

LAT/VMS Management Guide

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January 1988

This document describes and explains the tasks involved in managing the Local Area Transport (LAT) software on Version 4.7 systems.

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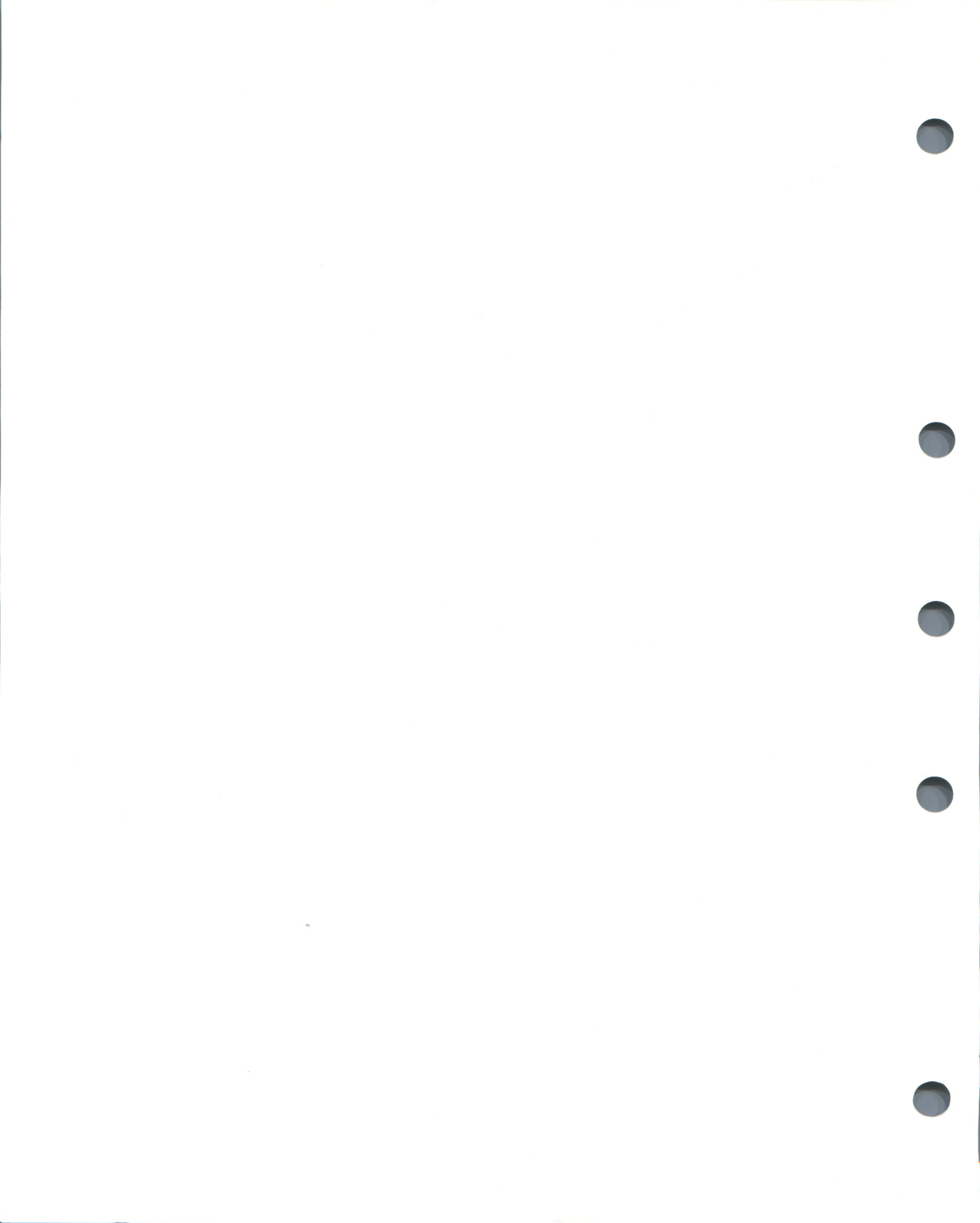
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Contents

PREFACE		xi
---------	--	----

CHAPTER 1	FUNCTIONS OF LAT/VMS SOFTWARE ON A VMS SYSTEM	1-1
-----------	---	-----

1.1	LOCAL AREA TRANSPORT (LAT) PROTOCOL	1-1
-----	-------------------------------------	-----

1.2	LAT PRINT SYMBIONT	1-2
-----	--------------------	-----

1.3	LAT DEFINITIONS	1-3
1.3.1	LAT node	1-3
1.3.1.1	VMS Service Nodes • 1-3	
1.3.1.2	Terminal Server Nodes • 1-3	
1.3.2	Services	1-3
1.3.3	Groups	1-3
1.3.4	Sessions	1-3

1.4	SERVICE NODE/SERVER COMMUNICATIONS	1-4
1.4.1	Virtual Circuits	1-4
1.4.2	Service Announcements	1-4
1.4.3	Load Balancing and Service Rating	1-5
1.4.4	Automatic Failover	1-5
1.4.5	Remote Printer Device	1-5

1.5	LAT/VMS FILES	1-6
-----	---------------	-----

CHAPTER 2	VAX/VMS SERVICE NODE MANAGEMENT	2-1
-----------	---------------------------------	-----

2.1	MANAGEMENT OVERVIEW	2-1
-----	---------------------	-----

2.2	EXAMPLE OF A LAT CONFIGURATION	2-1
-----	--------------------------------	-----

2.3	THE LTLOAD.COM COMMAND PROCEDURE	2-3
-----	----------------------------------	-----

Contents

2.4	SETTING SERVICE NODE CHARACTERISTICS	2-5
2.4.1	Node Name _____	2-6
2.4.2	Node Identification _____	2-6
2.4.3	LAT Network Groups _____	2-6
2.4.4	Multicast Timer _____	2-7
<hr/>		
2.5	MANAGING SERVICES	2-7
2.5.1	Service Names _____	2-8
2.5.2	Service Announcements _____	2-8
2.5.3	Service Ratings _____	2-8
<hr/>		
2.6	ADVERTISING SERVICES	2-9
<hr/>		
2.7	EDITING YOUR SYSTEM STARTUP COMMAND PROCEDURES	2-9
2.7.1	Invoking LTLOAD.COM on Individual Nodes _____	2-9
2.7.2	Invoking LTLOAD.COM on VAXcluster Nodes _____	2-10
<hr/>		
2.8	USING LATCP INTERACTIVELY	2-10
2.8.1	Invoking LATCP _____	2-11
2.8.2	Using HELP for LATCP Commands _____	2-11
2.8.3	Exiting from LATCP _____	2-11
2.8.4	Loading and Starting the LAT Port Driver _____	2-12
2.8.5	Stopping the LAT Port Driver _____	2-12
2.8.6	Displaying Your Service Node Characteristics _____	2-12
2.8.7	Changing a Service Name _____	2-13
2.8.8	Changing a Service Announcement _____	2-13
2.8.9	Changing a Service Rating _____	2-13
<hr/>		
CHAPTER 3	SETTING UP REMOTE PRINTERS	3-1
<hr/>		
3.1	CREATING APPLICATIONS PORTS ON SERVICE NODES	3-1
<hr/>		
3.2	MAPPING APPLICATIONS PORTS TO SERVER PORTS AND SERVICES	3-2
<hr/>		
3.3	SETTING UP PRINTER CHARACTERISTICS FOR NONCLUSTERED NODES	3-2
3.3.1	Setting Up Terminal Characteristics for Remote Printers _____	3-3
3.3.2	Defining a Form for a Remote Printer _____	3-4
3.3.3	Setting Up a Remote Printer as a Spooled Device _____	3-5

3.3.4	Initializing Queues for Remote Printers _____	3-5
<hr/>		
3.4	SETTING UP REMOTE PRINTING ON VAXCLUSTERS	3-6
3.4.1	Guidelines for Order of Events on VAXclusters _____	3-6
3.4.2	Queues in a VAXcluster Environment _____	3-6
<hr/>		
3.5	PRINTING JOBS	3-8
<hr/>		
3.6	TROUBLESHOOTING PROBLEMS WITH A REMOTE PRINTER QUEUE	3-9
3.6.1	Checkpointed Errors _____	3-9
3.6.2	Suspended Printing Errors _____	3-10
3.6.3	Pending Errors _____	3-10

CHAPTER 4 LAT PORT DRIVER QIO INTERFACE 4-1

4.1	USING VAX/VMS FUNCTION CODES AND MODIFIERS FOR LAT DEVICES	4-1
<hr/>		
4.2	LAT PORT DRIVER FUNCTION CODE	4-2
4.2.1	LAT Port Function Code Modifiers _____	4-2
4.2.2	Hangup Notification _____	4-3
4.2.3	I/O Status Block _____	4-3
<hr/>		
4.3	PROGRAMMING EXAMPLE	4-4

CHAPTER 5 LAT CONTROL PROGRAM COMMAND DESCRIPTIONS 5-1

5.1	ENTERING LATCP COMMANDS	5-1
	CREATE PORT	5-2
	CREATE SERVICE	5-3
	DELETE PORT	5-5
	DELETE SERVICE	5-6
	EXIT	5-7
	HELP	5-8
	SET COUNTERS	5-9
	SET NODE	5-10
	SET PORT	5-12

Contents

SET SERVICE	5-14
SHOW CHARACTERISTICS	5-16
SHOW COUNTERS	5-17
SHOW PORTS	5-21
SHOW SERVERS	5-23
START NODE	5-24
STOP NODE	5-26

APPENDIX A	ASCII CHARACTERS FOR NODE AND SERVICE NAMES	A-1
------------	---	-----

APPENDIX B	QUALIFIERS FOR DCL PRINTER SETUP COMMANDS	B-1
------------	---	-----

APPENDIX C	LAT CONTROL PROGRAM ERROR MESSAGES	C-1
------------	------------------------------------	-----

INDEX

EXAMPLES

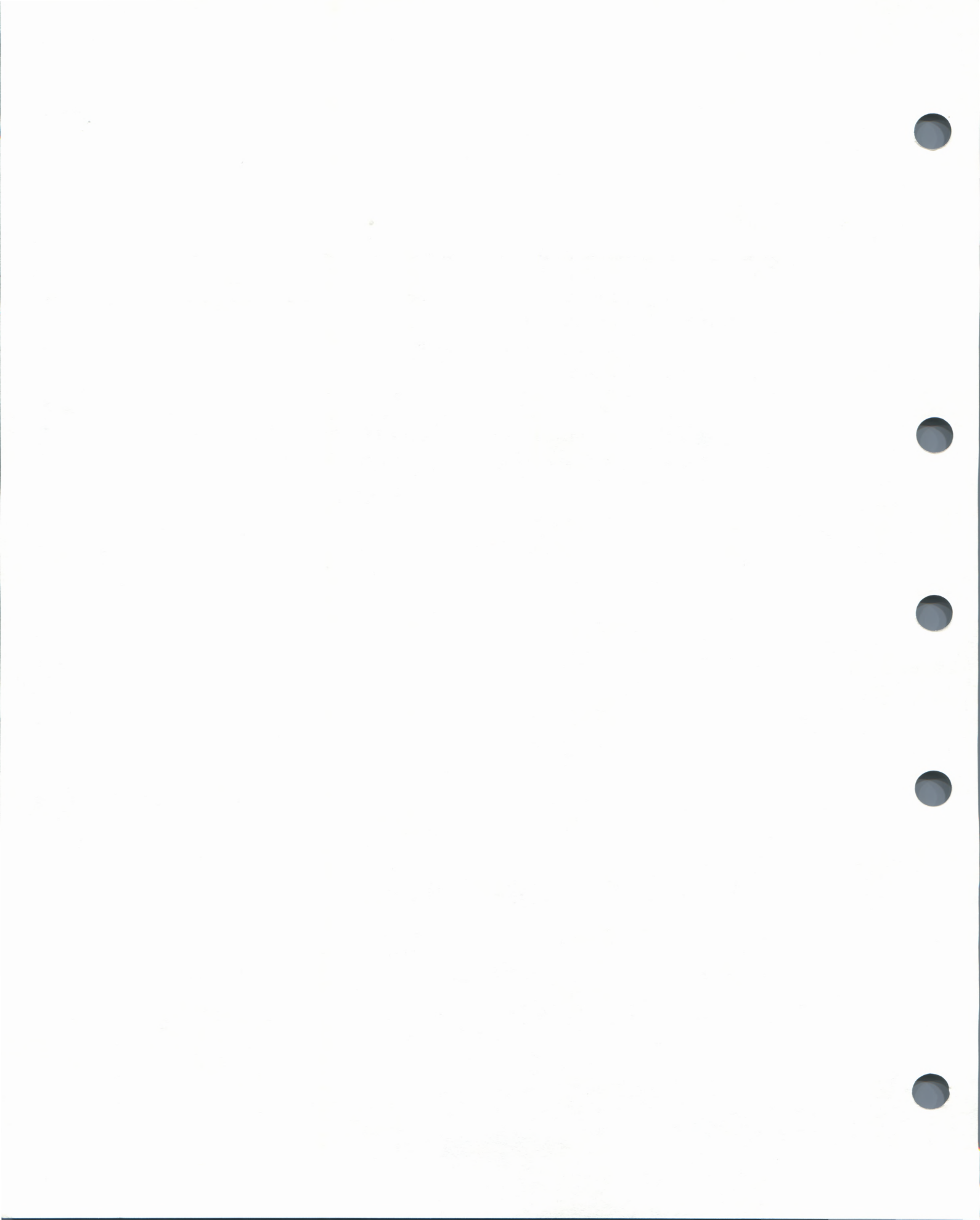
2-1	LTLOAD.COM Template Command Procedure _____	2-4
2-2	Example of LAT Service Node Startup Command File ____	2-5
2-3	Invoking LTLOAD.COM on a VAXcluster Node _____	2-10
3-1	Command Procedure for Configuring Remote Printers ____	3-3
3-2	Command Procedure for Configuring Remote Printers Using a Generic Queue _____	3-7
4-1	Application Program for Connecting to a Remote Device _	4-5

FIGURES

1-1	A Typical LAT Configuration _____	1-2
2-1	Service Nodes, Remote Printers, and Services _____	2-2
4-1	First Word of the I/O Status Block _____	4-4

TABLES

4-1	LAT Connection Status Codes _____	4-3
4-2	LAT Rejection Codes _____	4-4
5-1	Descriptions of LAT Node Counters _____	5-18
5-2	Protocol Error Bit-Mask Definitions _____	5-19
A-1	ASCII Characters Used to Specify Node and Service Names _____	A-1
B-1	Command Qualifiers Required for Remote Printers _____	B-1
B-2	Additional Qualifiers Required for Particular Devices _____	B-2



Preface

Intended Audience

This document is intended for system managers who will manage Local Area Transport (LAT) software.

Document Structure

This document contains five chapters and three appendixes:

- Chapter 1 describes the Local Area Transport (LAT) protocol, the LAT/VMS software, and the general concepts of service node and server communications.
- Chapter 2 discusses how to set up the characteristics of a service node using startup command procedures and how to manage services offered by the node. This chapter gives examples of startup command procedures.
- Chapter 3 presents the commands used to set up a remote printer as a spooled device, to set up print queues, and to associate remote printers with your service node. This chapter also discusses troubleshooting for remote printer queues.
- Chapter 4 discusses the QIO interface to the LAT port driver and the function code modifiers used to establish and terminate connections to remote devices.
- Chapter 5 shows how to enter LATCP commands interactively and provides a full description of each LAT/VMS command.
- Appendix A lists the ASCII characters for node and service names.
- Appendix B describes the terminal and queue characteristics required for setting up printers.
- Appendix C lists and explains LATCP error messages.

Preface

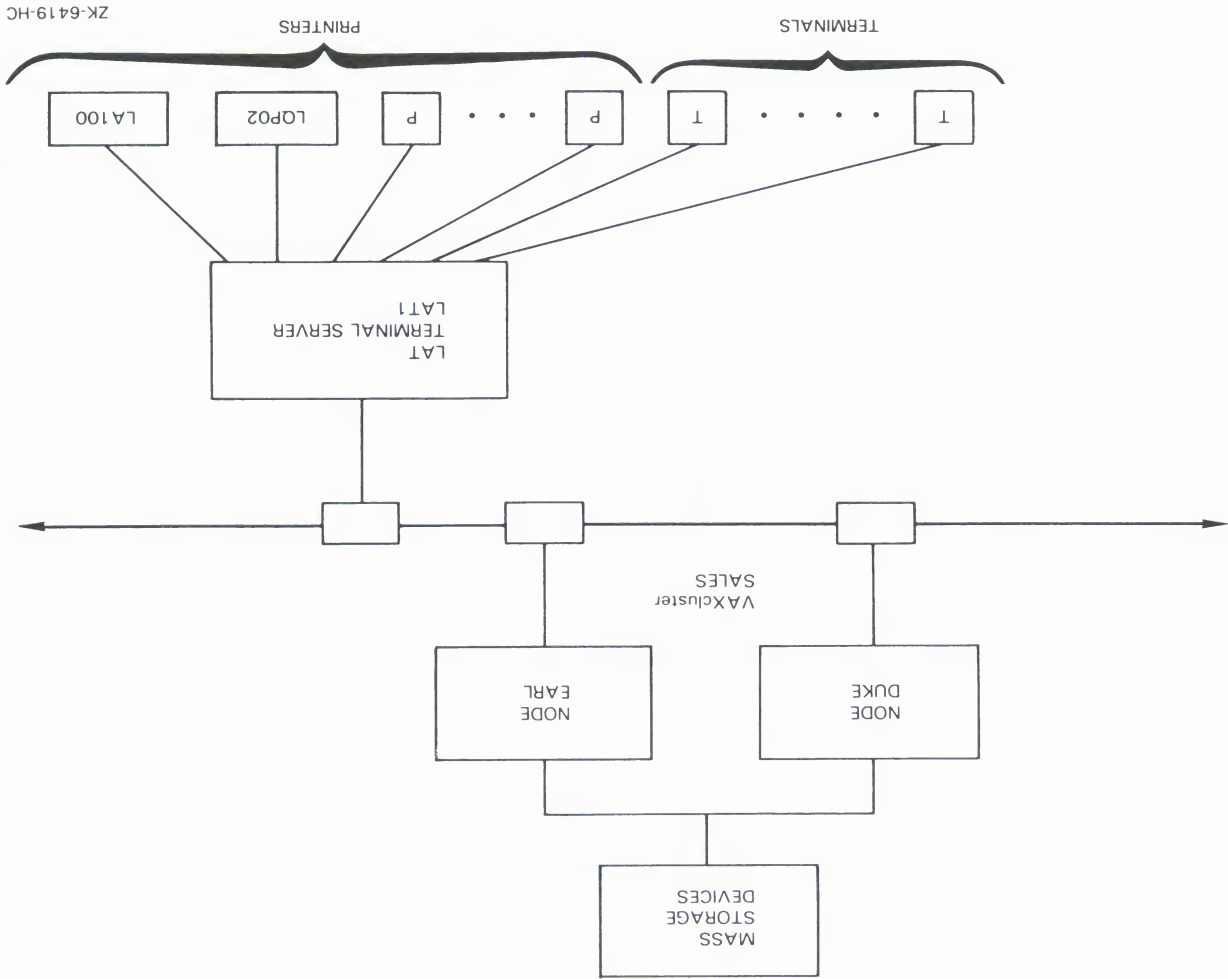
Conventions

Convention	Meaning
<code>RET</code>	In examples, a key name (usually abbreviated) shown within a box indicates that you press a key on the keyboard; in text, a key name is not enclosed in a box. In this example, the key is the RETURN key. (Note that the RETURN key is not usually shown in syntax statements or in all examples; however, assume that you must press the RETURN key after entering a command or responding to a prompt.)
CTRL/C	A key combination, shown in uppercase with a slash separating two key names, indicates that you hold down the first key while you press the second key. For example, the key combination CTRL/C indicates that you hold down the key labeled CTRL while you press the key labeled C. In examples, a key combination is enclosed in a box.
<code>\$ SHOW TIME</code> 05-JUN-1988 11:55:22	In examples, system output (what the system displays) is shown in black. User input (what you enter) is shown in red.
<code>\$ TYPE MYFILE.DAT</code> . . .	In examples, a vertical series of periods, or ellipsis, means either that not all the data that the system would display in response to a command is shown or that not all the data a user would enter is shown.
input-file, . . .	In examples, a horizontal ellipsis indicates that additional parameters, values, or other information can be entered, that preceding items can be repeated one or more times, or that optional arguments in a statement have been omitted.
[logical-name]	Brackets indicate that the enclosed item is optional. (Brackets are not, however, optional in the syntax of a directory name in a file specification or in the syntax of a substring specification in an assignment statement.)
quotation marks apostrophes	The term quotation marks is used to refer to double quotation marks ("). The term apostrophe (') is used to refer to a single quotation mark.

Functions of LAT/VMS Software on a VMS System

1.1 Local Area Transport (LAT) Protocol

Figure 1-1 A Typical LAT Configuration



ZK-6419-HC

Note: The LAT port driver accepts connections through only one Ethernet adapter on each service node.

LAT Print Symbiont

The LAT/VMS software includes the LATSYM print symbiont. The LATSYM print symbiont allows the LAT port driver to create and terminate connections to remote printers on servers. LATSYM uses the same I/O function-code modifiers that are provided for application programs (see Chapter 4).

Note: You cannot use the standard VMS print symbiont for LAT connections. See Chapter 3 for the configurations required to set up your service node for remote printers on terminal servers.

Functions of LAT/VMS Software on a VMS System

1

LAT/VMS software functions in an Ethernet local area network (LAN) environment and is part of your VMS operating system. LAT/VMS software enables your VMS system to exchange data with a terminal server—a communication device that connects terminals, modems, or printers to an Ethernet network. LAT/VMS software also has the features required for your VMS system to function as a VMS service node, which is a node that accepts connections requested by server users.

1.1 Local Area Transport (LAT) Protocol

1.1

Local Area Transport (LAT) is an Ethernet-based protocol that provides an efficient means of logically connecting terminal servers to one or more VMS service nodes on the same Ethernet. LAT does not use a DECnet protocol to transport messages, but it can exist on a DECnet network. Figure 1-1 shows a typical LAT configuration.

Functions of LAT/VMS Software on a VMS System

1.3 LAT Definitions

1.3 LAT Definitions

The following sections define terms used throughout this manual.

1.3.1 LAT node

A LAT node runs software that implements the LAT protocol. There are two types of LAT nodes: VMS service nodes and terminal server nodes.

1.3.1.1 VMS Service Nodes

A VMS service node is an individual computer in a local area network that offers its resources to users and devices. In this manual, the term *service node* refers to a VMS system running the LAT software.

1.3.1.2 Terminal Server Nodes

A terminal server node (also called a server) connects users to services offered by VMS service nodes. A terminal server node is located near the terminals and printers it supports. The terminals and printers are physically cabled to the terminal server; the terminal server is physically connected to the Ethernet.

Terminal server nodes build and maintain a database of available services using announcements received over the network for service nodes. When terminal server nodes receive requests from terminal users, they scan their service database, locate the least busy system that offers the requested service, and establish a logical connection between the user's terminal and the VMS service node providing the service.

1.3.2 Services

Each VMS service node offers its resources as a service. Most often, a node offers a general processing service, but it can offer special application services as well. A system manager can create up to eight services on each VMS service node. Each service can offer all of the resources of the node even though each service has a different service name. See Chapter 2 for information about services.

1.3.3 Groups

A LAT configuration is partitioned into logical subdivisions called groups. A server can establish logical connections with VMS service nodes with which it shares common groups. See Chapter 2 for information about setting up groups for your service node.

1.3.4 Sessions

A session is a logical connection between a device at a terminal server port and a VMS service. Each terminal on a server appears as if it were connected directly to a service it is using; the actions of the terminal server are transparent to users. LAT server software enables a user to maintain several sessions at once, allowing the user to move quickly from one session to another.

Functions of LAT/VMS Software on a VMS System

1.4 Service Node/Server Communications

1.4 Service Node/Server Communications

Following is an overview of service node and server communications.

1.4.1 Virtual Circuits

A virtual circuit is an independent, logical path used for exchanging data between two nodes. LAT uses a virtual circuit to create sessions between a server and a service node. LAT virtual circuits are multiplexed over a single physical circuit. The physical circuit hardware includes the server's network interface, the network hardware, and the service node's network interface.

To establish server to service node communications, the server determines whether a virtual circuit exists to the service node that is offering a service or requesting a remote printer connection. If no virtual circuit between the nodes exists, the server establishes one.

Once established, a virtual circuit between the server and the service node lasts as long as sessions are active. During this period, this single virtual circuit channels all the data exchanged by all sessions between the server and the service node. Thus, all concurrent connections between a server and a service node— whether requested by a terminal user on a server or by an application program on a service node — share one virtual circuit. Each server or service node can support up to 255 concurrent virtual circuits.

The server sends virtual circuit messages at regular intervals. The interval between transmissions is determined by a circuit timer, which the server maintains. The server holds the requests-to-send data made by server ports by buffering input at a port until the circuit timer expires. The server then transmits all data that is pending from all of its ports in one virtual circuit message. If the server is maintaining multiple virtual circuits, the server builds one message per circuit and sends out multiple virtual circuit messages.

1.4.2 Service Announcements

A VMS service node broadcasts service announcements over the Ethernet at frequent intervals so that terminal servers know where network resources are available. The service announcement contains a node name, group designations, service names, and a rating of service availability. Each server uses the information received in these announcements to build a directory of service node names and service names. Service nodes do not maintain an equivalent directory, however. For example, when an application program requires the use of a remote printer, the service node announces a request for information about the node offering that printer.

The service announcement includes identification strings for the service node and for services offered by the node. An identification string is a short ASCII string that you specify when setting up your service node or creating a service.

Functions of LAT/VMS Software on a VMS System

1.4 Service Node/Server Communications

1.4.3 Load Balancing and Service Rating

LAT protocol provides a load-balancing feature that allows servers to establish connections to a service on the least busy service node offering the service. Servers use service ratings to determine which service node offering a service is least busy. Servers compare the service rating values provided by all service nodes offering a requested service and connect to the node with the best (highest) rating.

Service ratings are calculated dynamically by each service node (or set to static values by system managers) and announced as part of the service announcement message. A service rating is based on the overall level of activity of the node and on the processor type. A high level of system activity gives a low service rating and hence inhibits new connections.

Service names provide a mechanism for distributing user demand on VAXcluster nodes. Creating an identical service name on two or more service nodes enables servers to balance the load on the service nodes in the VAXcluster that offer the common service. Load balancing is especially useful for VAXcluster management, though its use is not limited to clusters.

1.4.4 Automatic Failover

In addition to load balancing, servers provide automatic failover when multiple service nodes offer a common service. Automatic failover is a failure-recovery function that takes over if a session is disrupted because a service node becomes unavailable. After such a failure, the server automatically searches for other service nodes that offer the same service. The server attempts to connect to the service on an alternative node with the highest service rating. In the case of VAXclusters, automatic failover provides a reliable terminal connection to a reliable service. Automatic failover allows users to log in again and to continue working in the event of a node failure.

1.4.5 Remote Printer Device

A printer connected to a server is called a remote printer. A remote printer must be an asynchronous ASCII character device. A remote printer on a server can be shared by all LAT/VMS service nodes, which makes it possible to optimize the use of remote printers.

Application programs on a service node can request a connection to a remote device. A request by an application program for a connection to a server is called a host-initiated request. Host-initiated requests by an application program identify the targeted remote device. The identification is the server name and the port ID or a service offered at that port. Each remote device is mapped to a logical device (applications port) on the service node.

When an application program attempts to access the applications port, the LAT port driver (LTDRIVER), which is contained in the LAT/VMS software, sends a host-initiated request over the LAN to the server. The server then makes the connection. To guarantee that all the service nodes obtain reasonable access to each remote device, a server manager can enable a first-in/first-out (FIFO) queue on a server. A queued or nonqueued request is accepted by the server if the remote port is free. If the remote port is busy and queuing is enabled on the server, then a remote request is queued.

Functions of LAT/VMS Software on a VMS System

1.5 LAT/VMS Files

1.5 LAT/VMS Files

The files that constitute the LAT/VMS software are installed in the following directories:

SYS\$SYSTEM directory

LTDRIVER.EXE
LATCP.EXE
LATSYSM.EXE

SYS\$MANAGER directory

LTLOAD.COM

SYS\$HELP directory

LATCP.HLB

2 VAX/VMS Service Node Management

As a LAT service node manager, you are responsible for several tasks, including the following:

- Setting up the characteristics of your service node (Section 2.4)
- Managing services offered by your service node (Section 2.5)
- Setting up applications ports and queues to support remote devices for your service node (Chapter 3)
- Editing your system startup files (Section 2.7)
- Starting the LAT software (Section 2.8.4)
- Stopping the LAT software Section 2.8.5)

This chapter discusses how to set up characteristics of your service node and manage services offered by your service node.

2.1 Management Overview

The LAT/VMS software includes a command procedure called LTLOAD.COM. This command procedure resides in the SYS\$MANAGER directory. To execute LTLOAD.COM automatically at system startup, place a line that invokes LTLOAD.COM in your system startup command procedure (SYS\$MANAGER:SYSTARTUP.COM). LTLOAD.COM contains LAT Control Program (LATCP) commands that set up your LAT default characteristics. You can edit the LTLOAD.COM command procedure to customize the characteristics of your service node and services.

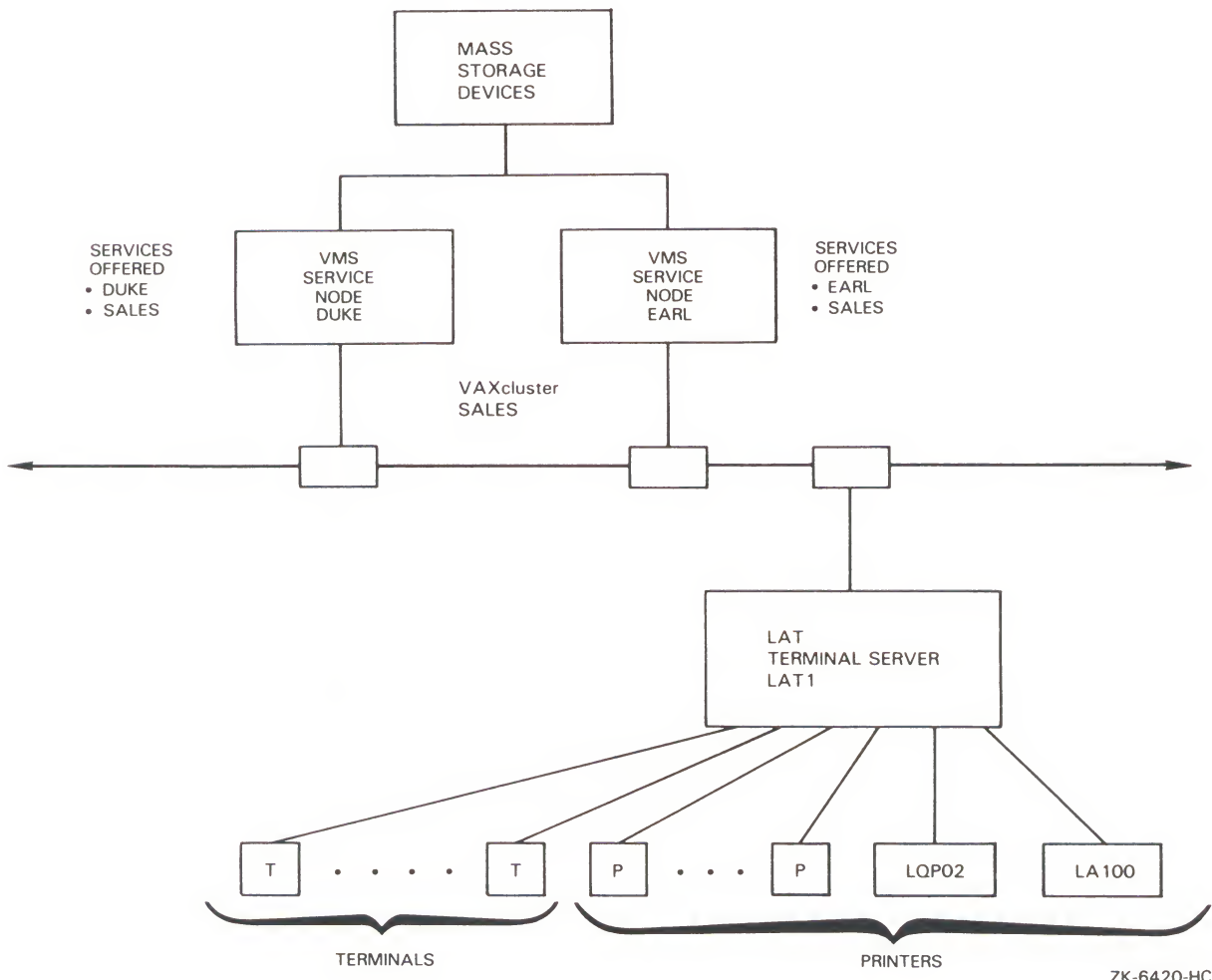
2.2 Example of a LAT Configuration

Figure 2-1 shows a sample LAT configuration. This figure is referred to throughout this chapter.

VAX/VMS Service Node Management

2.2 Example of a LAT Configuration

Figure 2-1 Service Nodes, Remote Printers, and Services



ZK-6420-HC

The nodes DUKE and EARL, which are part of a VAXcluster system, can make host-initiated requests for any of the remote printers connected to the LAT1 server. These nodes share the same mass storage devices and offer a common cluster LAT service called SALES. The LAT terminal server, LAT1, has interactive terminals represented by the letter T. The printers on this server are represented by the letter P or by a specific printer name. LQP02 and LA100 are printers.

VAX/VMS Service Node Management

2.3 The LTLOAD.COM Command Procedure

2.3 The LTLOAD.COM Command Procedure

The LTLOAD.COM command procedure performs the following LAT management functions needed at system startup time:

- Loads the LAT port driver using a System Generation Utility (SYSGEN) command
- Sets up your LAT service node characteristics
- Creates services for your service node
- Sets up some of the remote printer characteristics
- Starts the LAT port driver

Example 2-1 shows the template LTLOAD.COM command procedure supplied with the LAT/VMS software. This command procedure applies default node and service characteristics to your system. You can pass parameters to LTLOAD.COM to override these default characteristics. This method of executing LTLOAD.COM is especially useful if you have multiple nodes in a VAXcluster with the same LAT characteristics.

The LTLOAD.COM command procedure accepts the following parameters:

- P1 specifies the service name.
- P2-P4 specifies up to three valid qualifiers for the LATCP command SET NODE, such as "/ENABLE=(25,26)".

Enter a command in your system startup command procedure (SYS\$MANAGER:SYSTARTUP.COM) to invoke the LTLOAD.COM command procedure automatically upon system startup. This command in SYSTARTUP.COM should pass values for P1-P4 to the LTLOAD.COM command procedure if they are required. Section 2.7 explains how to invoke the LTLOAD.COM command procedure automatically upon system startup.

You can edit the template LTLOAD command procedure to tailor the characteristics of your service node, overriding the default characteristics and specifying the node and service characteristics that you desire.

The CREATE PORT and SET PORT commands in LTLOAD.COM set up a remote printer for your service node. Chapter 3 explains these commands.

The LTLOAD.COM file, shown in Example 2-2, refers to the service nodes, server, and printers in Figure 2-1. Because this LTLOAD.COM file has been edited to supply node and service characteristics, the P1 and P2-P4 parameters are not specified. The following sections of this chapter explain the commands in this file.

VAX/VMS Service Node Management

2.3 The LTLOAD.COM Command Procedure

Example 2-1 LTLOAD.COM Template Command Procedure

```
$ ! This command procedure starts up the LAT protocol
$ ! and configures applications ports for remote printer use.
$
$ RUN SYS$SYSTEM:SYSGEN
CONNECT LTAO: /NOADAPTER
$
$ ! Invoke LATCP
$
$ LCP := $LATCP
!
! The following commands set up the LAT service with the default name
! SYS$NODE and default ident SYS$ANNOUNCE. If you do not want the
! default SYS$NODE node name applied, specify a service name for the first
! parameter in the command line. You can use up to three parameters
! (P2 -- P4) to specify additional characteristics, such as group
! codes, for your node.
!
$ LCP SET NODE /IDENT 'P2' 'P3' 'P4' /NOLOG
$ LCP CREATE SERVICE 'P1' /IDENT /NOLOG
$ !
$ RUN SYS$SYSTEM:LATCP
!
! Set up the applications ports that will support remote printer
! access.
!
! Create the applications ports.
!
! CREATE PORT LTA1: /NOLOG
! CREATE PORT LTA2: /NOLOG
!
! Maps applications port(s) to a specific port(s) on the server.
!
! SET PORT LTA1: /APPLICATION /NODE=SERVER_1 /PORT=PORT_5
! SET PORT LTA2: /APPLICATION /NODE=SERVER_1 /PORT=LQ_PRINTER
!
! Start the node.
!
START NODE
EXIT
```

VAX/VMS Service Node Management

2.3 The LTLOAD.COM Command Procedure

Example 2-2 Example of LAT Service Node Startup Command File

```
$ ! This command procedure starts up the LAT protocol
$ ! and configures applications ports for remote printer use.
$
$ RUN SYS$SYSTEM:SYSGEN
CONNECT LTAO: /NOADAPTER
$
$ ! Invoke LATCP
$
$ RUN SYS$SYSTEM:LATCP
!
! Set up the node name DUKE with the announcement "A member of
! the SALES VAXcluster". Enable groups 1 and 4, and set the
! multicast timer.
!
!
SET NODE DUKE /IDENT="A member of the SALES VAXcluster" /NOLOG
SET NODE DUKE /ENABLE=(1,4) /MULTICAST_TIMER=70 /NOLOG
!
! Create services DUKE and SALES.
!
CREATE SERVICE DUKE /IDENT="DUKE Interactive Service" /NOLOG
CREATE SERVICE SALES /IDENT="SALES Service" /NOLOG
!
! Set up the applications ports that will support remote printer
! access.
!
! Create the applications ports.
!
CREATE PORT LTA321: /NOLOG
CREATE PORT LTA322: /NOLOG
!
! Maps applications port(s) to a specific port(s) on the terminal server.
!
SET PORT LTA321: /APPLICATION /NODE=LAT1 /PORT=PORT_7
SET PORT LTA322: /APPLICATION /NODE=LAT1 /SERVICE=PRINTER
!
! Start the node.
!
START NODE
EXIT
```

2.4 Setting Service Node Characteristics

As the service node manager, you can set up the following service node characteristics, or you can use the default values for these characteristics:

- Node name — The default value is SYS\$NODE.
- Node identification announcement — The default value is SYS\$ANNOUNCE.
- LAT network groups — The default value is group 0.
- Multicast timer — The default value is 60 seconds.

VAX/VMS Service Node Management

2.4 Setting Service Node Characteristics

2.4.1 Node Name

All LAT service nodes must have a node name that is unique within the LAT network. If the service node is part of a DECnet network, the LAT service node name is, by default, the same as the DECnet node name SYS\$NODE. The DECnet node name must be unique within the same logical Ethernet and must be unique within the entire DECnet network. If the service node is not running DECnet, but will be in the future, then it is recommended that you define the logical name SYS\$NODE before using the LTLOAD.COM command procedure and LATCP.

The LAT node name can be from 1 to 16 ASCII characters long. Legitimate characters are described in Appendix A.

The following LATCP command assigns the name DUKE to your service node:

```
SET NODE DUKE
```

2.4.2 Node Identification

The node identification is a description for your node. The node identification is advertised to server users in announcement messages that your service node processes once the LAT port driver is started. The node identification is a string of up to 64 ASCII characters enclosed in quotation marks (""). The node identification cannot begin with an ampersand (&), and nonprintable characters are translated as spaces.

The following command specifies a node identification for node DUKE:

```
SET NODE DUKE /IDENT="A member of the SALES VAXcluster"
```

If you do not specify a node identification, the default is the translation of the logical name SYS\$ANNOUNCE. If the logical name SYS\$ANNOUNCE is not defined and you do not specify a node identification string, then only your service node name is sent in the announcement messages.

2.4.3 LAT Network Groups

Groups, which are used to partition the LAT network into logical subdivisions, are established by the network manager, system managers, and server managers. The integers 0 to 255 are valid group numbers. Groups are used to restrict message traffic between servers and service nodes. To establish a connection, the server requesting a connection to your LAT service node must share at least one group with your node.

When a server receives messages from service nodes that are not in any group enabled on the server, it ignores these messages. Groups help manage the size of the server's databases by limiting the number of service nodes for which the server keeps information. Groups are not intended as a security mechanism.

The following LATCP command enables groups 1 and 4 for service node DUKE:

```
SET NODE DUKE /ENABLE=(1,4)
```

Group 0 is enabled by default for all service nodes and servers. If you do not want group 0 enabled, you must disable it using the /DISABLE qualifier.

VAX/VMS Service Node Management

2.4 Setting Service Node Characteristics

2.4.4 Multicast Timer

The multicast timer determines the time between the announcement messages sent by your service node. The minimum value is 10 seconds; the maximum is 255 seconds.

The default value of 60 seconds is usually adequate. If you assign a large value to the multicast timer, network overhead is minimized because announcement messages are sent less frequently. However, terminal server users have to wait longer for services to become available after the server is rebooted or after recovering from a network problem. In addition, these messages provide the service rating used in load balancing by the server (see Chapter 1). Infrequent announcement messages by the service node can impede load balancing by the server.

If you assign a small value to the multicast timer, more network resources are consumed, since the server must adjust its LAT database and process announcement messages more frequently.

Note that, whenever you change a characteristic for your node, the announcement messages are immediately sent out over the network to announce that change.

The following LATCP command sets the multicast timer for node DUKE to 70 seconds:

```
SET NODE DUKE /MULTICAST_TIMER=70
```

This command causes announcement messages for node DUKE to be sent out on the network every 70 seconds.

2.5 Managing Services

You can create up to eight services on your service node. All the functions and features offered by your VMS system are included for each service.

You can use the CREATE SERVICE command to specify the following characteristics for your service node, or you can use the default values for these characteristics:

- Service name — The default value is SYS\$NODE.
- Service announcement — The default value is SYS\$ANNOUNCE.
- Service rating — The default value is calculated by the LAT protocol, although the system manager can provide a static value for the service rating.

VAX/VMS Service Node Management

2.5 Managing Services

2.5.1 Service Names

Service names can be up to 16 ASCII characters long. Legitimate characters are described in Appendix A. You use a service name to request access to the resources of a LAT node.

Several service nodes can share one service name. A shared service name is especially useful in VAXclusters. It allows the cluster to be known by a cluster name instead of individual node names. Shared service names are also used for load balancing, which allows a server to make a connection to the least busy node offering a service.

The name of each service and the rating of the service node (see Section 1.4.3) are contained in the announcement messages sent by your node. Enter the LATCP command `SHOW SERVICES` to display a list of service names.

The following LATCP command, entered on node DUKE, assigns the service name SALES to node DUKE:

```
CREATE SERVICE SALES
```

If you do not specify a service name in the command line, the default service name, `SYS$NODE`, is assigned to the first service created on a node. If you create more than one service on a node, you must specify a unique service name for each service.

2.5.2 Service Announcements

The service announcement is a description of your service. Announcement messages advertise service announcements to server users. The service announcement is a string of up to 64 ASCII characters enclosed in quotation marks (""). This string cannot begin with an ampersand (&), and nonprintable characters are translated as spaces.

The following LATCP command specifies an announcement string for the service SALES:

```
CREATE SERVICE SALES /IDENT="SALES Service"
```

The default for the service announcement is the value for the system-wide logical name `SYS$ANNOUNCE`.

2.5.3 Service Ratings

At every announcement message interval, the LAT port driver software generates a dynamic service rating for services it offers on the LAT network. Servers use this service rating for load balancing. Dynamic service ratings vary from 255 (highly available to users) to 0 (not available to users).

Normally, these dynamically generated service ratings are adequate and allow efficient load balancing on the LAT network. However, you have the option of overriding the dynamic values by assigning a static service rating. If the dynamic rating on any alternate node drops below the specified static rating, a static service rating value can be used to direct server users temporarily away from or toward a particular node. Note that load balancing does not take place when static ratings are used on all nodes.

VAX/VMS Service Node Management

2.5 Managing Services

Enter the following command to specify a static rating of 195 for the service SALES:

```
CREATE SERVICE SALES /STATIC_RATING=195
```

This command disables the dynamic service rating generated by the LAT port driver for the service SALES.

2.6 Advertising Services

The announcement messages processed by your node advertise all services that you create for your service node. Advertisement of the services begins when the system startup procedure executes the LTLOAD.COM command procedure or when you start the LAT port driver manually by entering the LATCP command START NODE.

If new services are added while the driver is running, the announcement messages are sent out immediately over the network to announce the new services.

2.7 Editing Your System Startup Command Procedures

To configure your service node automatically upon system startup, add a command line to your system startup procedure to invoke the LTLOAD.COM command procedure. This section describes how to modify the system startup command procedure for both individual service nodes and VAXcluster nodes to invoke the LTLOAD.COM command procedure.

2.7.1 Invoking LTLOAD.COM on Individual Nodes

To invoke the LTLOAD.COM command procedure automatically at system startup time, add the following command line to your system startup command procedure (SYS\$MANAGER:SYSTARTUP.COM):

```
$ @SYS$MANAGER:LTLOAD.COM
```

Where you put the command line depends on whether your node is running the DECnet network. If your node is running the DECnet network, insert this command after invoking STARTNET.COM. If your node is not running the DECnet network, insert this line near the end of the startup file, when the node is ready to accept interactive users.

You can also create a command procedure to set up and start print queues for remote printers. To configure the remote printers automatically upon system startup, add a command line to your system startup command procedure to execute this print queue command procedure, as described in Chapter 3.

VAX/VMS Service Node Management

2.7 Editing Your System Startup Command Procedures

2.7.2 Invoking LTLOAD.COM on VAXcluster Nodes

For VAXcluster systems that can have LAT nodes with identical LAT configurations, use a common LTLOAD.COM command procedure and pass the cluster service name as a command line parameter when LTLOAD.COM is invoked. Edit the COMMON_STARTUP.COM file and include a command line, similar to the one in the following example, to be executed after the DECnet network has been started:

```
$ @SYS$COMMON:[SYSMGR]LTLOAD.COM SALES "/ENABLE=(24,25)"
```

This command passes the cluster service name, SALES, to all nodes in the cluster and enables groups 24 and 25.

VAXcluster systems can also have LAT nodes with different LAT configurations, such as the applications ports. In this case, edit a node-specific SYSTARTUP.COM file to invoke LTLOAD.COM after the DECnet network has been started, as shown in Example 2-3.

Example 2-3 Invoking LTLOAD.COM on a VAXcluster Node

```
$ ! This is a site specific startup command procedure for node DUKE
$ ! on the SALES VAXcluster.
$ !
$ ! Invoke the common system startup procedure
$ !
$ ! @SYS$COMMON:[SYSMGR]COMMON_STARTUP.COM
$ !
$ ! Start up DECnet
$ !
$ ! @SYS$MANAGER:STARTNET.COM
$ !
$ ! Define the Login Announcement
$ !
$ ! DEFINE/SYS/EXEC SYS$ANNOUNCE -
$ ! "DUKE-A Member of the Sales VAXcluster"
$ !
$ ! Start LAT
$ !
$ ! @SYS$MANAGER:LTLOAD.COM
$ !
```

2.8 Using LATCP Interactively

In addition to putting LATCP commands in a startup command file, you can enter LATCP commands interactively to modify node or service characteristics. You must have the CMKRNL privilege to invoke LATCP. Only one user at a time can run LATCP interactively.

Edit the LTLOAD.COM command procedure to contain the service node characteristics you want to remain in effect when the system is shut down and restarted. The service node characteristics you specify in the LTLOAD.COM command procedure are initiated upon system startup.

The service node characteristics you specify interactively with the LATCP command SET remain in effect until your service node is shut down.

Note: Before you use the LATCP commands interactively, you must load and start the LAT port driver by executing LTLOAD.COM or by entering the

VAX/VMS Service Node Management

2.8 Using LATCP Interactively

commands described in Section 2.8.4. If the DECnet network is going to be started on your node, you must start the DECnet network before starting the LAT port driver.

2.8.1 Invoking LATCP

Enter the following command to invoke LATCP:

```
$ RUN SYS$SYSTEM:LATCP
LCP>
```

You can also define a symbol, as follows, and use this symbol to invoke LATCP. Define this symbol in your login command file, so that it is available every time you log in to use your system.

```
$ LCP ::= $LATCP
$ LCP
LCP>
```

When the system displays the LCP> prompt, you can enter multiple LATCP commands, as in the following example:

```
$ LCP
LCP> SET NODE DUKE
LCP> START NODE
LCP> EXIT
```

If you have defined the symbol LCP, you can use it to enter a single LATCP command at the DCL prompt. For example, to specify the node name DUKE, enter the following command:

```
$ LCP SET NODE DUKE
```

To specify the default node name (the translation of the SYS\$NODE logical name), enter the following command:

```
$ LCP SET NODE
```

2.8.2 Using HELP for LATCP Commands

The LATCP command HELP provides information about each LATCP command. To get syntax information for a LATCP command, specify HELP and the command name, as follows:

```
$ LCP
LCP> HELP SET NODE
```

The output from this command displays the format and qualifiers for the SET NODE command.

2.8.3 Exiting from LATCP

Enter the following command to exit from LATCP and return to the DCL command level:

```
LCP> EXIT
$
```

Pressing CTRL/Z has the same effect as entering the EXIT command.

VAX/VMS Service Node Management

2.8 Using LATCP Interactively

2.8.4 Loading and Starting the LAT Port Driver

If you choose not to use the LTLOAD.COM command procedure to load the LAT port driver, you can load the LAT port driver interactively. First, set up your node and service characteristics. Then, enter the following SYSGEN command to load the driver interactively (you must have CMKRNL privileges):

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> CONNECT LTAO: /NOADAPTER
SYSGEN> EXIT
$
```

Enter the following commands to start the LAT port driver on your service node:

```
$ RUN SYS$SYSTEM:LATCP
LCP> START NODE
LCP> EXIT
$
```

2.8.5 Stopping the LAT Port Driver

Before stopping the LAT port driver, you should use the DCL command REPLY to notify system users that you are stopping it. See the STOP NODE command in Chapter 5 for an example. Enter the following command to stop the LAT port driver:

```
$ RUN SYS$SYSTEM:LATCP
LCP> STOP NODE
LCP> EXIT
$
```

The STOP NODE command shuts down the LAT port driver and disconnects all sessions to your node.

2.8.6 Displaying Your Service Node Characteristics

Enter the following commands to display the characteristics for your service node:

```
$ RUN SYS$SYSTEM:LATCP
LCP> SHOW CHARACTERISTICS
LCP> EXIT
$
```

The SHOW CHARACTERISTICS command displays characteristics and service information for your service node. See the SHOW CHARACTERISTICS command in Chapter 5 for an example of the display.

VAX/VMS Service Node Management

2.8 Using LATCP Interactively

2.8.7 Changing a Service Name

To change a service name, eliminate the service by entering the DELETE SERVICE command and then enter a CREATE SERVICE command to assign a new service name, as shown in the following example:

```
$ RUN SYS$SYSTEM:LATCP
LCP> DELETE SERVICE SALES
LCP> CREATE SERVICE ACCOUNTING
LCP> EXIT
$
```

If you do not specify a service name with the DELETE SERVICE command, the service name that is the translation of the SYS\$NODE logical name is deleted.

2.8.8 Changing a Service Announcement

You can change the service announcement string by using the SET SERVICE command. For example, the following command changes the announcement string for the service SALES to "A Member of the Sales Cluster":

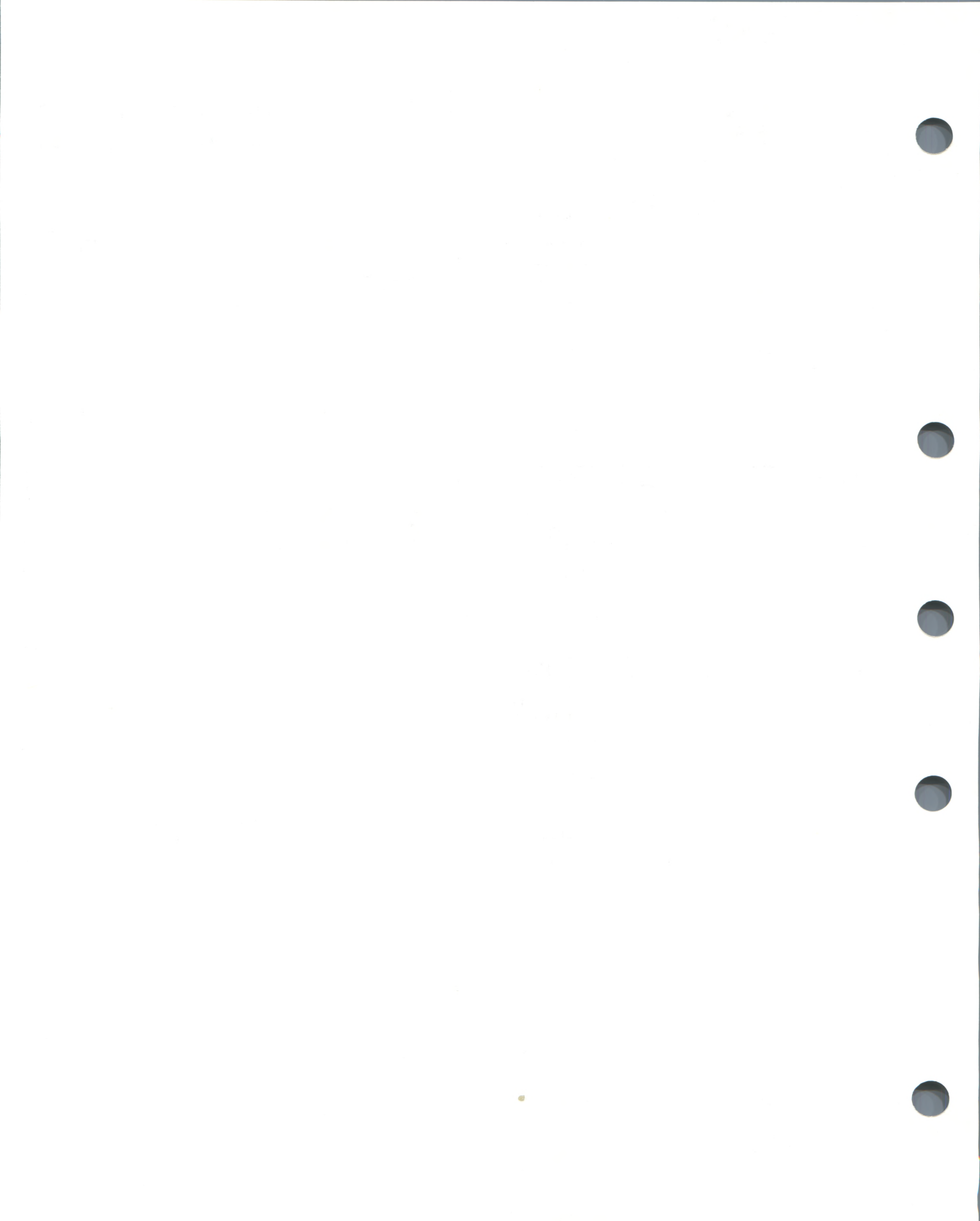
```
$ RUN SYS$SYSTEM:LATCP
LCP> SET SERVICE SALES/ID="A Member of the Sales Cluster"
LCP> EXIT
$
```

2.8.9 Changing a Service Rating

You can change a static service rating to a dynamic service rating by entering the following command:

```
$ RUN SYS$SYSTEM:LATCP
LCP> SET SERVICE SALES /NOSTATIC_RATING
LCP> EXIT
$
```

The service ratings placed in subsequent announcement messages are calculated dynamically on the basis of your service node's activity.



3 Setting Up Remote Printers

This chapter discusses the following topics:

- The LATCP commands required to associate remote printers with your service node
- The DCL commands necessary to set up a remote printer as a spooled device
- The DCL commands necessary to set up print queues
- Troubleshooting for remote printer queues

To set up a remote printer for your service node, you need to do the following:

- 1 Create applications ports on the service node (Section 3.1)
- 2 Map applications ports to server ports (Section 3.2)
- 3 Set up printer characteristics (Section 3.3)
- 4 Define the form for the remote printer if one does not exist (Section 3.3.2)
- 5 Set up the remote printer as a spooled device (Section 3.3.3)
- 6 Initialize and start the queues (Section 3.3.4)
- 7 When appropriate, set up remote printing on VAXcluster systems (Section 3.4)

Note: This chapter does not discuss all of the Digital Command Language (DCL) command qualifiers used in the examples. Refer to the *VAX/VMS DCL Dictionary* for information on these command qualifiers.

3.1 Creating Applications Ports on Service Nodes

The logical device for an application program on your service node is called an applications port. The LATSYM print symbiont on your service node uses an applications port to access a remote printer. Use LATCP commands to create an applications port by specifying a port name in the form LTA n , where n is a number from 1 through 9999. The following example creates the applications port LTA321:

```
CREATE PORT LTA321: /APPLICATION
```

Setting Up Remote Printers

3.2 Mapping Applications Ports to Server Ports and Services

3.2 Mapping Applications Ports to Server Ports and Services

You need to logically associate (map) an applications port with a remote printer on a server. To do this, use the SET PORT command to specify the applications port name and the server name, plus one or both of the following:

- Server port name
- Remote service name

The service name on the server is associated with one or more specific ports on that server. Obtain the server port name, server name, and remote service name from the server manager.

The following example shows the applications port LTA321 (created in the previous example) being mapped to a remote printer, using the SET PORT command. The name of the applications port (LTA321), the server (LAT1), and the server port (LN03) are specified.

```
SET PORT LTA321: /APPLICATION /NODE=LAT1 /PORT=LN03
```

The /APPLICATION qualifier specifies that the LTA321 port on the service node functions as an applications port.

The next example shows the applications port LTA322 being mapped to a set of remote printers on a server, using the SET PORT command. The following command line specifies the names of the applications port, the server, and the remote service:

```
SET PORT LTA322: /APPLICATION /NODE=LAT1 /SERVICE=PRINTER
```

The service PRINTER represents an available remote printer.

If a server has more than one printer, use the service name to specify the printer when submitting a job. The server assigns your job to the printer that becomes available first.

The server manager assigns a service name to a group of printers on the server. Not all servers support remote services.

3.3 Setting Up Printer Characteristics for Nonclustered Nodes

You can create a command procedure to configure your remote printers. To ensure that your remote printers are configured on system startup, place a command line in SYS\$MANAGER:SYSTARTUP.COM to invoke this command procedure following the command line that invokes LTLOAD.COM.

Using the command procedure allows you to maintain remote print queues separately from other queues on a node. This separation is useful because queues for local applications devices usually are started before the LTLOAD.COM file is executed, while remote print queues must be started afterward. Separation also reduces the possibility of unintentionally interfering with the other applications devices and queues on your node when you are setting up applications ports and queues for remote printers.

Example 3-1 is a sample of a command procedure for setting up remote printer characteristics and for starting the queues for those printers.

Setting Up Remote Printers

3.3 Setting Up Printer Characteristics for Nonclustered Nodes

Example 3-1 Command Procedure for Configuring Remote Printers

```
#!
#! SYS$MANAGER:REMOTE_PRINT.COM
#!
#! This command procedure sets up the local characteristics of the
#! applications devices for remote printers and sets up the print
#! queues for these remote printers. These devices should have been
#! set up previously by the LLOAD.COM command file. NOTE: The queue
#! manager must be running before executing this file.
#!
#! o Replace the strings formA and formA_number with the name and number
#! of the form you set up, or remove all references to them if you do
#! not set up a form.
#! o Replace the device types LQPO2 and LA100 with the actual device
#! types for your remote printers.
#! o Replace the strings LQ$PRINT, and LA$PRINT, with the actual names
#! you choose for queues associated with remote printers.
#!
#! Set up local characteristics for the applications devices.
#!
#! SET TERMINAL LTA1: /PERM /DEVICE=LQPO2 /WIDTH=80 /PAGE=60 -
# /LOWERCASE /NOBROADCAST
#! SET TERMINAL LTA2: /PERM /DEVICE=LA100 /WIDTH=132 /PAGE=66 /NOBROAD
#!
#! Set the protection on the devices so that only the symbiont can access
#! them.
#!
#! SET PROTECTION=(S:RWLP,O,G,W) /DEVICE LTA1:
#! SET PROTECTION=(S:RWLP,O,G,W) /DEVICE LTA2:
#!
#! Set the devices spooled.
#!
#! SET DEVICE LTA1: /SPOOLED=(LQ$PRINT,SYS$SYSDEVICE:)
#! SET DEVICE LTA2: /SPOOLED=(LA$PRINT,SYS$SYSDEVICE:)
#!
#! Define a form to use with the remote printers. Be sure to use a
#! form number that has not already been used.
#!
#! DEFINE/FORM formA formA_number /WIDTH=80 /STOCK=DEFAULT /TRUNCATE
#!
#! Initialize the remote printer queues.
#! The following assumes that the queue manager has been started.
#!
#! INITIALIZE/QUEUE /START /PROCESSOR=LATSYM /FORM=formA /RETAIN=ERROR -
# /DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) /RECORD_BLOCKING -
# LQ$PRINT /ON=LTA1:
#! INITIALIZE/QUEUE /START /PROCESSOR=LATSYM /RETAIN=ERROR -
# /DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) /RECORD_BLOCKING -
# LA$PRINT /ON=LTA2:
```

3.3.1 Setting Up Terminal Characteristics for Remote Printers

Once you map an applications port on your service node to a remote printer, (see Section 3.2), use the DCL command SET TERMINAL to specify terminal characteristics for the remote printer.

Setting Up Remote Printers

3.3 Setting Up Printer Characteristics for Nonclustered Nodes

Refer to Appendix B for a list of supported printers and the associated terminal characteristics you must specify for each printer. When you specify a device type, the characteristics for that device are automatically assigned. In the following example, the SET TERMINAL command sets up the automatic line width and page length for the LA210 printer:

```
$ SET TERMINAL LTA322: /PERMANENT /DEVICE=LA210 /NOBROADCAST
```

Alternatively, you can override the automatic line width and page length values for a device by entering different width and page values. For example, a laser printer can load special font files if you override the printer's automatic page width by entering the following command, which sets the page width for the LN03 printer to 255:

```
$ SET TERMINAL LTA322: /PERMANENT /DEVICE=LN03 /WIDTH=255 -  
_ $ /PAGE=66 /NOBROADCAST
```

Do not use the SET TERMINAL/WIDTH command to specify paper width; instead, use the DEFINE/FORM command described in Section 3.3.2.

Note: The /PERMANENT and /NOBROADCAST qualifiers must be specified for remote printers.

3.3.2 Defining a Form for a Remote Printer

The DEFINE/FORM command defines a form name and number, as well as the physical paper stock. Do not enter the DEFINE/FORM command unless the queue manager is running. Define a new form if no appropriate form exists on your system. Enter the SHOW QUEUE/FORM command to look at the form names and form numbers currently defined on your service node.

All DEFINE/FORM commands should resemble the following example, which defines a form named LN_FORM and numbered 10:

```
$ DEFINE/FORM LN_FORM 10 /WIDTH=80 /STOCK=DEFAULT /TRUNCATE
```

When a print job is submitted without a /FORM qualifier, the symbiont uses the default stock for the job. This is important, because the stock of a job must match the stock of the queue or the job remains pending on the queue and does not print. The /STOCK=DEFAULT qualifier gives the system-wide default for paper stock to the form. Then, by assigning this form to a queue using INITIALIZE/QUEUE (see Section 3.3.4), you allow jobs without a /FORM qualifier to print, because both job and queue require the default stock. Note that, if a user specifies a form other than the queue's form, the job still can print if the two forms use an identical stock. In this case, however, the flag page may be incorrectly formatted.

By specifying the default stock for the form that the queue uses, you reduce the likelihood of such problems. Other methods for avoiding problems with incompatible stock designations are discussed in Sections 3.5 and 3.6.

Note: The /STOCK=DEFAULT parameter works only when a system-wide default exists. If printers were not used on your system before, a default stock may not exist for the system. If your system lacks this default, add the following command to the procedure for setting up remote printers or at the top of the file you use for defining print forms:

```
$ DEFINE/FORM DEFAULT 0 /WIDTH=132 /STOCK=DEFAULT
```

Setting Up Remote Printers

3.3 Setting Up Printer Characteristics for Nonclustered Nodes

3.3.3 Setting Up a Remote Printer as a Spooled Device

Enter the SET DEVICE/SPOOLED command to set up a remote printer as a spooled device. For example, the following command sets the applications port LTA322 as a spooled device associated with the queue LA210\$PRINT:

```
$ SET DEVICE LTA322: /SPOOLED=(LA210$PRINT,SYS$SYSDEVICE:)
```

3.3.4 Initializing Queues for Remote Printers

The INITIALIZE/QUEUE command in the following example initializes the queue for a remote printer.

```
$ INITIALIZE/QUEUE /START /PROCESSOR=LATSYM /FORM_MOUNTED=DEFAULT -  
_ $ /RETAIN=ERROR /DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) -  
_ $ /RECORD_BLOCKING LA210$PRINT /ON=LTA322:
```

Do not enter the INITIALIZE/QUEUE command unless the queue manager is running. For information on the queue manager, refer to the *VAX/VMS System Manager's Reference Manual*.

The qualifiers used with the INITIALIZE/QUEUE command start and set up remote printers, as follows:

- /START starts the queue.
- /PROCESSOR=LATSYM specifies the LAT print symbiont, which is required for remote printers.
- /FORM_MOUNTED=DEFAULT assigns a default form to the queue. Defining a default form is discussed in Section 3.3.2.

Note that, it is not necessary to include the /FORM_MOUNTED qualifier if the queue uses the system-wide default form.

- LA210\$PRINT names the queue.
- /ON=LTA322 specifies an applications port associated with the remote printer. The applications port must have been previously mapped to the printer with the SET PORT command (see Section 3.2).
- /RETAIN=ERROR ensures that error status messages are generated.

An error status at a remote device cannot be passed back directly to the queue manager. Thus, when a connection with a server cannot be made, no error status is sent to the user. However, specifying the /RETAIN=ERROR qualifier in the INITIALIZE/QUEUE command ensures that you can get status for such an error. When this qualifier is in effect, a job that fails because of a problem on the network is labeled with an error status message, such as "Checkpointed:". See Section 3.6 on troubleshooting for additional information about checkpointed errors.

Setting Up Remote Printers

3.4 Setting Up Remote Printing on VAXclusters

3.4 Setting Up Remote Printing on VAXclusters

DIGITAL recommends that you configure applications ports on at least two nodes of a VAXcluster system, so that a redundant path to the device is available in the event of a failure of a cluster node. To configure a remote-printer applications port on a cluster node, include the LATCP commands CREATE PORT and SET PORT for that port in the node's LTLOAD.COM command procedure.

3.4.1 Guidelines for Order of Events on VAXclusters

On VAXcluster systems, where management of remote printers can become complex, adhere to the following order of events when you add commands to the system startup command procedure. Additional events can occur between the listed events.

- Start the queue manager
- Start the DECnet network
- Invoke the LTLOAD.COM command procedure to start LAT and establish applications ports for remote printers

You can have node-specific LTLOAD.COM files for nodes on the cluster with different LAT characteristics. You can also have a cluster-common LTLOAD.COM file for nodes that have identical LAT characteristics. Note that, not all nodes require applications ports defined for remote devices.

- Set up and start queues to remote printers. Rather than including these commands in the startup command procedure, you may choose to invoke another command procedure that sets up and starts queues.

3.4.2 Queues in a VAXcluster Environment

Queues are used in several ways in a VAXcluster environment. On one node, you can set up a device-specific queue that points to one remote printer on a server. A device-specific queue always points to a particular device, and the remote printer must be mapped to an applications port on the node. To initialize the device-specific queue on one node, define the device-specific queue in the startup command procedure for that node.

You can also set up a generic queue on one node to handle requests for several remote printers. On this same node, you need to first create a device-specific queue for each printer. The generic queue points to the printers via each printer's device-specific queue. In this case, there is one path to each remote printer, and each printer is mapped to an applications port on this node. To initialize a generic queue on one node in the cluster, define the device-specific queues and the generic queue in the startup command procedure for that node.

Finally, you can set up a generic queue that provides a redundant path via several nodes to several remote printers. The generic queue points to the remote printers via each printer's device-specific queue. Each printer must have a device-specific queue on each participating node. Notice that each printer must be mapped to the same applications port on each participating node. Define the generic queue and the device-specific queue in the startup command procedure for each node using the generic queue.

Setting Up Remote Printers

3.4 Setting Up Remote Printing on VAXclusters

Example 3-2 sets up a generic queue for one printer and a generic queue for two printers. See Section 3.3 for an explanation of the commands used in this example.

Refer to the *Guide to VAXclusters* and the *VAX/VMS System Manager's Reference Manual* for detailed information about generic output queues.

Example 3-2 Command Procedure for Configuring Remote Printers Using a Generic Queue

```

$!
$! SYS$MANAGER:COMMON_REMOTE_PRINT.COM
$!
$! This is a template cluster common command procedure which sets up
$! characteristics and queues for remote printers.
$!
$! This file assumes that two nodes in the cluster access the remote
$! devices, and that ONLY those nodes call this file.
$!
$! o Replace the strings nodeA and nodeB with the actual names for your
$! cluster nodes which access the remote devices.
$! o Replace the strings formA and formA_number with the name and number
$! of the form you set up, or remove all references to them if you do
$! not set up a form.
$! o Replace the device types LQPO2 and LA100 with the actual device type
$! for your remote devices.
$! o Replace the strings LQ$PRINT, LA$PRINT, SYS$LQPRINT and
$! TERMINAL$PRINT with the actual names for your queues to the
$! remote devices.
$!
$! Compute the name of the executing node
$!
$ NODE = F$GETSYI("NODENAME")
$!
$ nodeA_START = "/NOSTART"
$ nodeB_START = "/NOSTART"
$!
$! Redefine one of the previous symbols.
$!
$ 'NODE'_START = "/START"
$!
$! Set up local characteristics for the applications devices.
$!
$! This procedure assumes that the remote devices have been mapped to the
$! same LTAx: device on each node that accesses them.
$!
$ SET TERMINAL LTA1: /PERM /DEVICE=LQPO2 /WIDTH=80 /PAGE=60
$ /LOWERCASE /NOBROADCAST
$ SET TERMINAL LTA2: /PERM /DEVICE=LA100 /NOBROADCAST
$!
$! Set the protection on the devices so that only the symbiont can access
$! them.
$!
$ SET PROTECTION=(S:RWLP,O,G,W) /DEVICE LTA1:
$ SET PROTECTION=(S:RWLP,O,G,W) /DEVICE LTA2:
$!
```

Example 3-2 Cont'd. on next page

Setting Up Remote Printers

3.4 Setting Up Remote Printing on VAXclusters

Example 3-2 (Cont.) Command Procedure for Configuring Remote Printers Using a Generic Queue

```
#! Set the devices spooled.
#!
$ SET DEVICE LTA1: /SPOOLED=('NODE'$LQPRINT,SYS$SYSDEVICE)
$ SET DEVICE LTA2: /SPOOLED=('NODE'$LAPRINT,SYS$SYSDEVICE)
#!
#! Define a form to use with the remote printers. Be sure to use a
#! form number that has not already been used.
#!
$ DEFINE/FORM formA formA_number /WIDTH=80 /STOCK=DEFAULT /TRUNCATE
#!
#! Initialize the remote printer queues.
#! The following assumes that the queue manager has been started.
#!
$ INITIALIZE/QUEUE /PROCESSOR=LATSYM /FORM=formA /RETAIN=ERROR -
/DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) /RECORD_BLOCKING -
/ON=nodeA::LTA1: 'nodeA_START' nodeA$LQPRINT
$ INITIALIZE/QUEUE /PROCESSOR=LATSYM /RETAIN=ERROR -
/DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) /RECORD_BLOCKING -
/ON=nodeA::LTA2: 'nodeA_START' nodeA$LAPRINT
#!
$ INITIALIZE/QUEUE /PROCESSOR=LATSYM /FORM=formA /RETAIN=ERROR -
/DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) /RECORD_BLOCKING -
/ON=nodeB::LTA1: 'nodeB_START' nodeB$LQPRINT
$ INITIALIZE/QUEUE /PROCESSOR=LATSYM /RETAIN=ERROR -
/DEFAULT=(NOBURST,FLAG=ONE,NOTRAILER) /RECORD_BLOCKING -
/ON=nodeB::LTA2: 'nodeB_START' nodeB$LAPRINT
#!
#! Initialize the clusterwide generic queues.
#!
#! A generic queue with one printer.
#!
$ INITIALIZE/QUEUE /START /GENERIC=(nodeA$LQPRINT,nodeB$LQPRINT) -
SYS$LQPRINT
#!
#! A generic queue with two printers.
#!
$ INITIALIZE/QUEUE /START /GENERIC=(nodeA$LQPRINT,nodeA$LAPRINT, -
nodeB$LQPRINT, nodeB$LAPRINT) TERMINAL$PRINT
```

3.5 Printing Jobs

After you set up remote printers, a user on your service node can enter a DCL command to print a file. The following example prints the file LATDOC.MEM on the remote LA120 printer:

```
$ PRINT LATDOC.MEM /QUEUE=SYS$120PRINT
```

To avoid problems with flag pages or with queues whose form does not use the default stock, assign a system-wide global symbol for each queue. This symbol must be assigned in the system-wide login command procedure, SYS\$MANAGER:SYLOGIN.COM. Select a symbol, such as 38PRINT, to represent a PRINT command specifying a given queue and its form type, as in the following example:

```
$ 38PRINT == "PRINT/QUEUE=SYS$38PRINT/FORM=LA_FORM"
```

Setting Up Remote Printers

3.5 Printing Jobs

Instruct users to specify this symbol when they send printing jobs to remote queues. The symbol provides an easy and accurate way to print the files, as in the following example:

```
$ 38PRINT LATDOC.MEM
```

3.6 Troubleshooting Problems with a Remote Printer Queue

Errors can occur on a print queue for a number of reasons. The effect of errors upon the queue varies according to the type of error. While some errors can cause an individual job to remain in a pending state, others can cause the entire queue to pause or stop. When the queue stops, all jobs on the queue remain in the pending state until the queue is restarted. Before you restart a queue, determine and correct the condition that caused it to stop.

This section discusses the following three types of errors:

- Checkpointed errors — Errors that stop the queue and checkpoint the current job (holding it for resubmission when the queue restarts).

These errors are caused by some problem between the service node and the server, such as a network problem or an incorrect service name assigned to the remote device.

- Suspended printing errors — Errors that stall the queue and temporarily suspend printing jobs (permitting partially printed jobs to be left on the queue and completed later).

These errors are caused by a problem in the server or in the printer while a job is printing, such as the printer running out of paper.

- Pending errors — Errors that force an individual job to remain in a pending state but leave the queue functioning.

These errors are caused by a print command that specifies a printer form whose paper stock is incompatible with the stock specified for the queue.

Jobs that remain pending for a long time have not necessarily experienced an error. Enter the `SHOW QUEUE/FULL` command to determine whether the user requested a delay in printing.

The remainder of this section discusses these three types of errors and suggested methods of responding to them.

3.6.1 Checkpointed Errors

Checkpointed errors are caused by the failure to create a network or server connection. Two types of errors can prevent a connection, and a third type can terminate an existing connection. These errors are as follows:

- Incorrect names assigned for the LTA port — The node name does not match the name of the server; the applications port name does not match the name of a server port that allows remote access; or the service name does not match the name of a service offered by the server. Furthermore, if both a service name and a port name are specified, the service must be offered on the port. Check with the server manager or network manager to verify that the correct names are specified on the service node.

Setting Up Remote Printers

3.6 Troubleshooting Problems with a Remote Printer Queue

- Host-initiated request never received — For example, in some cases, the server is on a different Ethernet or on an Ethernet segment that is currently disconnected. In other cases, the server is inactive when the request is sent.
- Connection abnormally terminated because of a network or server problem — For example, a job is printing when a network problem causes the circuit to go down.

To ensure that checkpointed jobs are identified by an error status message, use the `/RETAIN=ERROR` qualifier in the `INITIALIZE/QUEUE` command (see Section 3.3.4). A checkpointed error status message makes it easy to identify a failed job. Refer to Chapter 4 for additional information about error status messages. With the job number you can delete a job, if you wish to submit it to another queue rather than wait until the problem with the stopped queue is resolved. However, if you prefer, you can leave the job on the queue.

After a checkpointed error occurs, the queue stops or pauses. Identify and remove the cause of the error before restarting the queue. Once the underlying problem is resolved, reset and restart the queue, by entering the following commands:

```
$ STOP/QUEUE/RESET queue-name  
$ START/QUEUE queue-name
```

You can resubmit the checkpointed job with the following DCL command:

```
$ SET QUEUE queue-name/ENTRY=entry-number/NOHOLD
```

Refer to the *VAX/VMS DCL Dictionary* for more details on the `START/QUEUE` command.

3.6.2 Suspended Printing Errors

Suspended printing errors occur if the job fails to print completely after being accepted by a server. These errors can result from a problem on the network, server, or printer. These printing errors cause the queue to stall, but the job is only temporarily suspended. Once the problem is corrected, the job resumes printing.

3.6.3 Pending Errors

A pending error can occur if the stock associated with a job differs from the stock associated with a queue. Any print job whose stock is incompatible with the stock of the queue remains in a pending state. However, no error message is generated; the job continues to be labeled simply as "Pending" until it is deleted or until the stock assigned to the queue is changed. A pending error affects only the individual job. The queue does not stop, so error-free jobs can continue to print. To resolve a pending error, the stock of the queue must be changed to match the job or the job must be deleted and submitted to a queue with compatible stock.

Methods for reducing the occurrence of pending errors include the following:

- Assigning the default stock when defining the form to be assigned to a queue (see Section 3.3.2).

When a queue uses the default stock, users need not specify a form in print commands, thereby reducing a likely source of error.

Setting Up Remote Printers

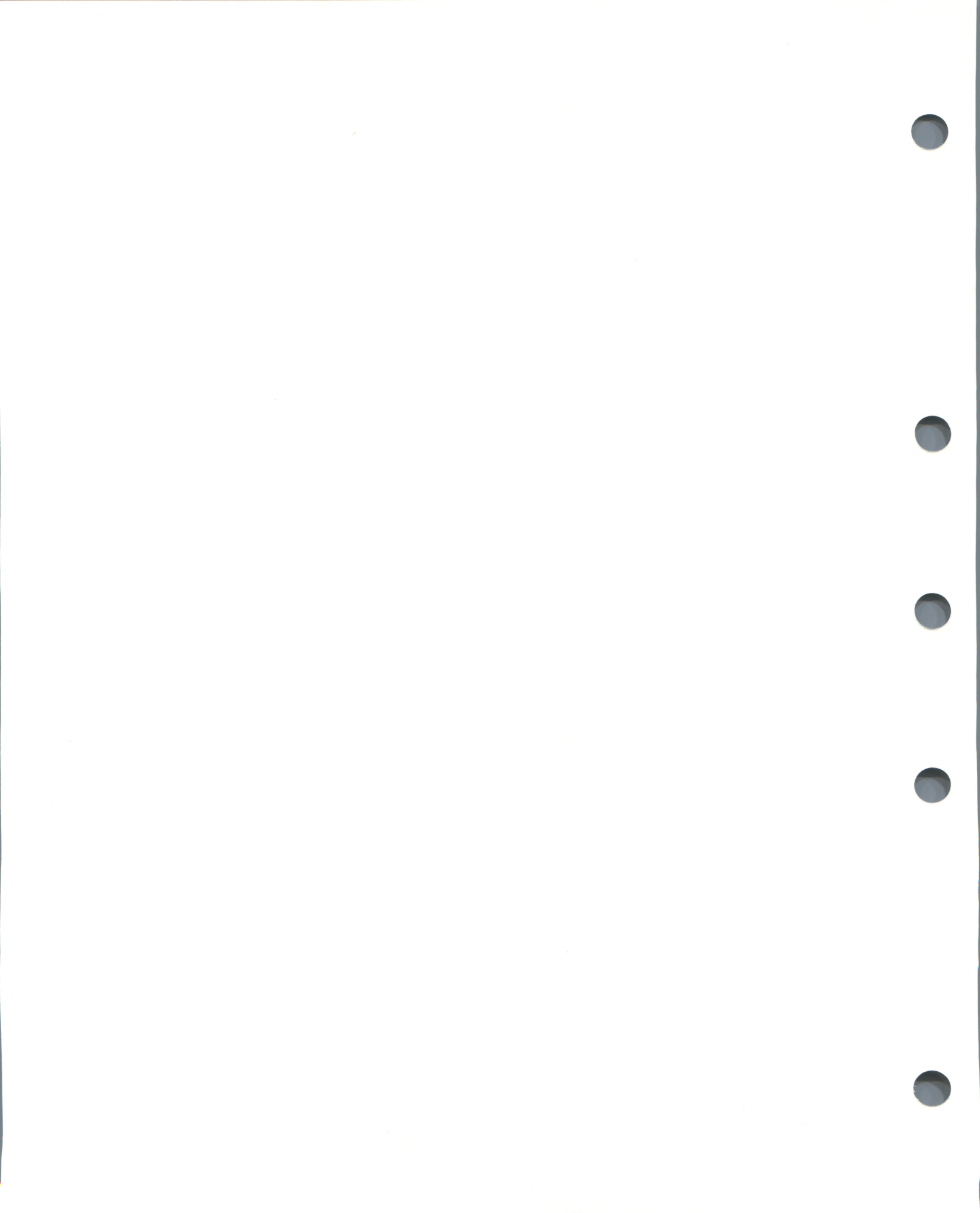
3.6 Troubleshooting Problems with a Remote Printer Queue

- Creating a system-wide global symbol for printing to a queue with a nondefault stock (see Section 3.5).

When users enter this symbol, they avoid pending errors.

Note that the success of a singular preventative method depends on avoiding print commands that specify forms requiring unavailable stock. Therefore, occasionally a user who specifies a form can experience a problem with a print job. In this case, the following are possible solutions:

- You or the user can delete a job requiring an incompatible stock and either resubmit the job to the same queue (specifying a form using the suitable stock) or submit the job to a different queue whose stock is what the user specified in the original PRINT/FORM command.
- If an alternative queue is not available and printing a job with a different stock is essential, change the stock of the printer and/or the queue. Changing the stock involves the following steps:
 - 1 Stopping the queue
 - 2 Changing the physical stock in the printer, if desired
 - 3 Changing the stock specification of the queue to match the new stock
 - 4 Restarting the queue



4 LAT Port Driver QIO Interface

The LAT software allows application programs to use remote devices on a server. A remote device, such as a printer, can be shared over the network served by the LAT software. Figure 1-1 shows a typical LAT configuration.

Before a remote device can be accessed by an application program, the remote device needs to be mapped to an applications port on your VMS system. (See Chapter 3 for a discussion about mapping.) Once the remote device is mapped, the application program can establish and terminate a connection to that device. The connection is made through the applications port on your node that is associated with the remote device.

This chapter discusses the QIO interface to the LAT port driver and the function code modifiers that you use to establish and terminate connections to remote devices. You must use these QIO functions to establish a connection to a remote device from an application program. DIGITAL does not support any other methods of connection.

4.1 Using VAX/VMS Function Codes and Modifiers for LAT Devices

The *VAX/VMS I/O User's Reference Manual: Part I* describes VMS I/O terminal port function codes. You cannot use all of those terminal port function codes for LAT devices. However, you can use all read terminal port function code modifiers and all write terminal port function code modifiers.

VAX/VMS does not support the following SET MODE or SET CHARACTERISTICS function code modifiers for LAT devices:

```
TT$_MODEM  
TT2$_SETSPEED  
TT$_ALTRPAR  
TT$_BREAK  
TT$_ALTFRAME  
IO$_LOOP  
IO$_UNLOOP
```

Read and write modem function code modifiers are not supported for LAT devices.

Flow control to the physical device is handled by the terminal server instead of the host. A separate flow control mechanism exists between the server and host. The following terminal characteristics do not apply to LAT terminals:

```
TT$_READSYNCH  
TT$_TTSYNCH
```

LAT Port Driver QIO Interface

4.2 LAT Port Driver Function Code

4.2 LAT Port Driver Function Code

The LAT port driver accommodates I/O requests from application programs for connections to remote devices (for example, a graphics printer) on a server. A request for the LAT port driver must include the VMS IO\$_TTY_PORT function code. IO\$_TTY_PORT allows the VMS terminal device driver to forward a LAT-specific request to the LAT port driver. In addition, the request must include a LAT port function code modifier.

4.2.1 LAT Port Function Code Modifiers

The LAT port function code modifiers are IO\$_M_LT_CONNECT and IO\$_M_LT_DISCON. The IO\$_M_LT_CONNECT function code modifier requests the LAT port driver to make a connection to a remote device on a server. The IO\$_M_LT_DISCON function code modifier requests the LAT port driver to terminate the LAT connection to the remote device.

When an application program issues an IO\$_M_LT_CONNECT request for a connection to a remote device, one of the following situations occurs:

- The connection is established — The connection is successful. You can use the device.
- The connection is timed out — The server is not available, or an incorrect server name was specified.
- The connection is rejected — An incorrect port name or service was specified or the server, service, or remote port is disabled.
- The request is queued at the server — The remote port was busy when requested. In this case, the QIO is not completed until the connection is established, rejected, or timed out.

When a connection request is queued at the server, the QIO function does not complete until the request is removed from the queue. The \$CANCEL system service does not cancel the queued connection. To cancel the connection request, execute the IO\$_TTY_PORT!IO\$_M_LT_DISCON (disconnect QIO). Include an exit handler in your application programs that executes the disconnect QIO on exit. Issuing the disconnect QIO to an already disconnected device does not cause any problems.

The LAT port driver cannot attempt to connect to a remote device under the following circumstances:

- The request is not to an applications port — The QIO request was probably issued to an interactive port. The LAT port driver rejects the request.
- The requested applications port is busy — The QIO requests an applications port that is already in use. The LAT port driver rejects the request.

After you execute an IO\$_TTY_PORT!IO\$_M_LT_DISCON (disconnect QIO), the applications port's UCB momentarily goes off line. If you execute a connect QIO for a remote device immediately after a disconnect QIO, it is also possible that the connect QIO may return a SS\$_DEVACTIVE status. In this situation, retry the connect QIO.

LAT Port Driver QIO Interface

4.2 LAT Port Driver Function Code

4.2.2 Hangup Notification

To ensure that the terminal driver notifies application programs that are writing data of an abnormal connection termination, enable a CTRL/Y AST on the channel. To do this, use the IO\$_SETMODE function code and IO\$_M_CTRLYAST function code modifier. Note that VMS returns the AST parameter SS\$_HANGUP to the CTRL/Y AST routine.

When an application program with a pending read request has an abnormal LAT connection termination, the VMS terminal driver returns a SS\$_HANGUP hangup notification in the first word of the I/O status block.

4.2.3 I/O Status Block

When an application program makes an I/O request for a connection to a remote device on a server, the LAT port driver puts status information about the request into the first word of the I/O status block (see Table 4-1).

If the server rejects the request, the LAT port driver returns a numeric LAT rejection code in the second word of the I/O status block. This numeric code represents the reason for the rejection. Table 4-2 describes the LAT rejection codes.

Table 4-1 LAT Connection Status Codes

Event	Status	Explanation
Connection established	IOSB = SS\$_NORMAL	The connection is successful, and the device is ready to use.
Connection timeout	IOSB = SS\$_TIMEOUT	The connection timed out. The server is not available or an incorrect server name was specified. The timeout period is 5 seconds.
Connection rejected	IOSB = SS\$_ABORT IOSB+2 = LAT reject code	The connection cannot be made. The LAT port driver updates the I/O status block.
Request is not to an applications port	SS\$_ILLIOFUNC No status in IOSB. QIO is rejected immediately.	The QIO request is not to an applications port. The LAT port driver rejects the request.
Connection already established on port	SS\$_DEVACTIVE No status in IOSB. QIO is rejected immediately.	The QIO request is for an applications port already in use. The LAT port driver rejects the request.

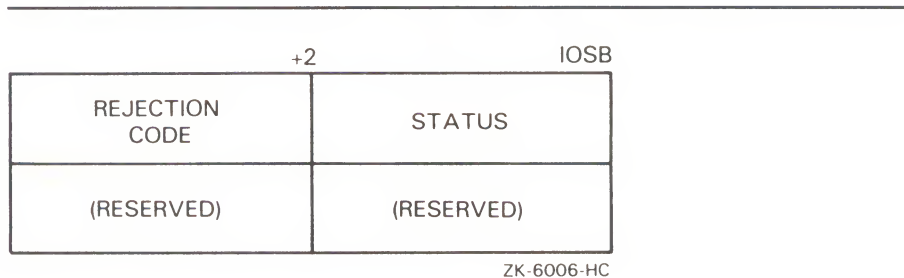
Note: If a request for a connection is queued on the server, the QIO is not completed until the connection is established, rejected, or timed out.

LAT Port Driver QIO Interface

4.2 LAT Port Driver Function Code

The LAT port driver puts status information about a connection request into the first word of the I/O status block. An example of how a status block might look after an I/O request is shown in Figure 4-1.

Figure 4-1 First Word of the I/O Status Block



The rejection code for abort status at the IOSB+2 refers to the rejection codes shown in Table 4-2. This field is valid only when a QIO request has the abort status.

Table 4-2 LAT Rejection Codes

Value	Reason
0	Unknown
2	System shutdown in progress
5	Insufficient resources at server
6	Port or service in use
7	No such service
8	Service is disabled
9	Service is not offered on the requested port
10	Port name is unknown
13	Immediate access rejected
14	Access denied
15	Corrupted request
16	Requested function is not supported
17	Session cannot be started
18	Queue entry deleted by server
19	Illegal request parameters

4.3 Programming Example

In the following example, the program requests a connection to an applications port. The program uses the LAT/VMS port function code and the function code modifiers for the LAT port driver to solicit the connection to the applications port.

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 Application Program for Connecting to a Remote Device

```

        .TITLE   LAT APPLICATIONS PORT PROGRAMMING EXAMPLE
        .IDENT   /1.0/
;*****
;
;               LAT APPLICATIONS PORT PROGRAM
;
;*****
        .SBTTL   DECLARATIONS
;
; DEFINE SYMBOLS
;
        $IODEF           ; I/O FUNCTION CODES
        $QIODEF          ; QIO DEFINITION CODES
;
; DECLARE EXIT HANDLER CONTROL BLOCK
;
EXIT_HANDLER_BLOCK:
        .LONG   0           ; SYSTEM USES THIS FOR POINTER
        .LONG   EXIT_HANDLER ; ADDRESS OF EXIT HANDLER
        .LONG   1           ; ARGUMENT COUNT FOR HANDLER
        .LONG   STATUS      ; DESTINATION OF STATUS CODE
STATUS:   .BLKL   1           ; STATUS CODE FROM $EXIT
;
; ALLOCATE TERMINAL DESCRIPTOR AND CHANNEL NUMBER STORAGE
;
TT_DESC:  .ASCID   /SYS$INPUT/ ; NAME OF TERMINAL
TT_CHAN:  .BLKW   1           ; TT CHANNEL NUMBER STORAGE
LT_DESC:  .ASCID   /LTA700:/   ; NAME OF LT DEVICE
LT_CHAN:  .BLKW   1           ; LT CHANNEL NUMBER STORAGE
;
; APPEND <CR><LF> TO MESSAGE
OUT_MSGLEN = 2
OUT_MSG:  .ASCII   <CR><LF>
;
; ALLOCATE INPUT BUFFER
;
IN_BUFLN = 80
IN_BUF:   .BLKB   IN_BUFLN    ; ALLOCATE CHARACTER BUFFER
IN_IOSB:  .BLKQ   1           ; INPUT I/O STATUS BLOCK
SOL_IOSB: .BLKQ   1           ; SOLICIT CONNECT QIO I/O STATUS BLOCK
;
; DEFINE CARRIAGE CONTROL SYMBOLS
;
        CR=~XOD           ; CARRIAGE RETURN
        LF=~XOA           ; LINE FEED

```

Example 4-1 Cont'd. on next page

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 (Cont.) Application Program for Connecting to a Remote Device

```
;
; DEFINE OUTPUT MESSAGES
;
; MESSAGES ARE ACCESSED BY INDEXING INTO A TABLE OF LONGWORDS
; WITH EACH MESSAGE DESCRIBED BY A MESSAGE ADDRESS AND LENGTH
;
MSG_TABLE:                                ; TABLE OF MESSAGE ADD. AND LEN.
      .LONG      01$                       ; FIRST MESSAGE ADDRESS
      .LONG      05$                       ; FIRST MESSAGE LENGTH
      .LONG      10$                       ; MESSAGE ADDRESS
      .LONG      15$                       ; MESSAGE LENGTH
      .LONG      20$                       ; MESSAGE ADDRESS
      .LONG      25$                       ; MESSAGE LENGTH
      .BLKQ      2                          ; BLANK MESSAGE CODES
      .LONG      50$                       ; MESSAGE ADDRESS
      .LONG      55$                       ; MESSAGE LENGTH
      .LONG      60$                       ; MESSAGE ADDRESS
      .LONG      65$                       ; MESSAGE LENGTH
      .LONG      70$                       ; MESSAGE ADDRESS
      .LONG      75$                       ; MESSAGE LENGTH
      .LONG      80$                       ; MESSAGE ADDRESS
      .LONG      85$                       ; MESSAGE LENGTH
      .LONG      90$                       ; MESSAGE ADDRESS
      .LONG      95$                       ; MESSAGE LENGTH
      .LONG      100$                      ; MESSAGE ADDRESS
      .LONG      105$                      ; MESSAGE LENGTH
      .BLKQ      2                          ; BLANK MESSAGE CODES
      .LONG      130$                      ; MESSAGE ADDRESS
      .LONG      135$                      ; MESSAGE LENGTH
      .LONG      140$                      ; MESSAGE ADDRESS
      .LONG      145$                      ; MESSAGE LENGTH
      .LONG      150$                      ; MESSAGE ADDRESS
      .LONG      155$                      ; MESSAGE LENGTH
      .LONG      160$                      ; MESSAGE ADDRESS
      .LONG      165$                      ; MESSAGE LENGTH
      .LONG      170$                      ; MESSAGE ADDRESS
      .LONG      175$                      ; MESSAGE LENGTH
      .LONG      180$                      ; MESSAGE ADDRESS
      .LONG      185$                      ; MESSAGE LENGTH
      .LONG      190$                      ; MESSAGE ADDRESS
      .LONG      195$                      ; MESSAGE LENGTH
;
; MESSAGES
;
01$:      .ASCII  /REASON UNKNOWN/
05$=-.01$
;
10$:      .ASCII  <CR><LF>/CONNECTION ESTABLISHED/
15$=-.10$
;
20$:      .ASCII  /SYSTEM SHUTDOWN IN PROGRESS/
25$=-.20$
;
50$:      .ASCII  /INSUFFICIENT RESOURCES/
55$=-.50$
;
60$:      .ASCII  /PORT OR SERVICE IN USE/
65$=-.60$
```

Example 4-1 Cont'd. on next page

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 (Cont.) Application Program for Connecting to a Remote Device

```
;
70$: .ASCII /NO SUCH SERVICE/
75$=-70$
;
80$: .ASCII /SERVICE IS DISABLED/
85$=-80$
;
90$: .ASCII /SERVICE NOT OFFERED BY REQUESTED PORT/
95$=-90$
;
100$: .ASCII /PORT NAME IS UNKNOWN/
105$=-100$
;
130$: .ASCII /IMMEDIATE ACCESS REJECTED/
135$=-130$
;
140$: .ASCII /ACCESS DENIED/
145$=-140$
;
150$: .ASCII /CORRUPTED REQUEST/
155$=-150$
;
160$: .ASCII /REQUESTED FUNCTION IS NOT SUPPORTED/
165$=-160
;
170$: .ASCII /SESSION CANNOT BE STARTED/
175$=-170$
;
180$: .ASCII /QUEUE ENTRY DELETED BY LOCAL NODE/
185$=-180$
;
190$: .ASCII /ILLEGAL REQUEST PARAMETERS/
195$=-190$
;
NOTCON: .ASCII <CR><LF>/CONNECTION REJECTED - /
NOTCONL=-NOTCON
;
; STATIC QIO PACKETS FOR MESSAGE OUTPUT USING QIO$_G FORM
;
WRITE_QIO:
    $QIO FUNC=IO$_WRITEVBLK!IO$_BREAKTHRU!IO$_REFRESH,-
        EFN=1
;
ERROR_QIO:
    $QIO FUNC=IO$_WRITEVBLK!IO$_BREAKTHRU!IO$_REFRESH,-
        EFN=1
```

Example 4-1 Cont'd. on next page

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 (Cont.) Application Program for Connecting to a Remote Device

```

:
:
:       .SBTTL   MAIN ROUTINE
:++
:
:  FUNCTIONAL DESCRIPTION:
:
:*****
:
:               MAIN PROGRAM ROUTINE
:*****
:
:  The following code assigns a channel to the
:  applications port and attempts to create a connection
:  to that port.  The connection status is displayed on
:  the users terminal.  Input from the users terminal
:  is output on the applications port:  ^C input from the
:  user terminates the program.
:
:  INPUT PARAMETERS:
:  None.
:
:  OUTPUT PARAMETERS:
:  None.
:
:--
START:
:
:  .WORD                ; ENTRY MASK
:
:  Assign channels
:
:  $ASSIGN_S           DEVNAM=TT_DESC,- ; ASSIGN CHANNEL TO USERS
:                     CHAN=TT_CHAN    ; TERMINAL
:  BLBS      RO, 10$   ; NO ERROR IF SET
:  BRW       ERROR    ; ELSE, ERROR
10$: $ASSIGN_S           DEVNAM=LT_DESC,- ; ASSIGN CHANNEL TO LT DEVICE
:                     CHAN=LT_CHAN
:  BLBS      RO, 20$   ; NO ERROR IF SET
:  BRW       ERROR    ; ELSE, ERROR
:
:  Enable ^C on user terminal and ^Y on applications port.
:  Post read to user terminal and solicit connection to
:  applications port.
:
20$: BSBW      ENABLE_CTRLCAST ; ENABLE CONTROL C AST'S
:      BSBW      SOL_CONNECT   ; TRY TO CONNECT TO LT DEVICE
:      BSBW      ENABLE_READ    ; QUEUE READ
30$: NOP
:
:      BRB       30$           ; KEEP LOOPING UNTIL ^C
:      RET

```

Example 4-1 Cont'd. on next page

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 (Cont.) Application Program for Connecting to a Remote Device

```

;
; .SBTTL  ENABLE_CTRLYAST - Enable CTRLYAST on applications port
; ++
; FUNCTIONAL DESCRIPTION:
;
; Routine to allow hangup notification. This routine enables
; CTRLY AST delivery for the applications port. This routine will
; be called if an abnormal termination occurs to the remote
; device.
;
; INPUT PARAMETERS:
;
; None.
;
; OUTPUT PARAMETERS:
;
; None
;
; --
ENABLE_CTRLYAST:
    $QIOW_S CHAN=LT_CHAN,-
            FUNC=#IO$_SETMODE!IO$_CTRLYAST,-
            P1=HANGUP,-           ; AST ROUTINE ADDRESS
            P3=#3                 ; USER MODE
    BLBS    RO, 10$              ; NO ERROR IF SET
    BRW     ERROR
10$:      RSB
;
; .SBTTL  HANGUP - AST Routine for Control Y
; ++
; FUNCTIONAL DESCRIPTION
;
; AST routine to execute when ^Y status is returned for the
; applications port. This status is returned when the
; connection to the remote device is abnormally terminated.
;
; INPUT PARAMETERS:
;
; None
;
; OUTPUT PARAMETERS:
;
; None
;
; --
HANGUP:
    .WORD   ^M<>
    MOVZWL  #SS$_HANGUP,RO        ; INDICATE HANGUP
    BRW     ERROR                 ; AND EXIT
;
; .SBTTL  ENABLE_READ - QUEUE A READ TO THE TERMINAL
; ++

```

Example 4-1 Cont'd. on next page

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 (Cont.) Application Program for Connecting to a Remote Device

```
; FUNCTIONAL DESCRIPTION
;
; Routine to queue a read to the terminal. The queued
; read will not affect writes due to the fact that
; breakthru has been set for writes.
;
; INPUT PARAMETERS:
; None
; OUTPUT PARAMETERS:
; None
;
;--
ENABLE_READ:
    $QIO_S  CHAN=TT_CHAN, -           ; MUST NOT BE QIOW FORM
            FUNC=#IO$_READVBLK, -
            IOSB=IN_IOSB, -
            ASTADR=READAST, -
            P1=IN_BUF, -
            P2=#IN_BUFLen
    BLBS    RO,10$                   ; NO ERROR IF SET
    BRW     ERROR
10$:      RSB
;
; .SBTTL  READAST - AST Routine for Read Completion
; ++
; FUNCTIONAL DESCRIPTION
;
; AST routine to execute on read completion. The data which
; was input to/from the users terminal is output on the
; applications port. Another read is then posted.
;
; INPUT PARAMETERS:
; None
; OUTPUT PARAMETERS:
; None
;
;--
```

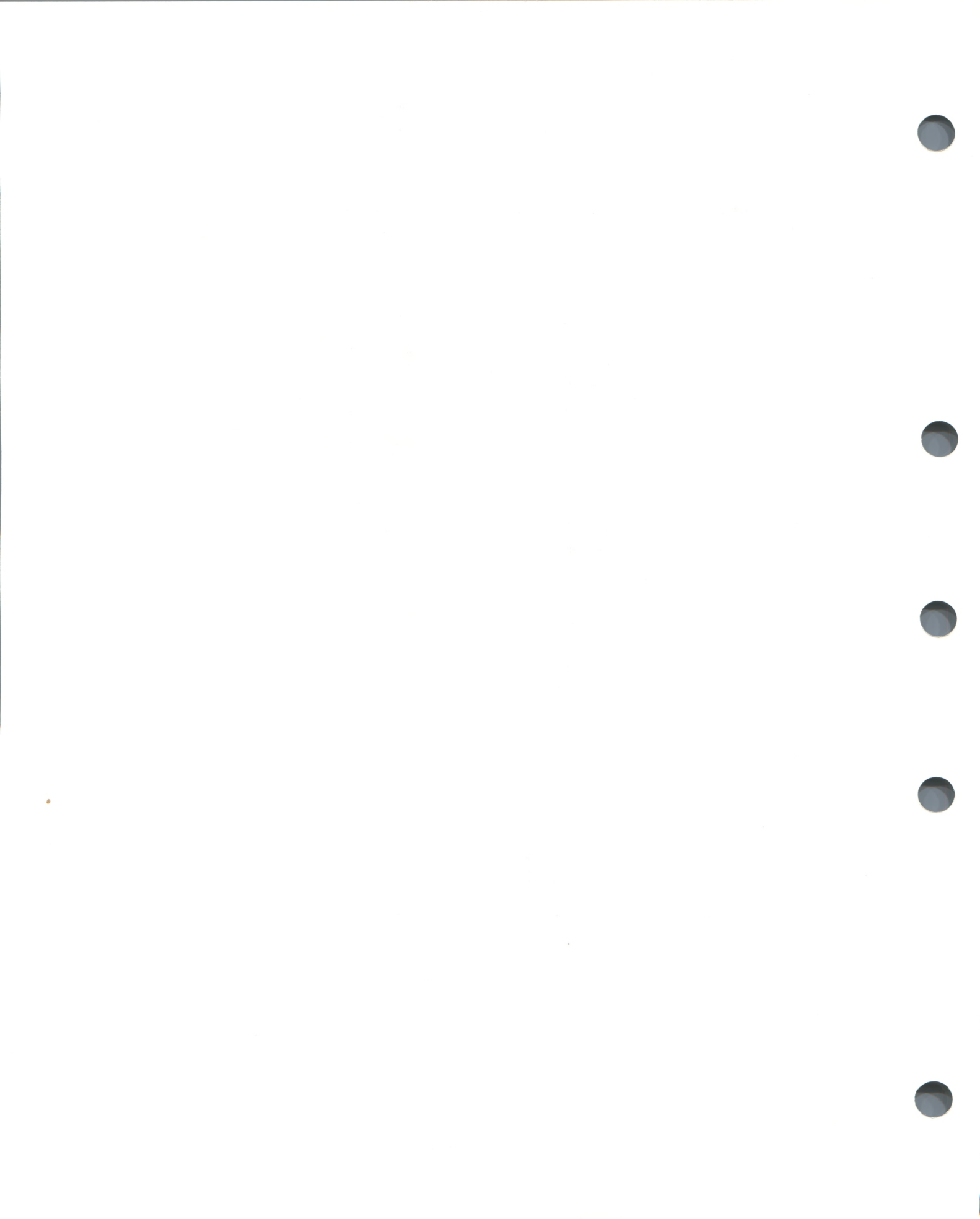
Example 4-1 Cont'd. on next page

LAT Port Driver QIO Interface

4.3 Programming Example

Example 4-1 (Cont.) Application Program for Connecting to a Remote Device

```
;
SOLAST:
    .WORD      ^M<>
    MOVZWL    SOL_IOSB,RO          ; GET RETURN STATUS
    BLBC     RO,10$                ; IF CLEAR, ERROR
    MOVL     RO,R1                 ; COPY STATUS CODE FOR INDEX
    JSB     WRITE_STATUS          ; OUTPUT SUCCESS MESSAGE
    BSBW    ENABLE_CTRLFAST       ; ENABLE CONTROL Y AST'S
    RET
10$:
    CMPW    RO,#SS$_ABORT         ; IS THIS A REJECTED CONNECTION?
    BNEQ    ERROR                ; IF EQ, OUTPUT ERROR MESSAGE
    $QIOW_G      ERROR_QIO        ; OUTPUT ERROR MESSAGE FIRST
    MOVZWL    SOL_IOSB+2,R1       ; SET R1 FOR OFFSET INTO TABLE
    MOVZWL    TT_CHAN,ERROR_QIO+8 ; INSERT CHANNEL INTO QIO PACKET
    JSB     WRITE_STATUS          ; OUTPUT ERROR REASON
    BRW     ERROR                ; EXIT
WRITE_STATUS:
    MOVQ     MSG_TABLE[R1],-      ; PUT MESSAGE INTO QIO
            WRITE_QIO+QIO$_P1
    MOVZWL    TT_CHAN,WRITE_QIO+8 ; INSERT CHANNEL INTO QIO PACKET
    $QIOW_G      WRITE_QIO
    RSB
    .SBTTL   EXIT_HANDLER:
; ++
;
; FUNCTIONAL DESCRIPTION:
;
;     Exit handler routine to execute when image exits. It will
;     cancel any outstanding I/O on these channels.
;
; INPUT PARAMETERS:
;     None
;
; OUTPUT PARAMETERS:
;     None
;
; --
;
EXIT_HANDLER:
    .WORD
    $CANCEL_S      CHAN=TT_CHAN   ; FLUSH ANY OUTPUT
    $CANCEL_S      CHAN=LT_CHAN
    RET
    .END START
```



5

LAT Control Program Command Descriptions

The LAT Control Program (LATCP) allows you to control the behavior of and obtain information from the LAT port driver (LTDRIVER). Only one user at a time can enter LATCP commands. You must have the CMKRNL privilege to run LATCP.

By entering LATCP commands, you can do the following:

- Start and stop the LAT port driver
- Specify configuration characteristics for your service node and its services
- Modify and display configuration characteristics
- Show and zero system counters

5.1

Entering LATCP Commands

Enter the following command to invoke LATCP:

```
$ RUN SYS$SYSTEM:LATCP
```

Once LATCP is invoked, the system displays the LCP> prompt. You can enter LATCP commands using the following format:

```
command-keyword [parameter(s)] [/qualifier(s)]
```

Multiple qualifiers and their arguments can be entered on one command line; qualifiers are separated by slashes (/). Also, you can continue a command to a new line by typing a hyphen and then pressing RETURN, as in the following example:

```
LCP> SET NODE DUKE /IDENT="SALES VAXCLUSTER" - RET  
_LCP> /MULTICAST_TIMER=50 /ENABLE=(1,2)
```

You can enter LATCP commands in either uppercase or lowercase characters (or a combination of both). Command lines can be up to 132 characters in length.

Commands can be abbreviated to their shortest unique length. For example, the commands SHOW CHARACTERISTICS and SHOW PORTS can be abbreviated as SH CH and SH PO respectively. However, to avoid ambiguity and possibly entering a command by accident, it is recommended that you abbreviate all commands to no fewer than three characters.

Error messages for the LATCP commands are shown in Appendix C.

CREATE PORT

CREATE PORT

Creates an applications port on your service node.

FORMAT

CREATE PORT *port-name*

Command Qualifiers

/APPLICATION
/[NO]LOG

Defaults

/APPLICATION
/LOG

RESTRICTIONS

LTA0 is not a valid parameter. An error is returned if the specified port already exists.

PARAMETERS

port-name

Specifies the name of the applications port to be created in the form LTA*n*, where *n* is a unique number from 1 to 9999.

DESCRIPTION

The CREATE PORT command creates an applications port on your LAT service node. The applications port must be logically associated (mapped) with a remote device on a server. Enter the SET PORT command to do this mapping.

COMMAND QUALIFIERS

/APPLICATION

Specifies that the port being created on your service node functions as an applications port.

/[NO]LOG

Specifies whether characteristics of the ports on your service node are to be displayed when this command is executed.

EXAMPLE

LCP> CREATE PORT LTA27: /APPLICATION /NOLOG

This command creates a port LTA27 to be used as an applications port on your service node. The /NOLOG qualifier in this command specifies that the characteristics for the applications port on your service node are not displayed.

CREATE SERVICE

Creates a service on your service node.

FORMAT **CREATE SERVICE** *service-name*

Command Qualifiers	Defaults
<i>/IDENTIFICATION="id-string"</i>	<i>SYS\$ANNOUNCE</i>
<i>/[NO]LOG</i>	<i>/LOG</i>
<i>/[NO]STATIC_RATING=rating</i>	<i>/NOSTATIC_RATING</i>

RESTRICTIONS You cannot create more than one service with the default service name.

PARAMETERS *service-name*
 Specifies a LAT service name of 1 to 16 ASCII characters. Eligible characters are described in Appendix A. If you do not specify a service name in the command line, the default service name is the translation of the SYS\$NODE logical name.
 Coordinate the service names throughout the network to avoid duplicating them unintentionally.

DESCRIPTION This command creates a service offered by your service node. You can assign up to eight service names on your service node. You can later modify the service characteristics with the SET SERVICE command. The service is announced in the announcement messages sent by your service node.
 Several service nodes can share one service name. A shared service name is especially useful in VAXclusters. It allows the cluster to be known by a cluster name and also by individual node names.

COMMAND QUALIFIERS */IDENTIFICATION="identification-string"*
 Specifies a description for the service. The string is advertised to servers in the announcement messages sent to servers by your service node. The string can have up to 64 ASCII characters and must be enclosed in quotation marks (""). The string cannot begin with an ampersand (&), and nonprintable characters are translated as spaces. The default for this identification string is the translation of the logical name SYS\$ANNOUNCE.
/[NO]LOG
 Specifies whether the characteristics for your service node are to be displayed with this command.
/[NO]STATIC_RATING=rating
 Specifies whether the rating is to be static or dynamic.

CREATE SERVICE

EXAMPLE

```
LCP> CREATE SERVICE SALES /STATIC_RATING=195 /NOLOG
```

The command in this example creates the service "SALES" on your service node and assigns a static rating of 195. The /NOLOG qualifier in this command specifies that the characteristics for your service node are not displayed.

DELETE PORT

Deletes an applications port from your service node.

FORMAT **DELETE PORT** *port-name*

Command Qualifiers	Defaults
<i>None</i>	<i>None</i>

RESTRICTIONS The port must have been created with the LATCP command CREATE PORT.

PARAMETERS *port-name*
Specifies the name of the applications port you want to delete.

DESCRIPTION The DELETE PORT command stops any active session on the applications port and then deletes this port from your service node.

EXAMPLE

LCP> **DELETE PORT** LTA27:

The command in this example deletes the applications port LTA27. The port was created with the CREATE PORT command.

DELETE SERVICE

DELETE SERVICE

Deletes a service from your service node.

FORMAT **DELETE SERVICE** *service-name*

Command Qualifiers	Defaults
<i>[/NO]LOG</i>	<i>/LOG</i>

RESTRICTIONS *None.*

PARAMETERS *service-name*
Specifies the name of the service, created with the CREATE SERVICE command, to be deleted. To find service names, use the SHOW CHARACTERISTICS command. The default is the translation of the SYS\$NODE logical name.

DESCRIPTION The DELETE SERVICE command removes the service from your service node. The service is no longer available to server users and is no longer sent in the announcement messages sent by your service node.

COMMAND QUALIFIERS *[/NO]LOG*
Specifies whether the characteristics for your service node are to be displayed when this command is executed.

EXAMPLE

LCP> *DELETE SERVICE SALES*

The command in this example removes the service SALES from your service node. The service is no longer available to server users.

EXIT

Stops execution of LATCP and returns you to the DCL command level.

FORMAT

EXIT

Command Qualifiers	Defaults
--------------------	----------

None

None

RESTRICTIONS

None.

PARAMETERS

None.

DESCRIPTION

The EXIT command enables you to exit from LATCP and returns you to DCL command level. Pressing CTRL/Z has the same effect as the EXIT command.

EXAMPLES

1 LCP> EXIT

2 LCP> CTRL/Z

Each of these commands ends the LATCP session and returns control to the DCL command level.

HELP

HELP

Lists and explains the LATCP commands.

FORMAT **HELP** *command-name*

Command Qualifiers	Defaults
<i>None</i>	<i>None</i>

RESTRICTIONS *None.*

PARAMETERS *command-name*
The name of a LATCP command.

DESCRIPTION HELP is an on-line reference for LATCP commands. If you do not specify a command name, HELP displays general information on the commands for which help is available. If you supply a command name, HELP displays syntax and usage information for that command. Press RETURN to terminate the HELP session; the LATCP prompt reappears.

EXAMPLE

LCP> **HELP SET PORT**

In this example, the HELP SET PORT command produces a description of the SET PORT command and shows the command format.

SET COUNTERS

Resets your service node counters to zero.

FORMAT	SET COUNTERS/ZERO
---------------	--------------------------

Command Qualifiers	Defaults
---------------------------	-----------------

/ZERO

/ZERO

RESTRICTIONS	You cannot use this command to set device counters or server counters to zero.
---------------------	--

PARAMETERS	<i>None.</i>
-------------------	--------------

DESCRIPTION	The SET COUNTERS/ZERO command allows you to test the performance of your service node over a period of time. Once the counters for your LAT service node are set to zero, you can observe information that accumulates over the specific period by using the LATCP command SHOW COUNTERS /NODE.
--------------------	---

COMMAND QUALIFIERS	<i>/ZERO</i> Specifies to reset the service node counters to zero.
---------------------------	--

EXAMPLE

LCP> SET COUNTERS/ZERO

The command in this example resets your service node counters to zero.

SET NODE

SET NODE

Allows you to specify LAT node characteristics.

FORMAT **SET NODE** *node-name*

Command Qualifiers	Defaults
<i>/DISABLE=group-list</i>	<i>None</i>
<i>/ENABLE=group-list</i>	<i>/ENABLE=(0)</i>
<i>/IDENTIFICATION="id-string"</i>	<i>SYS\$ANNOUNCE</i>
<i>/[NO]LOG</i>	<i>/LOG</i>
<i>/MULTICAST_TIMER=seconds</i>	<i>/MULTICAST_TIMER=60</i>

RESTRICTIONS *None.*

PARAMETERS *node-name*

Specifies the name you assign to your service node. The node name can be from 1 to 16 ASCII characters in length. Appendix A lists the characters you can use in a service node name.

The node name should be the same as the DECnet node name. The DECnet node name must be unique within the same logical Ethernet as well as within the entire DECnet network. On DECnet nodes, the LAT node name is given the DECnet node name, SYS\$NODE, by default. If the service node is not running the DECnet network but will be in the future, DIGITAL recommends that you define the logical name SYS\$NODE.

DESCRIPTION The SET NODE command allows you to specify the following:

- Node name
- Node identification
- Groups
- Timing of configuration messages

See Chapter 2 for a discussion of these node characteristics. Any characteristics you omit are not changed from their previous settings.

Because LATCP commands change characteristics dynamically, you can enter the SET NODE command prior to activating the LAT port driver or at any time when the LAT port driver is active.

COMMAND QUALIFIERS */DISABLE=group-list*
Removes previously enabled groups associated with your service node.

/ENABLE=group-list

Gives your service node access to the listed groups. There are 256 groups, numbered from 0 to 255. When you enter a group list, use commas to separate individual groups.

Group 0 is enabled by default for all service nodes and servers.

Note: Not all servers support 256 groups.

/IDENTIFICATION="identification-string"

Specifies a description for your service node. The string is advertised in the announcement messages sent to servers by your service node. The string can have up to 64 ASCII characters and must be enclosed in quotation marks (""). The string cannot begin with an ampersand (&), and nonprintable characters are translated as spaces.

/[NO]LOG

Specifies whether your service node characteristics are to be displayed when this command is executed. /NOLOG prevents the display.

/MULTICAST_TIMER=seconds

Specifies the time, in seconds, between the announcement messages sent by your service node. The minimum value is 10 seconds; the maximum is 255 seconds. The default value is 60.

EXAMPLES

1 LCP> SET NODE DUKE /IDENT="SALES VAXCLUSTER" /NOLOG

The command in this example specifies that the announcement "SALES VAXCLUSTER" be included in the announcement messages sent from node DUKE. The /NOLOG qualifier in this command specifies that the characteristics of your service node are not displayed.

2 LCP> SET NODE DUKE /MULTICAST_TIMER=50 /ENABLE=(1,2)

The command in this example causes the node DUKE to send announcement messages every 50 seconds. This command also enables groups 1 and 2 for NODE DUKE.

3 LCP> SET NODE DUKE /DISABLE=2

The command in this example disables group 2 for node DUKE. Group 2 was enabled previously for the service node.

SET PORT

SET PORT

Logically associates (maps) an applications port with a remote port on a server.

FORMAT

SET PORT *port-name*

Command Qualifiers	Defaults
<i>/APPLICATION</i>	<i>/APPLICATION</i>
<i>/[NO]LOG</i>	<i>/LOG</i>
<i>/NODE=remote-node-name</i>	<i>None</i>
<i>/PORT=remote-port-name</i>	<i>None</i>
<i>/[NO]QUEUED</i>	<i>/QUEUED</i>
<i>/SERVICE=remote-service-name</i>	<i>None</i>

RESTRICTIONS

You must obtain the remote node (server) name, remote port name, and remote service names from the server manager.

PARAMETERS

port-name

Specifies the name of the applications port. The applications port name must be in the form LTA*n*, where *n* is a unique number from 1 to 9999.

DESCRIPTION

The SET PORT command maps an applications port on your service node to a port on a server. The applications port must have been created with the CREATE PORT command.

You must specify the applications port name and the remote node (server) name, plus one or both of the following:

- Server port name
- Remote service name

If you want to connect to a specific port for a service, specify both the remote service name and the port name.

The service name on the server is associated with one or more specific ports on that server.

COMMAND QUALIFIERS

/APPLICATION

Specifies that the port on your service node functions as an applications port.

/[NO]LOG

Specifies whether or not to display the characteristics of the ports on your service node when this command is executed.

/NODE=remote-node-name

Specifies the name of the remote node (server) to be logically associated with the applications port on your service node.

/PORT=remote-port-name

Specifies the name of the remote port on a server associated (mapped) with the applications port.

/[NO]QUEUED

Specifies the type of access being requested for the remote port.

There are two types of access requests to a port: queued and nonqueued. The LAT server manager defines the type of access allowed.

If you do not want your remote requests to be queued on the server, specify */NOQUEUED*. A queued or nonqueued request is accepted by the server if the remote port is free. If the remote port is busy and queuing is enabled on the server, then a remote request is queued. Do not specify */NOQUEUE* if the port is connected to a remote printer that is accessed by LATSYM.

/SERVICE=remote-service-name

Specifies the name of the remote service offered at the server port associated with the applications port.

EXAMPLES

1 LCP> SET PORT LTA322: /NODE=LAT1 /PORT=PORT_5

This example specifies that the applications port LTA322 is associated with the port named PORT_5 on the server named LAT1.

2 LCP> SET PORT LTA322: /NODE=LAT1 /SERVICE=PRINTER /QUEUED

This command associates the applications port LTA322 with the service PRINTER on server LAT1. The service PRINTER can be associated with one or more ports on LAT1. The */QUEUED* qualifier specifies that the server, offering the service PRINTER, queue the remote connection request.

SET SERVICE

SET SERVICE

Allows you to change service characteristics dynamically.

FORMAT

SET SERVICE *service-name*

Command Qualifiers	Defaults
<i>/IDENTIFICATION="id-string"</i>	<i>SYS\$ANNOUNCE</i>
<i>/[NO]LOG</i>	<i>/LOG</i>
<i>/[NO]STATIC_RATING=rating</i>	<i>/NOSTATIC_RATING</i>

RESTRICTIONS

You can only specify the service name of a service you created with the CREATE SERVICE command.

Your service node characteristics in the LTLOAD.COM file become operational upon system startup. The characteristics defined with the SET SERVICE command do not stay in effect after a restart of your system.

PARAMETERS

service-name

Specifies the name of the service whose characteristics that you change with this command.

The default service name is the translation of the SYS\$NODE logical name.

DESCRIPTION

The SET SERVICE command dynamically changes the characteristics of a service that you created with the CREATE SERVICE command.

COMMAND QUALIFIERS

/IDENTIFICATION="identification-string"

Specifies a description of the service. The string is announced to server users in the announcement messages sent to server users by your service node. The string can have up to 64 ASCII characters and must be enclosed in quotation marks (""). The string cannot begin with an ampersand (&), and nonprintable characters are translated as spaces.

/[NO]LOG

Specifies whether or not to display the qualifier values used in this command when this command is executed. /NOLOG prevents the display.

/[NO]STATIC_RATING=rating

Specifies whether the rating is to be static or dynamic.

EXAMPLE

LCP> SET SERVICE SALES /IDENT="A MEMBER OF THE SALES CLUSTER"

The command in this example specifies a new announcement "A MEMBER OF THE SALES CLUSTER" for the service SALES. This string is announced with the service SALES in the announcement messages sent by your service node.

SHOW CHARACTERISTICS

SHOW CHARACTERISTICS

Displays the characteristics for your service node.

FORMAT

SHOW CHARACTERISTICS

Command Qualifiers

None

Defaults

None

RESTRICTIONS *None.*

PARAMETERS *None.*

DESCRIPTION

This command displays the following node and service parameters for your LAT service node:

- Qualifier settings for the SET NODE command
 - LAT protocol status
 - LAT protocol version
 - Service characteristics defined for your service node
-

EXAMPLE

```
LCP> SHOW CHARACTERISTICS
```

```
LCP Characteristics
```

```
Node name = \DUKE\
```

```
Node name = \DUKE\ Node Identification = \A MEMBER OF THE SALES CLUSTER\
```

```
Groups = (0,64,127)
```

```
Multicast timer = 60 seconds
```

```
LAT Version = 5.1          LAT Protocol is active
```

```
Service Names and Ids:
```

```
Service name : \SALES\          rating : auto
```

```
id : \SALES SERVICE\
```

This example shows the display output by the SHOW CHARACTERISTICS command for the node named DUKE.

SHOW COUNTERS

Displays counter information for your LAT service node.

FORMAT

SHOW COUNTERS

Command Qualifiers

/DEVICE
/NODE
/SERVERS

Defaults

/NODE
/NODE
/NODE

RESTRICTIONS *None.*

PARAMETERS *None.*

DESCRIPTION This command displays counter information tabulated by the LAT port driver. The default for the qualifiers is the */NODE* qualifier.

COMMAND QUALIFIERS

/DEVICE

Specifies to display the Ethernet device counters. This information is the sum of all Ethernet usage on your node, including LAT and DECnet network usage.

For additional information on device counters, see the *VAX/VMS Network Control Program Reference Manual*.

/NODE

Specifies to display LAT counters for your service node (does not include DECnet counters). Table 5-1 gives descriptions of the LAT counters.

SHOW COUNTERS

Table 5-1 Descriptions of LAT Node Counters

Counter	Meaning
Receive frames	The number of LAT messages successfully received by the node.
Receive errors	The number of messages received showing detected problems. The Ethernet controller flagged these messages.
Receive duplicates	The number of duplicate messages received; this can indicate a system slowdown.
Transmit frames	The number of LAT messages successfully transmitted by the node.
Transmit errors	The number of transmitted messages with detected problems. The Ethernet controller flagged these messages.
Last transmit failure code	A hexadecimal number that indicates the reason for the last transmit failure. If a failure code exists, the failure reasons are shown at the end of the counters display.
Retransmissions	The number of LAT messages that the node retransmitted because they were not acknowledged by the server or servers.
Circuit timeouts	The number of times a circuit to a server timed out, indicating that a server failed to send a valid message in the required time span.
Protocol errors	The number of LAT messages with an illegal format received by the node. The actual error identification is recorded in the protocol error bit mask.
Protocol bit mask	A hexadecimal number that indicates circuit message errors or slot errors. Convert this number to binary format to determine the protocol error bit-mask definitions listed in Table 5-2
Resource errors	The number of times the service node attempted to create a circuit with a new server but failed because of insufficient resources.
No transmit buffer	The number of times no buffer was available for transmission.

SHOW COUNTERS

Unit timeouts	A repeat of a deallocation of resources. This occurs when an attempt is made to deallocate a Unit Control Block (UCB) that was already deallocated. This happens when there is an attempt to stop a LAT circuit on the service node.
Solicitation failures	The number of times a request for a connection to a remote device failed.
Discarded output bytes	The number of data bytes discarded because of an overflow of an internal buffer before the data could be output to an LT device.

Table 5-2 lists the protocol error bit-mask definitions.

Table 5-2 Protocol Error Bit-Mask Definitions

Bit	Meaning
0	Invalid start message received
1	Zero node index received
2	Node circuit index out of range
3	Node circuit sequence invalid
4	Node circuit index no longer valid
5	Circuit was forced to halt
6	Invalid server slot index
7	Invalid node slot index
8	Invalid credit field or too many credits used
9	Repeat create of slot by server
10	Invalid sequence number received in start message
11	Repeat disconnect of slot by server

/SERVERS

Specifies to display LAT counters for all servers known to your service node.

Note that some servers may be listed twice in the SHOW SERVER display. LATCP keeps up to two sets of counters for servers having an abnormal circuit termination. This allows the server information to be retained and examined by a service specialist.

SHOW COUNTERS

EXAMPLES

1 LCP>SHOW COUNTERS/NODE

LCP Node Counters

127597	Receive frames
0	Receive errors
3	Receive duplicates
161885	Transmit frames
0	Transmit errors
00000000	Last transmit failure code
28	Retransmissions
6	Circuit timeouts
0	Protocol errors
00000000	Protocol bit mask
0	Resource errors
0	No transmit buffer
0	Unit timeouts
0	Solicitation failures
0	Discarded output bytes

This example shows the display generated by the SHOW COUNTERS/NODE command.

2 LCP>SHOW COUNTERS/SERVERS

LCP Server Counters for LAT1

7882	Receive frames
8743	Transmit frames
0	Retransmissions
0	Out of sequence frames
0	Invalid messages
0	Invalid slots

This example shows the display generated by the SHOW COUNTERS /SERVER command.

SHOW PORTS

Displays the characteristics for the ports on your service node.

FORMAT **SHOW PORTS** *port-name*

Command Qualifiers	Defaults
<i>/APPLICATION</i>	<i>/APPLICATION</i>
<i>/INTERACTIVE</i>	<i>None</i>

RESTRICTIONS Do not use the */APPLICATION* or */INTERACTIVE* qualifiers with a specific port name.

PARAMETERS *port-name*
 Specifies the name of the port for which information is displayed. When you enter the SHOW PORTS command without entering a port name, characteristics for all of the LTA_n ports on the service node are displayed.

DESCRIPTION If the port is an applications port, the display lists the remote node name and the remote port or remote service name that you specified in the SET PORT command. If the port is an interactive port, it is currently being used by a server user. For all ports with current connections, the server sends the node name and port name to your service node. These are listed in the display.

COMMAND QUALIFIERS */APPLICATION*
 Generates a display for all applications ports.

/INTERACTIVE
 Generates a display for all interactive ports.

EXAMPLE

LCP> SHOW PORTS

```
Local Port Name = LTA62:   <interactive>
  Actual Remote Node Name = LAT10
  Actual Remote Port Name = PORT_7
```

```
Local Port Name = LTA322:  <application>
  Specified Remote Node Name = LAT1
  Specified Remote Port Name = LQP02
  Actual Remote Node Name = LAT1
  Actual Remote Port Name = LQP02
```

SHOW PORTS

```
Local Port Name = LTA321:    <application>  
Specified Remote Node Name = LAT1  
Specified Remote Service Name = PRINTER
```

The first port displayed in this example is the interactive port LTA62 connected to Port_7 on the LAT10 server.

The second port displayed in this example is the LTA322 applications port. Note that, in this display, the presence of the actual values indicates an established connection.

The third port displayed in this example is the LTA321 applications port mapped to the PRINTER service on the LAT1 server.

SHOW SERVERS

Displays the characteristics for the servers known to your service node.

FORMAT SHOW SERVERS

RESTRICTIONS *None.*

PARAMETERS *None.*

DESCRIPTION Displays the following information about servers known to your service node:

- Ethernet address
- Server status
- Number of active users

EXAMPLE

```
LCP>SHOW SERVERS
```

```
LCP Server Characteristics for LAT1
```

```
Ethernet address = AA-00-03-01-0D-BC
```

```
Server is active           Active users = 1
```

This example shows the output of the SHOW SERVERS command for the service node LAT1.

START NODE

START NODE

Starts the LAT port driver and sets service node characteristics.

FORMAT **START NODE** *node-name*

Command Qualifiers	Defaults
<i>/DISABLE=group-list</i>	<i>None</i>
<i>/ENABLE=group-list</i>	<i>/ENABLE=(0)</i>
<i>/IDENTIFICATION="id-string"</i>	<i>SYS\$ANNOUNCE</i>
<i>/[NO]LOG</i>	<i>/LOG</i>
<i>/MULTICAST_TIMER=seconds</i>	<i>/MULTICAST_TIMER=60</i>

RESTRICTIONS *None.*

PARAMETERS *node-name*

Specifies the name you choose for your service node. The node name can be from 1 to 16 ASCII characters long. Eligible characters are described in Appendix A. The default is the translation of the SYS\$NODE logical name.

DESCRIPTION The START NODE command activates the LAT port driver. Before entering this command, however, you must invoke the System Generation Utility (SYSGEN) to load the LAT port driver and the first LT template unit control block (UCB) as follows:

```
$ RUN SYS$SYSTEM:SYSGEN
SYSGEN> CONNECT LTAO: /NOADAPTER
```

Note that use of the SYSGEN command CONNECT requires the CMKRNL privilege.

After the LAT port driver is activated, you can modify your node characteristics dynamically with the SET NODE command. Also, if the DECnet network is to be started on your node, start it before starting the LAT port driver.

When you start LAT on your node, LATCP attempts to find an Ethernet controller device on the node. If the controller on your node does not match a controller that LAT recognizes, LAT attempts to translate the logical name LAT\$DEVICE as the controller name. Enter the following command, which requires the SYSNAM or SYSPRV privilege, to define an Ethernet controller device before starting LAT:

```
$ DEFINE/SYSTEM/EXEC LAT$DEVICE dev-name:
```

The STOP NODE command clears the current node characteristics. Invoke the LTLOAD.COM file to start LAT, or set the node characteristics manually before starting LAT.

**COMMAND
QUALIFIERS*****/DISABLE=group-list***

Removes previously enabled groups associated with your service node.

/ENABLE=group-list

Gives your service node access to the listed groups. There are 256 groups, numbered from 0 to 255. When you enter a group list, use commas to separate individual groups. The default is that no groups are enabled.

Note: Not all servers support 256 groups.

/IDENTIFICATION="identification-string"

Specifies a description for your service node. The string is advertised in the announcement messages sent to servers by your service node. The string can have up to 64 ASCII characters and must be enclosed in quotation marks ("). The string cannot begin with an ampersand (&), and nonprintable characters are translated as spaces.

/[NO]LOG

Specifies whether to display your service node characteristics when this command is executed. */NOLOG* prevents the display.

/MULTICAST_TIMER=seconds

Specifies the time, in seconds, between the announcement messages sent by your service node. The minimum value is 10 seconds; the maximum is 255 seconds. The default value is 60.

EXAMPLE

LCP> **START NODE DUKE /ID**

The command in this example starts node DUKE and assigns default values for the command qualifiers.

STOP NODE

STOP NODE

Shuts down the LAT port driver and terminates all of the sessions on LTA ports.

FORMAT

STOP NODE

Command Qualifiers	Defaults
--------------------	----------

None

None

RESTRICTIONS

None.

PARAMETERS

None.

DESCRIPTION

Use the following recommended steps to stop the LAT port driver with the STOP NODE command:

- 1 Since active connections are disconnected without warning, use the DCL command REPLY to warn LAT users to log off the node's services before you enter the STOP command.

If the node is down for a long period, tell the user when the node will be back up.

- 2 Enter the following command to invoke LATCP:

```
$ RUN SYS$SYSTEM:LATCP
```

- 3 Enter the following command to announce the reason for the shutdown of the LAT server:

```
LCP> SET NODE node-name/IDENTIFICATION="reason-for-shutdown"
```

- 4 Enter the LATCP command STOP NODE.

- 5 Enter the LATCP command EXIT to exit from LATCP.

If you want to stop the LAT port driver and want your service node to have the same characteristics when you restart the driver, do not use the START NODE command. Instead, invoke the SYS\$MANAGER:LTLOAD.COM command procedure. Alternatively, after stopping the LAT port driver using STOP NODE, you can set up your node characteristics manually with the SET NODE and SET SERVICE commands.

EXAMPLE

\$ REPLY /ALL "LAT SERVICE SHUTTING DOWN IN 5 MINUTES. PLEASE LOG OFF"

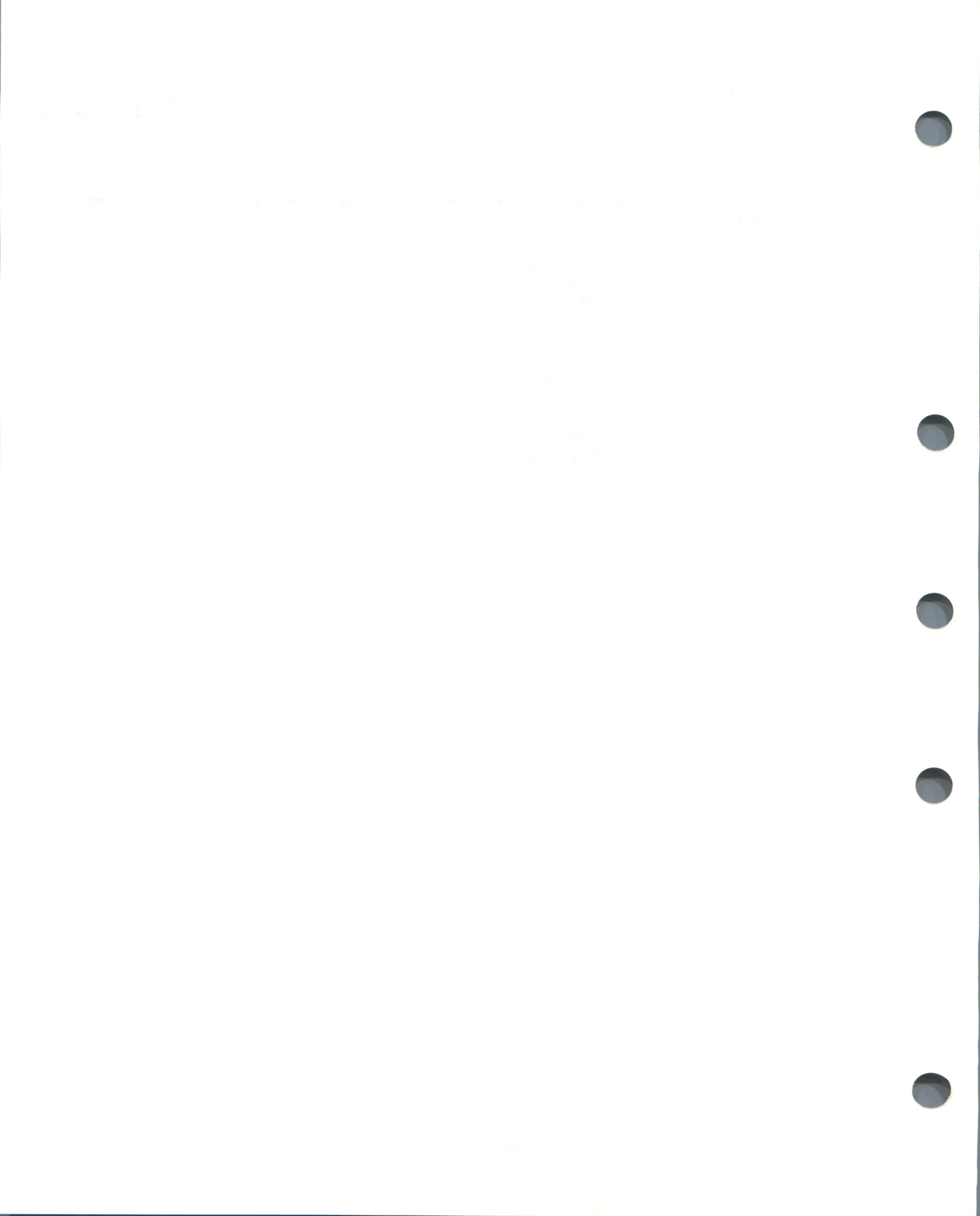
This command notifies users not connected through a server that the node is temporarily shutting down.

LCP> SET NODE DUKE /IDENT="SHUT DOWN FOR SERVICE--BACK UP 2:00 PM."

This command notifies users connected through a server that the services offered by node DUKE are temporarily unavailable.

LCP> STOP NODE

This command shuts down the LAT port driver and disconnects all sessions to your node.



A **ASCII Characters for Node and Service Names**

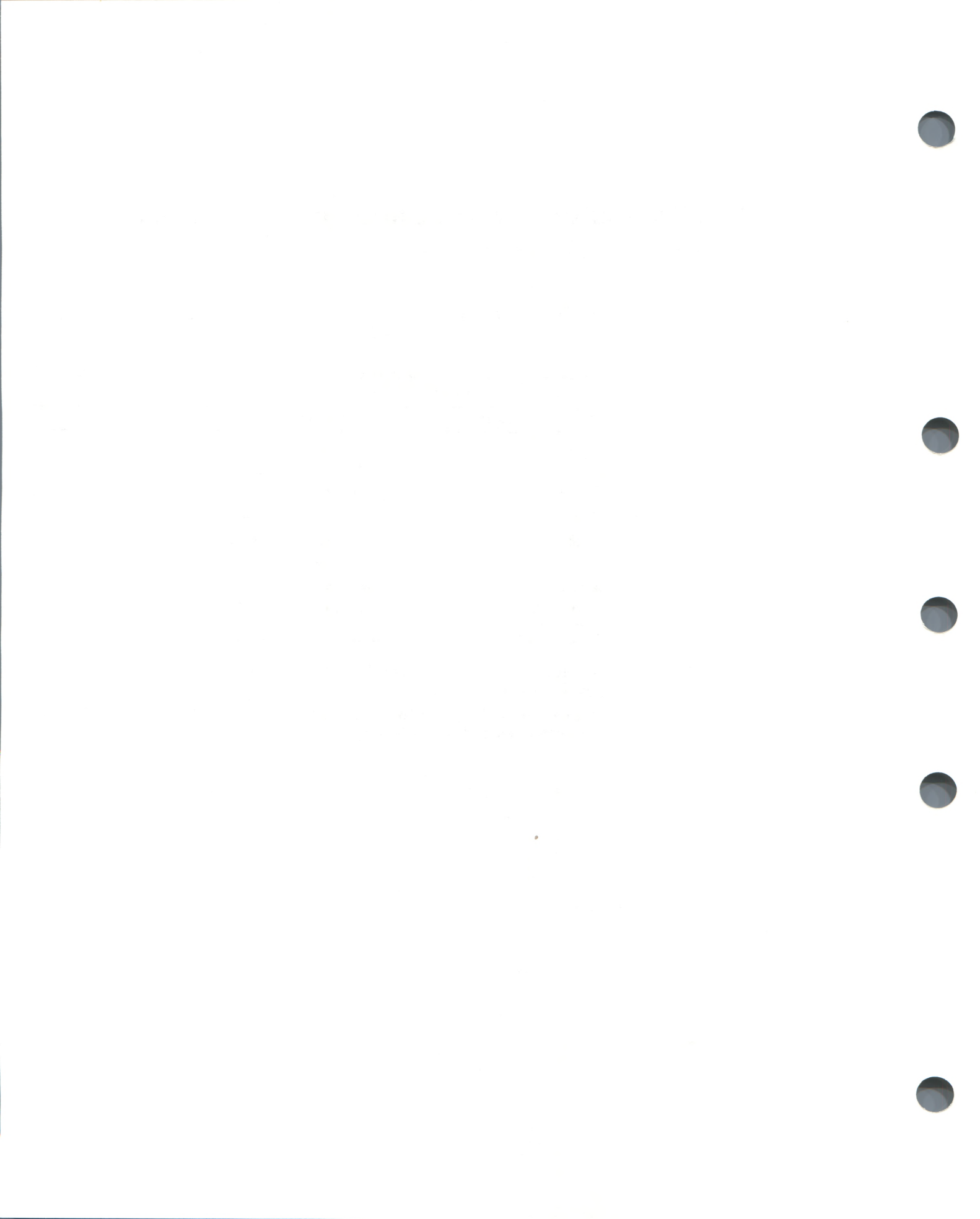
The ASCII characters used to specify node and service names for your service node are presented in Table A-1:

Table A-1 ASCII Characters Used to Specify Node and Service Names

ASCII Character	Meaning and Number
\$	dollar sign, ASCII code 36
-	hyphen, ASCII code 45
.	period, ASCII code 46
0 to 9	numerals, ASCII codes 48-57
A to Z	uppercase letters, ASCII codes 65-90
_	underscore, ASCII code 95
a to z	lowercase letters, ASCII codes 97-122
Part of the international character set	ASCII codes 192 to 253

Coordinate the service names throughout the network to avoid duplicating service names.

Names can be from 1 to 16 characters in length. Note that you cannot use a space in a node or service name.



B Qualifiers for DCL Printer Setup Commands

This appendix describes the terminal and queue characteristics required for setting up printers on VMS systems. The appendix contains the following two tables:

- Table B-1 shows the formats of standardized SET TERMINAL and INITIALIZE/QUEUE commands. These formats illustrate command qualifiers that are required for all printers.
- Table B-2 lists particular printers and indicates any associated values that usually should be specified for a given command qualifier.

In addition, the appendix includes comments about selected command qualifiers. For further details about the qualifiers for SET TERMINAL and INITIALIZE/QUEUE commands, see the *VAX/VMS DCL Dictionary* and Chapter 3 in this guide.

Table B-2 shows the standardized formats of the SET TERMINAL and INITIALIZE/QUEUE commands. The qualifiers in these two commands specify terminal or queue characteristics that you must set for all printers on your VMS system. Variables are in lowercase italics.

Table B-1 Command Qualifiers Required for Remote Printers

Command	Qualifier
SET TERMINAL LTAnn:	/PERMANENT /NOBROADCAST /DEVICE=type ¹ /WIDTH=value /PAGE=value
INITIALIZE/QUEUE	/START /PROCESSOR=LATSYM /FORM=form ² /RETAIN=ERROR /DEFAULT=values ³ /RECORD_BLOCKING /ON=LTAnn:

¹This qualifier specifies a page width and page length that is appropriate for the device specified in a SET TERMINAL command. However, for some devices you may want to select alternative values. For example, the qualifier /DEVICE=LA210 sets the /WIDTH value to 132 and the /PAGE value to 66. When you use narrow paper in the LA210 device, you can override the default width value with a /WIDTH=80 qualifier, and the printer will be correct for the paper used.

²This qualifier usually specifies a user-defined form having the appropriate /PAGE and /WIDTH values to match the printer and terminal characteristics.

³This command qualifier, unless otherwise specified in the list, specifies any valid defaults the user wishes for the printer.

Qualifiers for DCL Printer Setup Commands

Different types of printers vary in the values necessary for terminal and queue characteristics. Table B-2 shows values that must be specified for qualifiers that define nondefault characteristics. Entries listed as "User Preference" means that you can use any valid /DEVICE, /WIDTH, and /PAGE values with the SET TERMINAL command or any valid /DEFAULT and /FORM values with the INITIALIZE/QUEUE command.

Table B-2 Additional Qualifiers Required for Particular Devices

Device	SET TERMINAL Command	INITIALIZE/QUEUE Command
LA 12, LA34 LA36, LA38 LA50, LA100 LQP02, LQP03 LN01S, LN03S	User Preference	User Preference
LA 120, LA210	/NOTAB	User Preference
LXY12-DA LXY22-DA	/FORM /WIDTH=134 /PAGE=66 /NOWRAP /NOEIGHTBIT	User Preference (NOTE: Do NOT spool these devices.)
LCPO1	/INTERACTIVE /FULLDUP /TAB /FORM /SCOPE /LOWERCASE /EIGHTBIT /TTSYNC /NOMODEM /NOECHO /NOWRAP /NOESCAPE	/DEFAULT= (NOFLAG,NOFEED, NOTRAILER,NOBURST) /SCHEDULE= NOSIZE
LG01, LG02	/FORM /WIDTH=134 /PAGE=66 /NOWRAP	/DEFAULT=NOFEED
LVP16 Plotter	/WIDTH=132 /PAGE=0	/DEFAULT= (NOFLAG,NOFEED, NOTRAILER,NOBURST)
DECTalk DTC01, DTC03	/WIDTH=132 /PAGE=0	/DEFAULT= (NOFLAG,NOFEED, NOTRAILER,NOBURST)

C LAT Control Program Error Messages

This appendix lists the LAT Control Program (LATCP) error messages and gives an explanation of each one.

CANT BIND, Can't initialize device

Facility: LATCP, LAT Control Program

Explanation: The LAT device cannot be initialized.

User Action: Specify an appropriate applications or dedicated port.

INTERNAL, LATCP internal error

Facility: LATCP, LAT Control Program

Explanation: LATCP or the LAT port driver has insufficient buffer space or has detected some other internal error.

User Action: Verify that you entered the correct command. If the problem persists, submit a Software Performance Report (SPR).

IVCMD, Invalid command

Facility: LATCP, LAT Control Program

Explanation: The LATCP detected a command syntax error.

User Action: Enter a valid command.

IVDEV, Invalid node or device name

Facility: LATCP, LAT Control Program

Explanation: An invalid LT device or node name was specified with the CREATE or SHOW command, or an invalid or nonexistent LT device name was specified with the SET command.

User Action: Verify the node or device name, and reenter the command.

IVQUAL, Value for qualifier 'name' is invalid as 'number'

Facility: LATCP, LAT Control Program

Explanation: The value 'number' for the qualifier 'name' of a SET command was invalid or out of range.

User Action: Reenter the command with a valid value.

LOCKED, Data base locked. Try again later.,

Facility: LATCP, LAT Control Program

Explanation: LATCP cannot run because another user is modifying the LATCP database.

User Action: Wait for a while; then reenter the command. If the problem persists, determine who else is using LATCP and request that person to exit.

LAT Control Program Error Messages

MAXSERV, Maximum number of services exceeded,

Facility: LATCP, LAT Control Program

Explanation: Eight services have already been created on a service node.

User Action: Delete one of the existing services before creating a new one.

NONODE, Node name has not been initialized,

Facility: LATCP, LAT Control Program

Explanation: You attempted to start the LAT port driver without setting up a proper LAT node name.

User Action: Define your node name in one of the following ways:

- Equate your node name to the logical name SYS\$NODE.
- Use the SET NODE command.
- Use the START NODE command.

Start the LAT port driver again.

NOPORTS, No such ports,

Facility: LATCP, LAT Control Program

Explanation: A nonexistent port was specified with the SHOW command.

User Action: Ensure that the port exists and reenter the command. Enter the SHOW PORTS command to look at the ports for your service node.

NOSUCHSERV, Service name does not exist,

Facility: LATCP, LAT Control Program

Explanation: You attempted to use the SET command to modify a service not previously set up with a CREATE command.

User Action: Enter the SHOW CHARACTERISTICS command to look at the services defined for your node. Enter the CREATE SERVICE command to create the service (up to 8 allowed) for your node. Reenter the command.

NOTFROMLAT, Unable to shut down LAT from a LAT terminal,

Facility: LATCP, LAT Control Program

Explanation: You entered a LATCP STOP NODE command from a LAT terminal.

Explanation: Reenter the command from a console on your service node.

NOTINITED, LAT terminal port driver controller init not called,

Facility: LATCP, LAT Control Program

Explanation: The LAT port driver cannot start because it is not properly initialized.

User Action: Refer to the SYS\$MANAGER:LTLOAD.COM command procedure that is included with your LAT/VMS distribution software.

LAT Control Program Error Messages

NOTLOADED, LAT terminal port driver (LTDRIVER) is not loaded,

Facility: LATCP, LAT Control Program

Explanation: You attempted to start the LAT port driver before loading the driver with the SYSGEN command CONNECT.

User Action: Enter the SYSGEN command CONNECT to connect the LAT port driver. Start the LAT port driver again.

NOTSTARTED, LAT terminal port driver not started,

Facility: LATCP, LAT Control Program

Explanation: Your attempt to start the LAT port driver was unsuccessful.

User Action: Determine the cause of the failure, then reenter the command.

NOTSTOPPED, LAT terminal port driver not stopped,

Facility: LATCP, LAT Control Program

Explanation: A STOP NODE command failed to stop the LAT protocol.

User Action: Determine the specific cause of the failure and reenter the command.

NOSERVERS, No known servers,

Facility: LATCP, LAT Control Program

Explanation: You entered the SHOW COUNTERS/SERVER or the SHOW SERVERS command, but there are no servers in the LATCP database.

User Action: None.

SERVEXISTS, Service name already exists,

Facility: LATCP, LAT Control Program

Explanation: You attempted to create a service already created for this node.

User Action: Enter the SHOW CHARACTERISTICS command to see the services on your node. Reenter the CREATE command with a new service name.

STARTED, LAT terminal port driver started,

Facility: LATCP, LAT Control Program

Explanation: The LAT port driver started successfully.

User Action: None. This is an informational message.

STOPPED, LAT terminal port driver stopped,

Facility: LATCP, LAT Control Program The LAT port driver stopped successfully.

User Action: None. This is an informational message.



Index

A

- Announcement message • 2-7
 - Application program
 - abnormal LAT connection termination • 4-3
 - hangup notification • 4-3
 - QIO interface for • 4-2
 - Applications port
 - creating • 3-1
 - I/O status block for • 4-3
 - mapping to remote printer • 3-1
 - Automatic failover
 - description • 1-5
-

C

- Command procedures (LAT)
 - DCL commands for remote printer configuration • 3-7
 - system-specific LTLOAD • 2-5
 - system-specific printer configuration • 3-3
 - template LTLOAD • 2-3
 - using generic queues • 3-7
 - Commands
 - entering interactively • 2-10
 - CREATE PORT command • 5-2
 - CREATE SERVICE command • 5-3
-

D

- DELETE PORT command • 5-5
 - DELETE SERVICE command • 5-6
-

E

- EXIT command • 5-7
-

G

- Generic queue command procedure • 3-7
 - Groups
 - setting up • 2-6
-

H

- Hangup notification
 - for application program • 4-3
 - HELP command • 5-8
 - Host-initiated request
 - description • 1-5
-

I

- INITIALIZE/QUEUE command • B-1
-

L

- LAT
 - definitions • 1-3
- LAT application port
 - connecting application program to • 4-1
- LAT Control Program
 - error messages • C-1
 - exiting from • 2-11
 - online HELP • 2-11
- LAT Control Program commands
 - abbreviating • 5-1
 - entering • 5-1
- LATCP
 - See LAT Control Program
- LAT port driver
 - accessing remote devices • 4-4
 - function code modifiers • 4-2
 - loading and starting • 2-12
 - QIO for application programs • 4-2
 - rejection code • 4-4
 - rejection reason code • 4-3

Index

LAT port driver (cont'd.)

- sample I/O status block for • 4-4
- stopping • 2-12
- VMS function code modifiers • 4-2

LAT protocol

- description • 1-1

LAT/VMS software

- description • 1-1

Load balancing • 2-7

- description • 1-5

Local Area Transport

- See LAT

LTLOAD command procedure

- editing • 2-9
- general description • 2-1
- invoking on individual nodes • 2-9
- invoking on VAXcluster nodes • 2-10
- modifying • 2-3
- system-specific file • 2-5
- template file • 2-3

M

Multicast timer

- setting up • 2-7

N

Node identification

- description • 1-4
- setting up • 2-6

Node name

- ASCII characters allowed • A-1
- setting up • 2-6

P

Protocol bit mask

- error definitions • 5-19

Q

Queue

- assigning form type • 3-8

Queue (cont'd.)

- assigning global symbol for default stock • 3-8
- changing stock • 3-11
- checkpointed errors • 3-5, 3-9
- defining form type • 3-4
- ensuring error messages for • 3-5
- form type • 3-4
- generic • 3-7
- initializing for remote printers • 3-5
- initializing on VAXclusters • 3-7
- node-specific • 3-7
- on a server • 1-5
- on VAXclusters • 3-7
- pending errors • 3-9, 3-10
- restarting after error • 3-10
- suspended printing errors • 3-9, 3-10
- system-wide default form • 3-4
- troubleshooting • 3-9

R

Remote device

- access by LTDRIVER • 1-5

Remote printer

- description • 1-5
- initializing print queues • 3-5
- making a command procedure for • 3-2
- mapping from applications port • 3-1
- setting up • 3-1
- setting up applications port • 3-1
- setting up as a spooled device • 3-5
- setting up characteristics • 3-3
- setting up on VAXclusters • 3-6

S

Server

- queuing requests to • 1-5
- specifying name • 2-6, 3-2
- specifying port name • 3-2
- specifying service name • 3-2

Service

- advertising • 2-9
- definition • 1-3
- showing characteristics • 2-13

Service announcement

- changing • 2-13
- description • 1-4, 2-8

Service announcement (cont'd.)
 setting up • 2-8

Service identification string
 description • 1-4

Service name • 1-3
 ASCII characters allowed • A-1
 changing • 2-13
 description • 2-8
 for VAXclusters • 1-5
 setting up • 2-8

Service node
 See VMS service node
 displaying characteristics • 2-12
 setting up groups • 2-6
 setting up multicast timer • 2-7
 setting up node identification • 2-6
 setting up node name • 2-6

Service rating • 2-7
 changing • 2-13
 description • 1-5
 setting up • 2-8

Session
 definition • 1-3

SET COUNTERS command • 5-9

SET NODE command • 5-10

SET PORT command • 5-12

SET SERVICE command • 5-14

SET TERMINAL command • B-1

SHOW CHARACTERISTICS command • 5-16

SHOW COUNTERS command • 5-17

SHOW PORTS command • 5-21

SHOW SERVERS command • 5-23

START NODE command • 5-24

STOP NODE command • 5-26

System startup command procedures
 editing • 2-9

System startup files
 invoking SYSTARTUP.COM • 2-10

T

Terminal server node
 definition • 1-3

Troubleshooting remote printer queues • 3-9

V

VAXcluster
 automatic failover • 1-5
 load balancing in • 1-5
 use of service rating in • 1-5

Virtual circuit
 description • 1-4

VMS service node
 definition • 1-3



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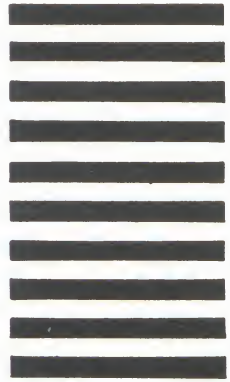
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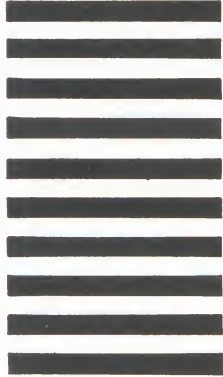
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