
LPR filename filetype (RSCS ASCII,NP24PS FORM NPPS
LPR filename filetype (RSCS NP24PS,TOTVM1 FORM NPPS
```

The ASCII PostScript file may have been created on VM/ESA using the Document Composition Facility (SCRIPT) or may have been created on a workstation and uploaded to VM/ESA.

It is not possible to print an ASCII file to a PostScript printer using RSCS as the LPRXPSE exit assumes a text file is in EBCDIC and translates it. The installation could create a duplicate definition of the PostScript printer as a PCL printer and print the ASCII file to the PCL printer.

Printing to a PCL printer is similar to PostScript, but can be simpler. If you have a PCL printer, such as the Hewlett-Packard 890C we used in our environment, and you have a FORM set up for that printer in LPRXFORM CONFIG, you can use the following commands. To print an EBCDIC file use this command:

```
LPR filename filetype (FORM HP890C
```

And to print an ASCII file use this command:

```
LPR filename filetype (FORM HP890C RSCS ASCII,LPR
```

In general, if a printer is explicitly defined in LPRXFORM CONFIG, you use the FORM parameter on LPR or PPS to direct your output to that printer. If your printer is explicitly defined in RSCS CONFIG, then the entry in LPRXFORM CONFIG is just used to specify control information and you would use specify the printer name using the PRINTER parameter on the PPS command or as a value on the RSCS parameter of the LPR command.

10.8 Printing from Windows to a network printer

Once you have completed the steps in 10.4.2, “Configuring Windows NT 4 as a print client” on page 151 or 10.4.3, “Configuring Windows 95/98 as a print client” on page 153, then printing is quite simple. From a Windows application simply select as your printer destination the printer you defined on a port in Windows. The print output will be routed to the VM/ESA system through the LPD driver in RSCS and then to the selected printer through an LPR driver.

For printing from a command prompt, enter the LPR command (or equivalent) with a `-S` parameter of the VM/ESA system domain name and a `-P` parameter of the printer you defined on a port in Windows.

10.9 Printing from Windows to a VM/ESA printer

While we have not described in this chapter how to print from Windows workstation to a VM/ESA host printer, this is quite simple to accomplish for ASCII files to non-AFP printers or AFP files to AFP printers.

For ASCII files, define the host printer in the LPDXMANY CONFIG file, specifying that the file be translated into EBCDIC. You should also specify class, form, and node ID if the printer is on a remote VM/ESA system.

For AFP files (using the IBM AFP driver for Windows), define the host printer in the LPDXMANY CONFIG file and specify the class, form, PSF destination and node if the printer is on a remote VM/ESA system.

10.9.1 IBM AFP printer drivers for Windows

IBM has made available printer drivers for the various Windows platforms which can be used to create an AFP data stream file.

These IBM AFP Printer Drivers are available from the IBM Printing Systems Web site at:

<http://www.ibm.com/printers/>

On the IBM Printing Systems Web site select **Support** in the menu on the left side, on the next page select **Fixes, printer drivers and updates** on the left side, and then select **IBM AFP printer drivers for Windows**. Follow the instructions on this Web page for the appropriate Windows version to download and install the driver.

10.10 Printing from UNIX workstation

Printing from a UNIX workstation is very dependent on the specific version involved. UNIX variants have commands such as QPRT, ENQ, LP and LPR. Refer to your operating system documentation for more information.

IBM Redbooks evaluation

TCP/IP Solutions for VM/ESA
SG24-5459-00

Your feedback is very important to help us maintain the quality of ITSO redbooks. **Please complete this questionnaire and return it using one of the following methods:**

- Use the online evaluation form found at <http://www.redbooks.ibm.com/>
- Fax this form to: USA International Access Code + 1 914 432 8264
- Send your comments in an Internet note to redbook@us.ibm.com

Which of the following best describes you?

Customer **Business Partner** **Solution Developer** **IBM employee**
 None of the above

Please rate your overall satisfaction with this book using the scale:
(1 = very good, 2 = good, 3 = average, 4 = poor, 5 = very poor)

Overall Satisfaction _____

Please answer the following questions:

Was this redbook published in time for your needs? Yes___ No___

If no, please explain:

What other redbooks would you like to see published?

Comments/Suggestions: (THANK YOU FOR YOUR FEEDBACK!)

SG24-5459-00

Printed in the U.S.A.

TCP/IP Solutions for VM/ESA

SG24-5459-00

