



Prime

***System Administrator's
Guide
Volume II
Communication Lines
and Controllers***

Revision 22.0

DOC10132-2LA

System Administrator's Guide Volume II Communication Lines and Controllers

Second Edition

Lois Anne Conrad

This guide documents the software operation of the Prime Computer and its supporting systems and utilities as implemented at Master Disk Revision Level 22.0 (Rev. 22.0).

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This warning applies to the 9950 and 2250 CPUs, and to all 50 Series processors manufactured after October 1, 1983

WARNING

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the instructions manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If there are any questions, please contact your Prime Field Office.

This warning applies to all other processors described in this book.

WARNING

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the instructions manual, may cause harmful interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference.

Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If there are any questions, please contact your Prime Field Office.

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ABOUT THIS BOOK

The *System Administrator's Guide, Volume II: Communication Lines and Controllers* is the second volume of the *System Administrator's Guide* set. This book provides definitions, instructions, and examples of the directives and commands necessary to configure communication lines. If you have administrative responsibility for a Prime system, this book is intended for you. Other administrative functions are described in the remaining books in the set:

- *System Administrator's Guide, Volume I: System Configuration* (DOC10131-2LA) discusses configuration planning, and the responsibilities of the System Administrator. It contains a master dictionary of all configuration directives, and an overview of all the PRIMOS[®] directories and files.
- *System Administrator's Guide, Volume III: System Access and Security* (DOC10133-2LA) documents all the security features available on the operating system, including ACLs, EDIT_PROFILE, and the Security Audit facility.

You are expected to have some familiarity with Prime systems before reading the volumes of the System Administrator's Guide. If you are not familiar with the PRIMOS operating system, read the *PRIMOS User's Guide* (DOC4130-5LA) which explains the Prime file management system and describes essential commands and utilities.

Read the *Rev. 22.0 Software Installation Guide* (IDR10176-2XA) if you are installing PRIMOS Rev. 22.0 for the first time or upgrading your system from a prior revision. It contains information on the system startup files and detailed upgrade instructions.

NEW FEATURES AT REV. 22.0

Rev. 22.0 introduces dynamic buffer allocation for asynchronous lines and support for up to 960 interactive processes. Two new commands, CAB and LAB, allow you to set and display asynchronous line buffers. The CONVERT_BUFFER_DIRECTIVES utility allows Rev. 20.0, 20.1, 20.2, and 21.0 users to upgrade AMLBUF, REMBUF, NTSBUF, and NTSABF configuration directives to the CAB commands.

CONTENTS

This book contains the following chapters and appendices:

Chapter 1, Communication Controllers: Describes the backplane and communication controllers and discusses the electrical interfaces supported by Prime. This chapter identifies the AMLC, ICS, PNC, and LHC controllers and LTS units, lists each controller's interface standards, and describes the features supported by each.

Chapter 2, Operating Intelligent Controllers: Introduces the `COMM_CONTROLLER` command that enables you to downline load protocols or runfiles to ICS, LHC, or LTS controllers interactively and at cold start.

Chapter 3, Useful Configuration Directives: Provides a reference table and a dictionary of all the configuration directives currently supported.

Chapter 4, Configuring Asynchronous Lines: Provides a detailed discussion of the `SET_ASYNC` command and the `CONVERT_AMLC_COMMANDS` utility. It briefly discusses asynchronous communication, outlines the procedure for configuring asynchronous lines, and explains how to determine line numbers and enable Auto Speed Detect.

Chapter 5, Assignable Asynchronous Lines: Explains how to use the `ASSIGN_ASYNC` and `UNASSIGN_ASYNC` commands to assign and release local assignable lines. It also provides a list of Prime products that require assignable lines. The second part explains how to use the `NTS_ASSOCIATE`, `NTS_UNASSOCIATE`, and `NTS_LIST_ASSOCIATE` commands to assign, release, and display NTS assignable lines.

Chapter 6, Allocating I/O Buffers: Describes dynamic buffer allocation for asynchronous lines, asynchronous character processing, I/O interrupt rates, I/O buffers, default buffer assignments, and methods of calculating buffer capacity. The second part introduces the `CAB` and `LAB` commands and explains how to use the `CONVERT_BUFFER_DIRECTIVES` utility.

Appendix A, Obsolete and Rarely Used Commands: Provides a complete discussion of the `AMLC` command, `ASSIGN_AMLC`, `UNASSIGN_AMLC`, `AMLBUF`, `REMBUF`, `NTSBUF`, and `NTSABF` for pre-Rev. 22.0 systems.

Appendix B, Determining Physical Line Numbers: Describes the procedure for tracing communications lines back to the controller. A table shows how AMLC controllers map physical lines to logical line numbers and user number.

RELATED DOCUMENTATION

Other helpful Prime documentation includes the following:

- *ICS User's Guide* (DOC10094-1LA) and its update package for Rev. 21.0 (UPD10094-11A) provide detailed information on the Prime Model 2 (ICS2) and Model 3 (ICS3) Intelligent Communications Subsystems.
- *Operator's System Overview* (DOC9298-3LA) introduces the series of operator's guides and describes computer-room operation of Prime systems.
- *Operator's Guide to System Monitoring* (DOC9299-3LA) describes how to monitor system activity and respond to system and user messages.
- *Operator's Guide to File System Maintenance* (DOC9300-4LA) describes the PRIMOS file system and explains how to format partitions with MAKE, run the disk maintenance program FIX_DISK, determine physical device numbers, and interpret disk error messages.
- *Operator's Guide to System Backups* (DOC9301-1LA) and its update packages for Rev. 20.0 (UPD9301-11A and UPD9301-12A) and Rev. 20.2 (UPD9301-13A) describe how to save information on disk or tape, and how to restore that information later.
- *Operator's Guide to the Batch Subsystem* (DOC9302-3LA) describes how to use the Batch Subsystem.
- *Operator's Guide to System Commands* (DOC9304-4LA) details the commands used by system operators.
- *Operator's Guide to the Spooler Subsystem* (DOC9303-3LA) describes how to set up, monitor, and control the Spooler subsystem.
- *PRIMOS Commands Reference Guide* (DOC3108-7LA) describes all user commands.
- *Site Preparation Guide* (DOC5029-3LA) provides information for preparing and maintaining a system site.

NETWORK DOCUMENTATION AVAILABLE AT REV. 22.0

- *PRIMENET Planning and Configuration Guide* (DOC7532-4LA)
- *Programmer's Guide to Prime Networks* (DOC10113-1LA)
- *Operator's Guide to Prime Networks* (DOC10114-2LA)
- *User's Guide to Prime Network Services* (DOC10115-1LA)
- *NTS Planning and Configuration Guide* (DOC10159-2LA)
- *NTS User's Guide* (DOC10117-2LA)
- *DSM User's Guide* (DOC10061-2LA)

PRIME DOCUMENTATION CONVENTIONS

The following conventions are used in command formats, statement formats, and in examples throughout this document. Examples illustrate the uses of these commands and statements in typical applications.

<i>Convention</i>	<i>Explanation</i>	<i>Example</i>
BOLDFACE	All words in command formats are in boldface including the names of commands, options, statements, and keywords. Enter them in either uppercase or lowercase.	SET_ASYNC -HELP
<i>Italic</i>	In command formats, words in lowercase bold italic indicate variables for which you must substitute a suitable value. In text and in messages, variables are in standard lowercase italic.	LOGIN <i>user-id</i> Supply a value for <i>x</i> between 1 and 10.
Monospace	Examples in monospace type show user input and the computer's response. The text includes all the prompts, messages, and results you would normally see.	OK, <u>TYPE (one two three)</u> one two three
Abbreviations in command formats	If a command or option has an abbreviation, the abbreviation is placed immediately below the full form.	LOGOUT LO
<u>Underscore</u> in examples	In examples, user input is underscored but system prompts and output are not.	OK, <u>RESUME MY_PROG</u> This is the output of MT_PROG.CPL
Brackets []	Brackets enclose a list of one or more optional items. Choose none, one, or more of these items.	LD [-BRIEF] [-SIZE]
Braces { }	Braces enclose a list of items. Choose one and only one of these items.	CLOSE {filename} -ALL }
Hyphen -	Wherever a hyphen appears as the first character of an option, it is a required part of that option.	SPOOL -LIST
Subscript	A subscript after a number indicates that the number is not in base 10. For example, a subscript 8 indicates an octal number.	200 ₈
Angle brackets in messages < >	In messages, a word or words enclosed by angle brackets indicates a variable for which the program substitutes the appropriate value.	Disk <diskname>

COMMUNICATION CONTROLLERS

Communication controllers are printed circuit boards, some with resident microprocessors, that are located in the computer's backplane. They pass data, control signals, and address information between the CPU and user terminals, printers, and other peripheral devices. Although users cannot communicate directly with the CPU, high-speed communication controllers create that illusion.

The first part of this chapter describes Prime communication controllers in general. It discusses the backplane, electrical interface standards, configuration limits, and the STATUS COMM command.

The second part of this chapter describes Prime communication controllers in detail. It discusses device address assignments, asynchronous line support, specific controller characteristics, and ICS card cage maintenance.

THE BACKPLANE

The term **backplane** describes the chassis in the Prime computer system that holds the various printed circuit boards that make up a Prime computer.

The backplane connects all the boards in a system, acts as a source of DC power, and provides a common interface between the CPU, memory, and the communication controllers. I/O busses built into the backplane provide separate interfaces for data, addresses, and control signals.

The standard backplane has sufficient slots for installing the CPU, memory, communication controllers, standard peripheral subsystems, and power supplies. Figure 1-1 is a diagram of the standard Prime backplane. It shows the relative position of these printed circuit boards. (Communication controllers are also known as I/O controllers.)

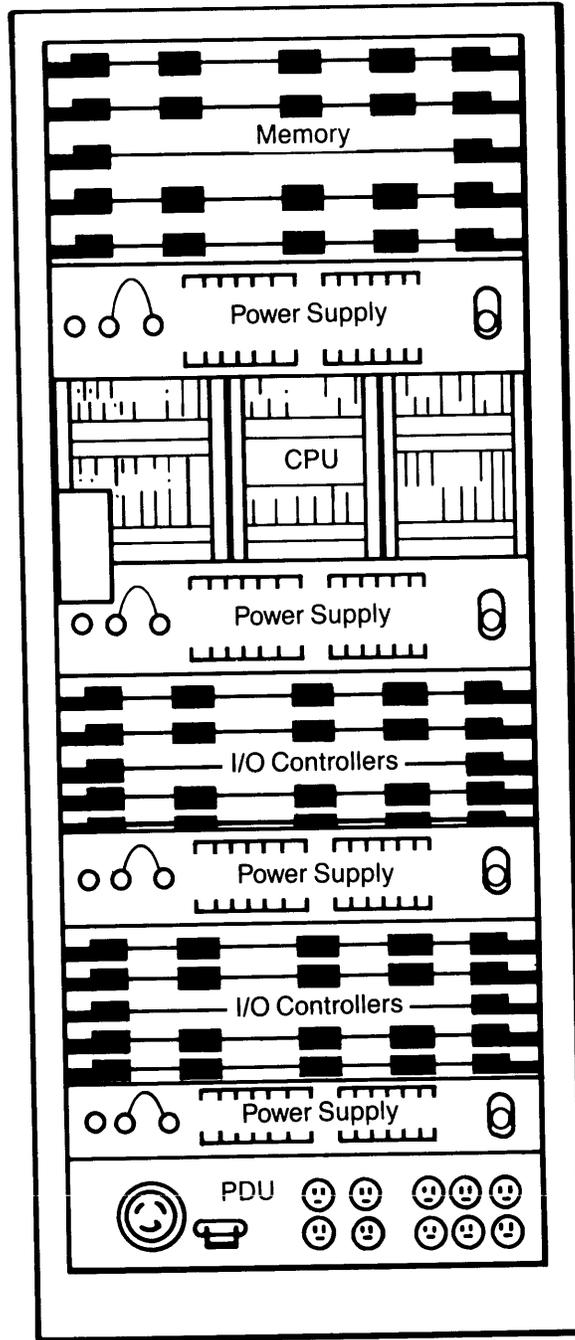


FIGURE 1-1. The Standard Prime Backplane

The total number of boards plugged into the backplane is limited only by the number of slots and the power available. The exact choice depends on your system's specific requirements.

Memory boards are commonly installed in the top of the backplane supported by their own power supply. The CPU boards usually are installed below the memory array and also have their own power supply. Depending on your installation and system configuration limits, you can have one or two groups of communication controllers. If the total amperage requirements for all the communication controllers exceeds the capacity of one power supply, you can install another. The Power Distribution Unit is usually located at the base of the CPU cabinet.

There are several types of printed circuit boards in the backplane. A typical system can include a selection of the following boards:

- Asynchronous MultiLine Controllers (AMLC)
- DC Power Supplies
- Floppy Disk Controller
- Intelligent Communication Subsystem (ICS) Controllers
- InterProcess Communication (IPC) Controller
- LAN Host Controllers (LHC)
- Magnetic Tape Controllers (MTC)
- Memory Array (MA)
- Multiple Data Link Controllers (MDLC)
- Power Distribution Unit (PDU)
- PRIMENET™ Node Controller (PNC)
- Storage Module Disk (SMD) Controllers
- Cartridge Module Disk (CMD) Controllers
- Fixed Media Disk (FMD) Controllers
- Synchronous MultiLine Controllers (SMLC)
- The Central Processing Unit (CPU)
- Unit Record Controllers (URC)
- Virtual Control Panel (VCP)

ELECTRICAL INTERFACE STANDARDS

An interface is a standard method of interpreting the electrical signals transmitted through the pins in the connectors of a data communication line. When you connect terminals, modems, or any other electronic devices to a host, an interface ensures that:

- Voltage and signal levels are compatible.
- Interface connectors plug together with identical pin wiring and corresponding pin connections.
- Control information supplied by one device is understood by the other device.

Prime communication controllers support four communication interface standards:

- 20 milliamp current loop
- DDS/V.35
- IEEE 802.3
- EIA RS-232-C (also called CCITT V.24 in Europe)

20 Milliamp Current Loop

The 20 milliamp current loop is a communication interface that supports devices that operate at relatively slow baud rates. This interface is available only on AMLC controllers. PT25™, PT45™, and PT65™ terminals can use either 20 milliamp current loop lines or RS-232-C/CCITT V.24 lines.

DDS/V.35

The DDS/V.35 communications interface supports high-speed synchronous lines which typically connect to broad-band modems. DDS/V.35 transmission rates can be as high as 64 kbps depending on the modem's internal clocking. This interface is available on ICS2 controllers with CLAC 522 line adapter cards or on ICS3 controllers with CLAC 622 line adapter cards.

IEEE 802.3

The IEEE 802.3 standard defines the digital interface for an Ethernet local area network (LAN). This interface is available only on LAN Host Controllers and LAN Terminal Servers running Network Terminal Service® (NTS) software.

EIA RS-232-C/CCITT V.24

The EIA RS-232-C/CCITT V.24 industrywide communication standard describes a communication interface. It supports modems, terminals, and printers, including products that use asynchronous lines. The RS-232-C standard has been adopted by manufacturers in the U.S. and Canada; CCITT V.24 is the equivalent international standard.

The RS-232-C standard defines the signals assigned to particular pin numbers in a 25-pin connector. Although the international standard uses all 25 pins, not all devices use the same pin connections, or timing.

Prime asynchronous and synchronous protocols support a subset of the full 25-pin data set support shown in Table 1-1. For example, transmit and receive timing for dialup lines is controlled by the modem's internal clock rather than by pins 15 and 17.

For device-specific information on other vendor's hardware, refer to the manufacturer's installation guide.

TABLE 1-1. EIA RS-232-C/CCITT V.24 Electrical Interface

<i>Pin</i>	<i>Signal Definition</i>
1	Protective ground
2	Transmit data
3	Receive data
4	Request to send
5	Clear to send
6	Data set ready
7	Signal return (ground)
8	Data carrier detect
9	DC+ test voltage
10	DC- test voltage
11	Unassigned
12	Second data carrier detect
13	Second clear to send
14	Secondary transmit data
15	Transmit clock
16	Secondary receive data
17	Receive clock
18	Unassigned
19	Secondary request to send
20	Data terminal ready
21	Signal quality detector
22	Ring indicator
23	Data signal rate selector
24	DTE transmit signal
25	Unassigned

SYSTEM CONFIGURATION LIMITS

The maximum number of controller boards that can be installed depends on the type of system that you have. Table 1-2 presents the maximum number of available slots in the backplane for I/O and communication controllers. Certain systems have twin-bay cabinets with two separate backplanes with individual power supplies. The CPU and memory arrays reside in one backplane and do not affect the I/O configuration.

TABLE 1-2. Physical Space Available For I/O Controllers

<i>Model Number</i>	<i>Cabinet Type</i>	<i>I/O Maximum</i>
2350™	Single	3
2450™	Single	3
2455™	Single	3
2755™	Single	7
4050™	Single	10
4150™	Single	10
4450™	Single	8
6150™	Twin-bay	13
6350™	Twin-bay	13
6550™	Twin-bay	22
9755™	Twin-bay	10
9955II™	Twin-bay	14

COMMUNICATION CONTROLLER CONFIGURATION LIMITS

Communication controllers for the 50 Series™ systems are compatible. You can install any combination of communication controllers up to the maximum number allowed provided you have available slots in the backplane, sufficient power, and adequate bulkhead connector space. Table 1-3 shows the maximum number of communication controllers supported at PRIMOS Rev. 22.0 and their line loads.

Synchronous Communication Support

Prime ICS, MDLC, and SMLC controllers provide synchronous communication support. Synchronous data transmission transfers data in blocks, which are framed by start and end-of-text characters. Systems that transfer a large volume of data at high speeds typically use synchronous data transmission. You can have a maximum of eight synchronous lines on a system regardless of which controllers you use.

Asynchronous Communication Support

Prime AMLC and ICS controllers provide asynchronous communication support. Asynchronous data transmission transfers characters individually. Each character is framed with start and stop bits. Prime systems that support a large number of interactive terminal users typically use asynchronous data transmission.

Ethernet Support

Prime LHC controllers and LTS units provide support for Ethernet local area networks. Asynchronous communication occurs through the Network Terminal Service (NTS) software which runs on the LHC controllers. NTS provides connection management services, as well as normal PRIMOS terminal services.

PRIMENET Support

Prime PNCII controllers provide support for a proprietary token-passing ring network. PRIMENET is a packet switching network. It transfers packets on a logical channel known as a virtual circuit. PRIMENET is compatible with other systems that support X.25 protocols at Layer 3 of the ISO OSO model.

Unit Record Support

Prime URC controllers provide continued support for devices such as punched card readers and parallel printers. URC controllers can translate 80 column card images into ASCII characters and convert output streams for parallel printers.

TABLE 1-3. PRIMOS Rev. 22.0 Communication Controller Configuration Limits

Controller	Line Load and Restrictions
8 AMLC	Each controller supports a maximum of 16 asynchronous lines.
8 ICS	<p>Any combination of ICS1, ICS2, and ICS3 controllers.</p> <p>ICS1 supports a maximum of eight asynchronous and one full-duplex synchronous line (optional).</p> <p>ICS2 supports a 16-LAC card cage containing any combination of 4-line asynchronous LACs and as many as four 2-line synchronous LACs, provided that the maximum line load is not exceeded.</p> <p>ICS3 supports an 8-LAC or 16-LAC card cage containing any combination of 4-line asynchronous LACs and as many as four 2-line synchronous LACs, provided that the maximum line load is not exceeded.</p> <p>The maximum line load for an ICS2 or ICS3 controller is</p> <ul style="list-style-type: none"> 64 ASYNC 8 FDX SYNC SNA 8 FDX SYNC RJE 3 HDX SYNC X.25 3 FDX SYNC X.25
6 LHC	Each controller supports a maximum of 128 asynchronous NTS lines, or 32 asynchronous lines when PRIMENET™ is also running on the same LHC. The maximum configuration is four LHC controllers for NTS and two LHC controllers for PRIMENET or TCP/IP.
2 MDLC	Each controller supports two or four synchronous lines for FDX, HDX PRIMENET, or RJE with on-board firmware support for as many as two protocols.
1 PNC-II	Each controller supports local ring network with PRIMENET software.
2 HSSMLC	Each controller supports two or four synchronous lines with on-board firmware support for one protocol.
2 URC	Each controller supports a maximum of two line printers and a card reader.

MONITORING YOUR CONTROLLERS

The STATUS COMM command provides an overview of your communication lines and controllers. Use the STATUS COMM command to display the line count, device name, and octal device address for all the controllers connected to your system. You can issue the STATUS COMM command from the supervisor terminal or any user terminal. If any of these devices are identified by model, type, downline load file number, a PROM set ID number, or a firmware option number, this information is displayed. Otherwise, the *type* field is blank.

Each controller's total line count is calculated separately for synchronous and asynchronous lines. Line counts for inoperable lines are calculated and displayed in the same manner. An entry in the *bad-lines* field indicates that a line is inoperable. A line is listed as inoperable when the software configuration, specifically the ICS CARDS directive, does not agree with the actual configuration or when the hardware is broken. This is a recoverable problem; other lines attached to the same Line Adapter Card (LAC) continue to operate.

The following example of the STATUS COMM command shows eight communication controllers. One is an ICS2 controller, using downline load file ICS2_01.DL, at device address 10₈. It currently supports 2 synchronous lines and 60 asynchronous lines, one of which is inoperable.

OK, STATUS COMM

Controller	Type	Device Address	Total-Lines		Bad-Lines	
			Async	Sync	Async	Sync
ICS2	F-01	10	60	2	1	0
LHC300		11	No Information		No Information	
ICS1		37	8	1	0	0
MDLC	5646	50	0	4	No Information	
AMLC	DMQ	52	16	0	No Information	
AMLC	DMQ	53	16	0	No Information	
AMLC	DMQ	54	16	0	No Information	
LHC300		56	No Information		No Information	

The following example shows 4 asynchronous controllers that support 64 communication lines. This system has no synchronous controllers.

OK, STATUS COMM

Controller	Type	Device Address	Total-Lines		Bad-Lines	
			Async	Sync	Async	Sync
AMLC	DMQ	35	16	0	No Information	
AMLC	DMQ	52	16	0	No Information	
AMLC	DMQ	53	16	0	No Information	
AMLC	DMQ	54	16	0	No Information	

DEVICE ADDRESSES

Device addresses are two-digit octal numbers that identify every controller. The CPU uses device addresses to direct instructions and data to the correct device. For certain asynchronous controllers, device addresses determine the sequence of line number allocation.

Device addresses are not determined by physical location in the backplane; each controller has a device address assigned when it is manufactured. Most device addresses are hard wired on the board in the factory, but some device addresses are set with dip switches when the controller is installed.

Unique Device Addresses

Certain device addresses are reserved for specific controllers. For example, the device address 4_8 is always reserved for the supervisor terminal. Some device addresses are valid for different types of controllers. For example, the device address 20_8 is valid for either the Virtual Control Panel, the Real Time Clock, or the System Option Controller. Table 1-4 lists the valid address assignments for all communication controllers.

Note

If identical model controllers are installed in the same system, their device addresses must be different so that the CPU can recognize and communicate with the correct controller.

The polling priority guarantees that each device address is polled for incoming characters in turn. ICS3 controllers, for example, arrive from the factory preset with the address 10_8 . If you have several ICS3 controllers, your Prime Field Service Representative can reassign a unique address to each device. At Rev. 22.0 the choices for valid ICS3 device addresses are 10_8 , 11_8 , 15_8 , 16_8 , 17_8 , 32_8 , 35_8 , 36_8 , 37_8 , 52_8 , 53_8 , and 54_8 .

Note

PRIMOS performs a complete software check at cold start. If you supply an incorrect device address for the ICS CARDS, LHC, or SYNC configuration directives or for the COMM_CONTROLLER command, an error message is displayed at the supervisor terminal.

TABLE 1-4. Valid Device Address Assignments

<i>Address</i>	<i>Communication Controller</i>
00 ₈	Unused
01 ₈	Paper tape reader
02 ₈	Paper tape punch
03 ₈	First Unit Record Controller (URC) (line printer, card reader, card punch)
04 ₈	Supervisor terminal
05 ₈	Second Unit Record Controller (URC) (line printer, card reader, card punch)
06 ₈	InterProcess Communication board (IPC)
07 ₈	PRIMENET Node Controller (PNC, PNC-II)
10 ₈	Intelligent asynchronous controller (ICS1, ICS2, ICS3, LHC300)
11 ₈	Intelligent asynchronous controller (ICS1, ICS2, ICS3, LHC300)
12 ₈	Floppy disk controller
13 ₈	Second Magnetic Tape Controller (MTC)
14 ₈	First Magnetic Tape Controller (MTC)
15 ₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
16 ₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
17 ₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
20 ₈	Virtual Control Panel (VCP) Real Time Clock (RTC) System Option Controller (SOC)
21 ₈	Reserved for specials
22 ₈	Fourth disk controller
23 ₈	Eighth disk controller
24 ₈	First disk controller Writable control storage
25 ₈	Third disk controller
26 ₈	Second disk controller
27 ₈	Sixth disk controller

TABLE 1-4 Valid Device Address Assignments (Continued)

<i>Address</i>	<i>Communication Controller</i>
30₈	First buffered parallel I/O channel
31₈	Second buffered parallel I/O channel
32₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
33₈	First 3008-3009 printer plotter
34₈	Second 3008-3009 printer plotter
35₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
36₈	Intelligent asynchronous controller (ICS1, ICS2, ICS3, LHC300)
37₈	Intelligent asynchronous controller (ICS1, ICS2, ICS3, LHC300)
40₈	Reserved for specials
41₈	First Digital Input System (DIS)
42₈	Second Digital Input System (DIS)
43₈	First Digital Output System (DOS)
44₈	Second Digital Output System (DOS)
45₈	Fifth disk controller Digital-to-analog output system
46₈	Computer products interface
47₈	Seventh disk controller PRIMENET Node Controller (PNC, PNC-II)
50₈	First Multiple Data Link Controller (MDLC) High Speed Synchronous Multiline Controller (HSSMLC) LAN Host Controller (LHC300)
51₈	Second Multiple Data Link Controller (MDLC) High Speed Synchronous Multiline Controller (HSSMLC) LAN Host Controller (LHC300)
52₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
53₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
54₈	Asynchronous controller (AMLC, ICS1, ICS2, ICS3, LHC300)
55₈	Multiple Autocall system

TABLE 1-4 Valid Device Address Assignments (Continued)

<i>Address</i>	<i>Communication Controller</i>
56₈	Synchronous Multiline Controller (SMLC) LAN Host Controller (LHC300)
57₈	Unused
60₈	General purpose interface board
61₈	General purpose interface board
62₈	General purpose interface board
63₈	General purpose interface board
64₈	General purpose interface board
65₈	General purpose interface board
66₈	General purpose interface board
67₈	General purpose interface board
70₈	Reserved for specials
71₈	Reserved for specials
72₈	Reserved for specials
73₈	Reserved for specials
74₈	Reserved for specials
75₈	Reserved for specials
76₈	Reserved for specials
77₈	I/O bus tester

ASYNCHRONOUS LINE SUPPORT

The maximum number of asynchronous lines that can exist on 6550, 6350, 4150, and 4050 systems is currently 1024. All other systems can support as many as 512 lines. One of these lines is reserved for the supervisor terminal. You can have as many as 512 direct connect local lines attached to AMLC and ICS controllers, and as many as 512 NTS login lines providing the total number of login lines is less than 960. The remaining lines must be assignable.

An LHC controller can support as many as 128 NTS connections at one time. If PRIMENET software is also running on the LHC, the maximum number of asynchronous connections is 32.

Current models of AMLC controllers support a maximum of 16 lines each. You can install a maximum of 8 AMLC controllers in larger systems for a total of 128 lines.

Like AMLC controllers, ICS1 controllers are located in the backplane. Each ICS1 controller supports 1 synchronous line and a maximum of 8 asynchronous lines.

ICS2 and ICS3 controllers have two basic parts: the controller board, which is located in the backplane; and an external card cage, which is usually located in a peripheral cabinet. In some CPU models, such as the 4150, the card cage is installed in the CPU cabinet.

Card cages come in 8-slot models for 2350 and 2450 systems, and 16-slot models for all other systems. Each slot can hold one 4-line asynchronous Line Adapter Card (LAC) or one 2-line synchronous LAC to add more lines as your need for lines increases. Thus, an 8-slot cage can support a maximum of 32 asynchronous lines, and a 16-slot cage can support a maximum of 64 asynchronous lines. You can connect any combination of 8-slot and 16-slot card cages to your system provided that the total number of direct-connect local lines does not exceed 512.

LACs are usually distributed among card cages. You do not have to load them into adjacent slots. An empty slot does not affect operation. ICS controllers recognize the presence of a LAC and allocate logical line numbers based on the order in which the cards appear. Logical line numbers are allocated first to lines attached to AMLC controllers, then to lines attached to ICS controllers based on the controller's address.

Line Number Allocation

Line numbers for NTS users are dynamically allocated when the connection is made and released when the user disconnects. NTS line numbers start at 1024. Line number allocation for AMLC and ICS controllers, however, is fixed. If you have any AMLC controllers, they are allocated line numbers first in the following device address order: 54_B, 53_B, 52_B, 35_B, 15_B, 16_B, 17_B, and 32_B. Table 1-5 shows the line number assignment to AMLC controllers. This assignment depends on the hardware and cannot be changed. If you have more than one AMLC controller and skip a valid AMLC device address, the line numbers associated with that device address are not used.

TABLE 1-5. Line Number Assignment for AMLC Controllers

<i>Boot Order</i>	<i>Device Address</i>	<i>Line Numbers</i>
First	54 ₈	0 to 15
Second	53 ₈	16 to 31
Third	52 ₈	32 to 47
Fourth	35 ₈	48 to 63
Fifth	15 ₈	64 to 79
Sixth	16 ₈	80 to 95
Seventh	17 ₈	96 to 113
Eighth	32 ₈	112 to 127

After line numbers are allocated to all AMLC controllers, ICS controllers are allocated line numbers based on device address in the following order: 10₈, 11₈, 36₈, 37₈, 32₈, 17₈, 16₈, 15₈, 35₈, 52₈, 53₈, and 54₈. ICS2 and ICS3 controllers are given a device address of 10₈ or 11₈ by the manufacturer. ICS1 controllers are usually assigned a device address of 36₈ or 37₈. However, you can use any valid device address shown in the list above.

The following example shows three fully-loaded controllers. Blocks of line numbers have been allocated to each controller.

<i>Controller Type</i>	<i>Device Address</i>	<i>Line Count</i>	<i>Line Numbers</i>
AMLC	54 ₈	16 Lines	0 to 15
ICS3	10 ₈	64 Lines	16 to 79
ICS1	36 ₈	8 Lines	80 to 87

The first line number on each ICS controller is always a multiple of 8. After all the lines connected to an ICS controller receive line numbers, the line numbers skip to the next multiple of 8 for the next ICS controller. This can result in line numbers being allocated for lines that are not currently in use.

In the example below, gaps occur from line numbers 44 to 47 and from 108 to 111. The block of line numbers from 0 to 15 is reserved for an AMLC controller at device address 54₈.

<i>Controller Type</i>	<i>Device Address</i>	<i>Line Count</i>	<i>Line Numbers</i>
AMLC	53 ₈	16 Lines	16 to 31
ICS3	10 ₈	12 Lines	32 to 43
ICS2	11 ₈	60 Lines	48 to 107
ICS1	36 ₈	8 Lines	112 to 119

AMLC CONTROLLER CHARACTERISTICS

An Asynchronous MultiLine Controller (AMLC) is a hardwired, single-board communication controller. It responds to hardware-defined instructions in the CPU called programmed I/O instructions, commonly known as PIO. An AMLC can provide CCITT V.24/RS-232-C or 20 milliamp current loop support for terminals, peripherals, and data sets. Figure 1-2 shows an AMLC controller board with FCC-compliant cables.

AMLC controllers use Universal Asynchronous Receiver Transmitters (UARTs), one pair per line, to convert serial characters from devices to parallel characters for the CPU. UARTs pass the character to the Direct Memory Channel (DMC) tumble table, one per board. A special process known as the AMLDIM services the DMC tumble tables.

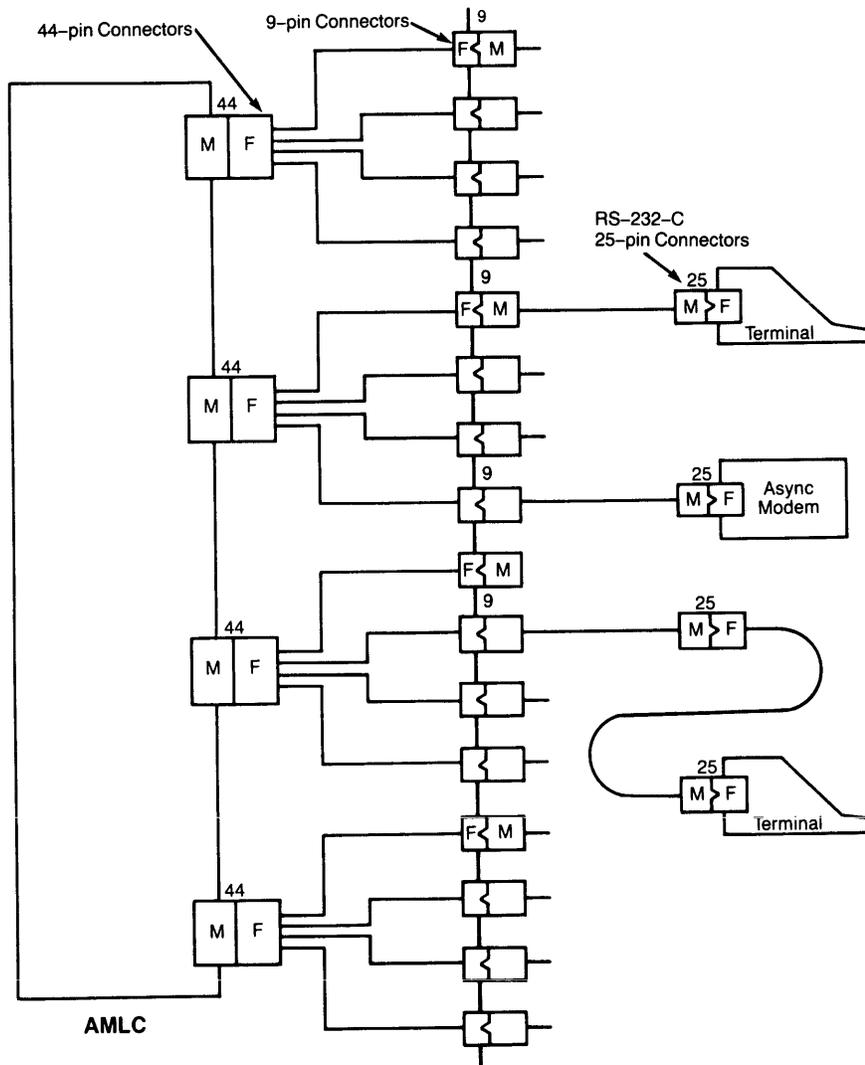


FIGURE 1-2. AMLC Board With FCC-Compliant Cables

All AMLC boards are shipped from the factory with a device address of 54₈. If you have more than one AMLC board in your system, you must rewire the device address when the board is installed. Valid AMLC device addresses are 54₈, 53₈, 52₈, 35₈, 15₈, 16₈, 17₈, and 32₈.

An AMLC controller can support eight line speeds as follows:

- Four fixed speeds (110, 134.5, 300, and 1200 baud)
- One programmable speed set with the AMLCLK configuration directive (default 9600 baud)
- Three user-selectable speeds hardwired with on-board jumper cables (preset at the factory to 75, 150, and 1800 baud)

Note

You can change the user-selectable speeds when the controller is installed. Ask your Customer Support Center to rewire the board and change your ASYNC JUMPER configuration directive to agree with the new speeds.

Current AMLC boards support 16 asynchronous communication lines. Older AMLC boards can support 8 or 16 lines depending on the specific model as shown in Table 1-6. The maximum number of AMLC controllers that can be installed in an FCC-compliant cabinet is four. Older model non-compliant cabinets can house eight. If additional local lines are desired, you can install an ICS controller.

Note

The baud rate of the last line on the last AMLC controller sets the AMLC I/O interrupt rate. For more information on interrupt rates and character processing, see Chapter 6, Allocating I/O Buffers.

TABLE 1-6. Characteristics of AMLC Controllers

<i>Controller</i>	<i>Maximum Lines</i>	<i>Comments</i>
AMLC 5152	8 asynchronous	No longer marketed, but still supported by Prime
AMLC 5154	16 asynchronous	RS-232-C/CCITT V.24
AMLC 5174	16 asynchronous	20 milliamp current loop
AMLC 5175	16 asynchronous	Lines 0-7 20 milliamp Lines 8-15 RS-232-C/V.24

ICS CONTROLLER CHARACTERISTICS

Intelligent Communication Subsystem Models ICS1, ICS2, and ICS3 are programmable communication controllers with on-board dual microprocessors. The microprocessors govern timing, initialization, and configuration. In this way, ICS controllers are able to reduce some of the overhead formerly generated by processes in the CPU that managed AMLC controllers. ICS controllers provide full CCITT V.24/RS-232-C support, as well as DDS/V.35 high-speed synchronous support. You can initialize, shutdown, and downline load runfiles to an ICS controller with the `COMM_CONTROLLER` command, interactively or at cold start. For more information, see Chapter 2, Operating Intelligent Controllers.

ICS controllers use Direct Memory Queue (DMQ) input and output buffers to reduce the amount of CPU overhead involved in transmitting characters. The ICS `INQSZ` configuration directive determines the capacity of the DMQ input buffers. A special process known as the `ASYNDM` services the DMQ buffers. ICS controllers have an internal timing mechanism that operates independently of individual lines or specific controllers. The ICS `INTRPT` configuration directive determines how frequently the `ASYNDM` interrupts the CPU. For more information on configuration directives, see Chapter 3, Useful Configuration Directives. For more information on character processing and interrupt rates, see Chapter 6, Allocating I/O Buffers.

The ICS1 is a single-board controller, which supports one synchronous and eight asynchronous communication lines. ICS2 and ICS3 controllers consist of a controller board located in the backplane and an external line adapter card cage. Figure 1-3 shows an ICS1 with FCC-compliant cables.

Card cages come in 8-LAC and 16-LAC versions. Each LAC can support either two synchronous lines or four asynchronous EIA RS-232-C communication lines. Figure 1-4 shows the cable connections for asynchronous ICS2 and ICS3 LACs. Each LAC contains a pair of UARTs for each line to perform serial data conversion and recognize packet framing. Dual baud rate generators residing on each LAC govern the transmit and receive timers. For more information on ICS controllers, see the *ICS User's Guide*.

Device addresses for ICS2 and ICS3 controllers are preset to 10_8 or 11_8 . If you have more than two of either model, you can set the dip switches on the controller board before it is installed to any available asynchronous controller address: 10_8 , 11_8 , 15_8 , 16_8 , 17_8 , 32_8 , 35_8 , 36_8 , 37_8 , 52_8 , 53_8 , and 54_8 . At Rev. 22.0 an ICS3 controller can support the following line speeds:

- Four fixed speeds (110, 134.5, 300, and 1200 baud)
- One programmable speed set with the `AMLCLK` configuration directive (default 9600)
- Three user-selectable speeds set with the `ASYNC JUMPER` configuration directive (default 75, 150, and 1800 baud)
- As many as eight per-line user-selectable speeds set with the `SET_ASYNC` command (50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, or 19200 baud)

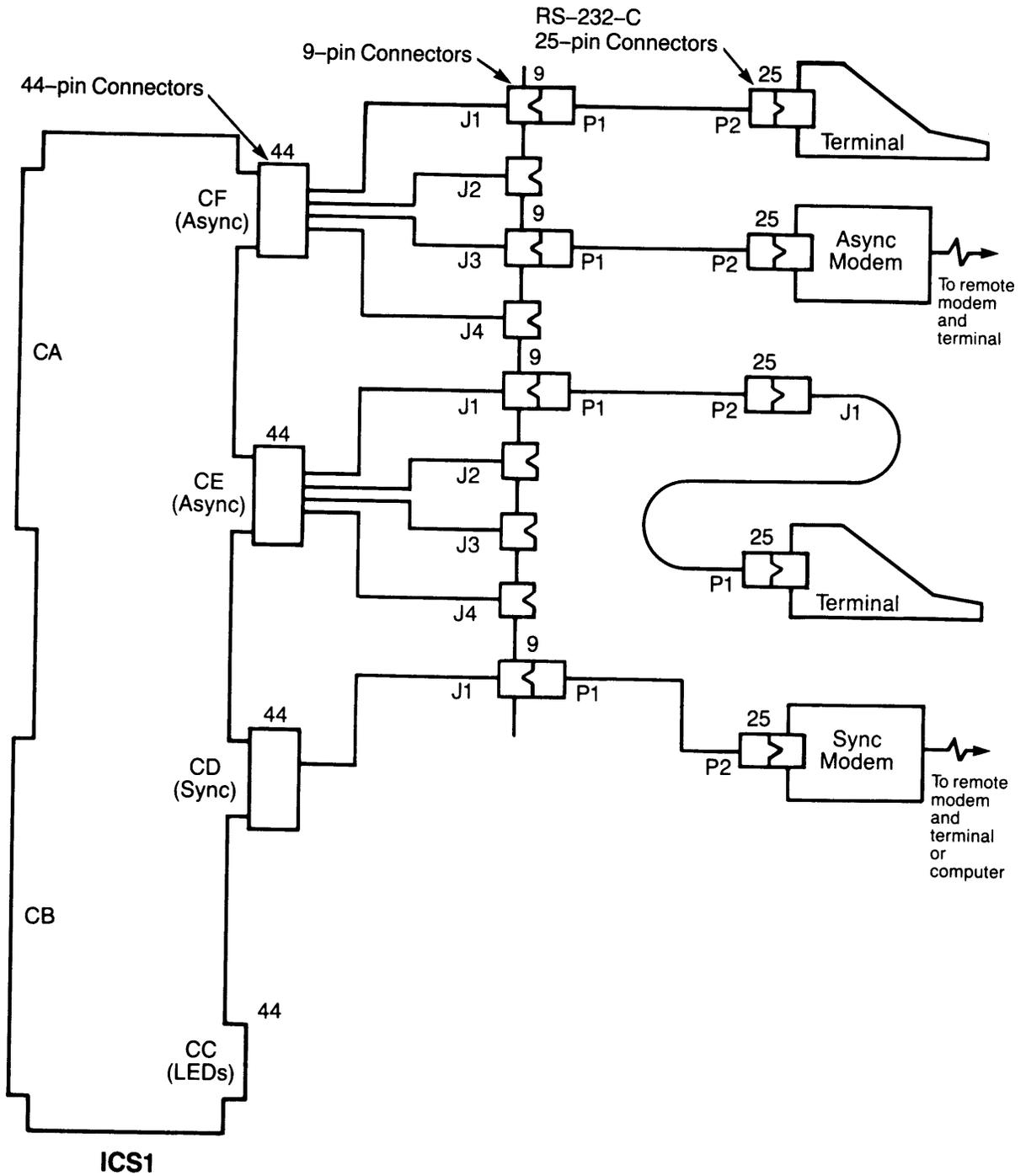


FIGURE 1-3. ICS1 Board With FCC-Compliant Cables

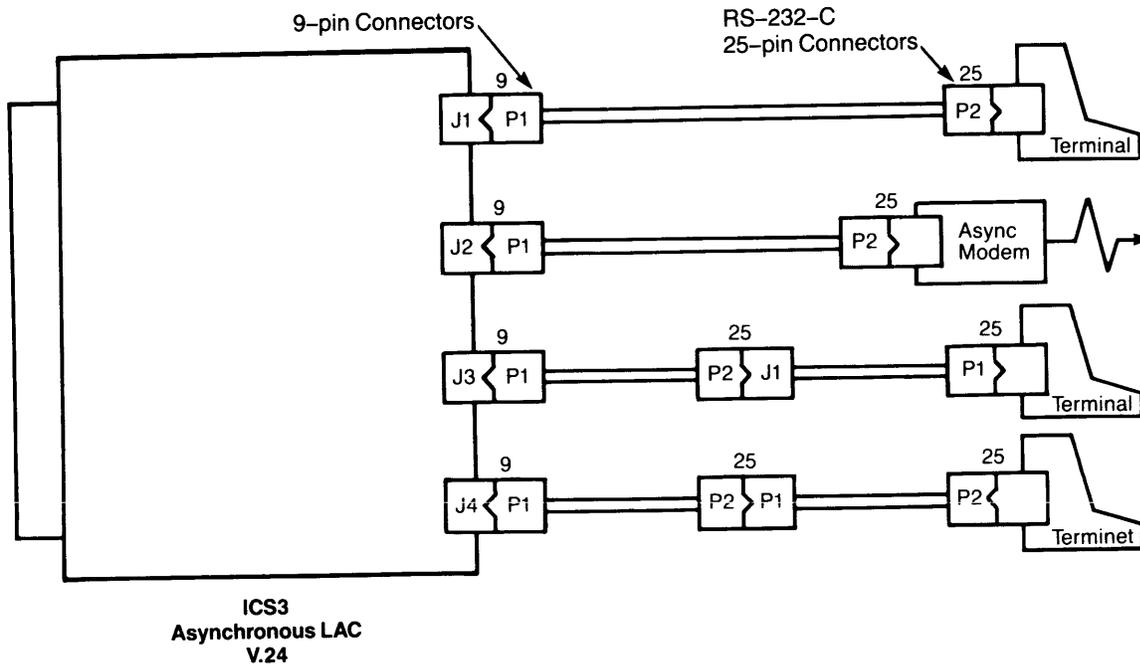
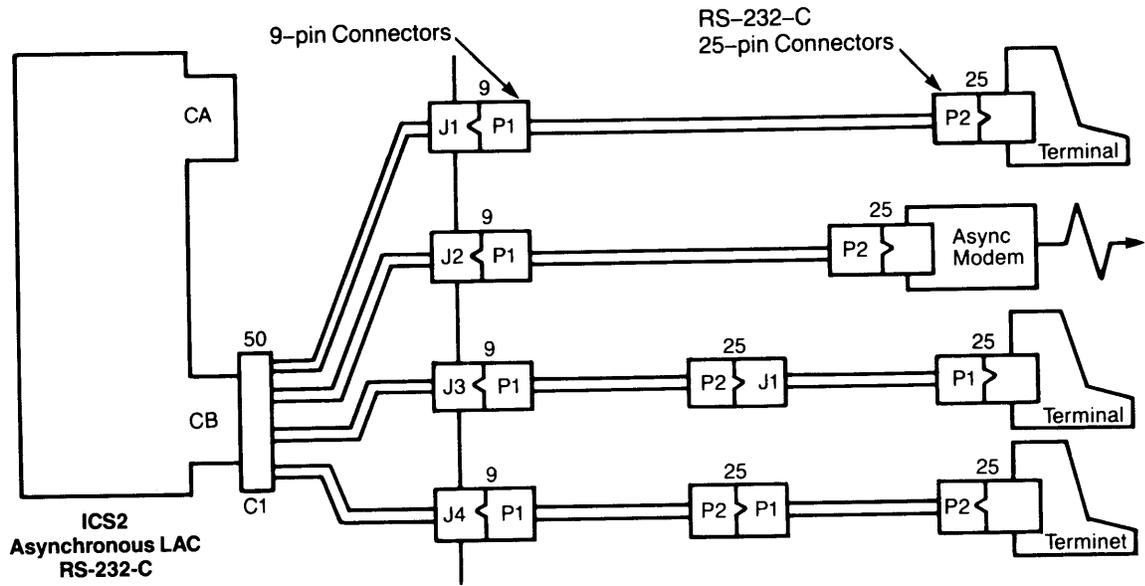


FIGURE 1-4. Cable Connections for ICS2 and ICS3 Asynchronous LACs

Table 1-7 summarizes the characteristics of ICS controllers.

TABLE 1-7. Characteristics of ICS Controllers

<i>Controller</i>	<i>Maximum Lines</i>	<i>Comments</i>
ICS1 5181	8 asynchronous 1 synchronous (fixed)	RS-232-C/CCITT V.24 Synchronous line supports RJE (HASP/2780, 3780) and X.25 FDX HDLC PRIMENET.
ICS2 5242	64 asynchronous 8 synchronous	RS-232-C/CCITT V.24 Supports 16 slots for 2-line sync or 4-line async line adapter cards.
ICS2 5720	32 asynchronous 8 synchronous	RS-232-C/CCITT V.24 Provides async and sync SDLC. SNA also supports DDS/V.35.
ICS3 5725	64 asynchronous 8 synchronous	RS-232-C/CCITT V.24 Basic model supports 16 slots for 2-line sync or 4-line async line adapter cards. Not for use in tower systems or 7564S cabinets.
ICS3 5730	32 asynchronous 8 synchronous	RS-232-C/CCITT V.24 Supports 8 slots for 2-line sync or 4-line async line adapter cards. For use in tower systems.
ICS3 5732	64 asynchronous 8 synchronous	RS-232-C/CCITT V.24 Supports 16 slots for 2-line sync or 4-line async line adapter cards in 6000 series (system cabinet only).
ICS3 5735	64 asynchronous 8 synchronous	RS-232-C/CCITT V.24 Supports 16 slots for 2-line sync or 4-line async line adapter cards. Contains an integral power supply (Peripheral cabinet only).

MAINTAINING ICS INTEGRITY

ICS card cages contain a maximum of 16 line adapter cards, each supporting four asynchronous or two synchronous lines. Use the optional ICS CARDS configuration directive to have PRIMOS report, at cold start, any inconsistencies between the expected LAC configuration and the actual configuration. For more information on this directive, see Chapter 3, Useful Configuration Directives. Figure 1-5 shows an 8-slot ICS3 card cage loaded with one 2-line synchronous LAC and one 4-line asynchronous LAC.

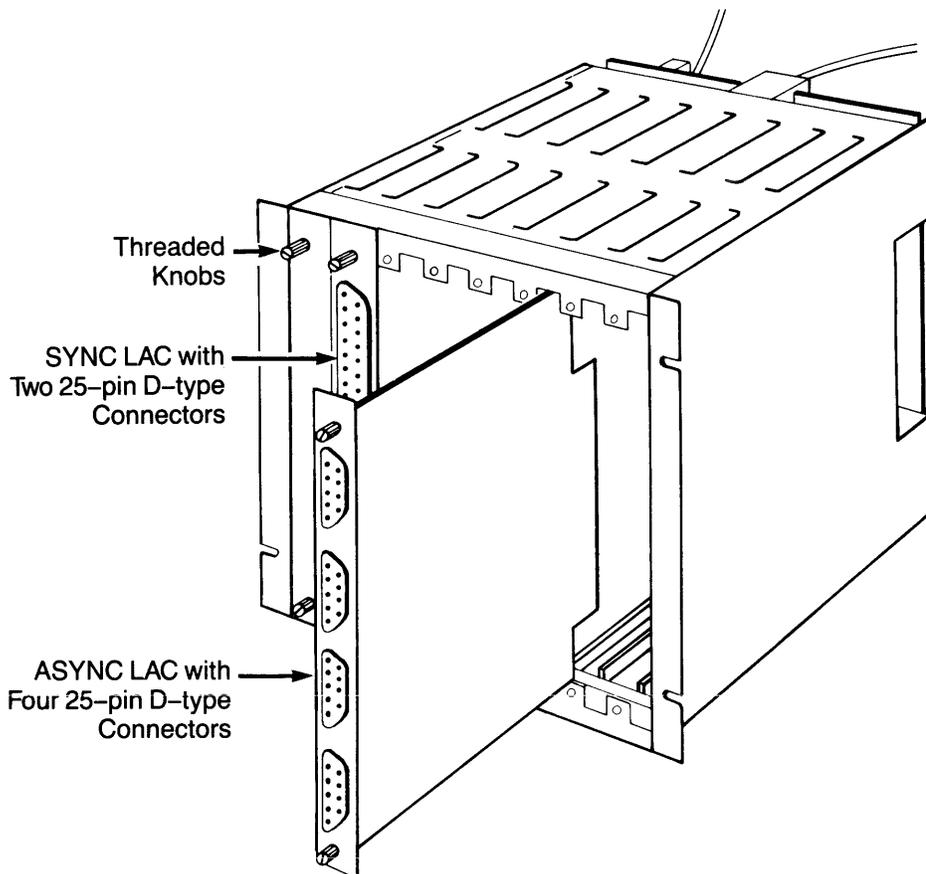


FIGURE 1-5. An 8-slot ICS3 Card Cage

If, at any other time, you suspect that one or more LACs have failed,

1. Check the power cord and connections to the card cage
2. Issue the STATUS COMM command to verify the line count and record the results, making note of the number of lines attached to each ICS2 or ICS3 controller.
3. Warm start the system.
4. If the warm start does not identify or resolve the problem, issue the STATUS COMM command and compare the results with previous line count.
5. Cold start the system. If the ICS2 or ICS3 subsystem can identify a bad LAC, one of the following messages is displayed at the supervisor terminal:

```
ICS device <dd>: async line <ee> (Jn) on line card in slot <y> is inoperable.
ICS device <dd>: line card in slot <y> is inoperable.
ICS device <dd>: line card in slot <y> is unrecognizable.
```

dd identifies the device address, usually 10 or 11.
ee identifies the physical line number.
n identifies one of four jacks on the LAC.
y identifies the affected slot on the controller.

6. If no message appears but the problem has not been resolved, issue the STATUS COMM command again. Compare the results with the results from step 2 above. If the output differs, a problem with at least one LAC is causing configuration discrepancies. Contact your Customer Support Center for help.

At cold start ICS controllers boot in the following order by device address: 10₈, 11₈, 36₈, 37₈, 32₈, 17₈, 16₈, 15₈, 35₈, 52₈, 53₈, and 54₈. This boot order determines line number allocation. If an ICS controller fails to boot at cold start, PRIMOS prevents any subsequent ICS controllers from initializing to maintain the line number assignments. Do not remove the damaged controller from the backplane. It may disrupt the line number based correspondence between the SET_ASYNC commands in your PRIMOS.COMI file and physical lines connected to printers, terminals, and modems. Failure to boot can generate the following messages at cold start.

Error: ICS controller at address <nn> failed to boot. (COMINI)

The ICS controller at device address *nn* did not start. Contact your Customer Support Center.

Error: ICS controller at address <nn> was not initialized. (COMINI)

The controller at device address *nn*, is not initialized because another ICS controller with a higher priority address has failed to start. Contact your Customer Support Center.

CHANGING LINE ADAPTER CARDS

If it becomes necessary to replace, remove, or add a LAC to the card cage, shut down PRIMOS and power off the system before doing so. To replace a LAC refer to Figure 1-6 and follow the procedure below. After the changes are complete, cold start the system.

Caution

LAC cards are *not* designed to be removed while the card cage power is on. Always power down the card cage before you insert or remove a LAC.

Procedure

Follow these basic instructions for installing LACs:

1. Shut the power off.
2. Verify that the power is off.
3. Attach a grounding strap to your wrist or use another device to prevent electrostatic discharge.
4. Locate the card cage.
5. For ICS2 Controllers: remove the card-support bar that spans the front of the card cage. See Figure 1-6.
6. Locate any vacant card slot to the right of the buffer card in the card cage backplane.
7. Hold the new card vertically with its component side facing left and its edge connectors pointing toward the intended card cage backplane slot.
8. Align the card with the upper and lower card guides and insert it into the slot.
9. For ICS3 Controllers: Screw in the threaded knobs at the top and bottom of the card as shown in Figure 1-5. Proceed to step 13 below.
10. For ICS2 Controllers: Push gently until the edge connectors protrude through the backplane and the ejector tabs are engaged.
11. For ICS2 Controllers: Close the upper and lower ejector tabs simultaneously. The tabs are located on the front of the card as shown in Figure 1-6. Press the tabs until the card is secure.
12. For ICS2 Controllers: When all cards are installed, replace the support bar.
13. Restore power and boot the system.
14. If you are using the ICS CARDS directive, change it to agree with the new configuration and initialize the LAC by rebooting the host computer system, when scheduling allows.

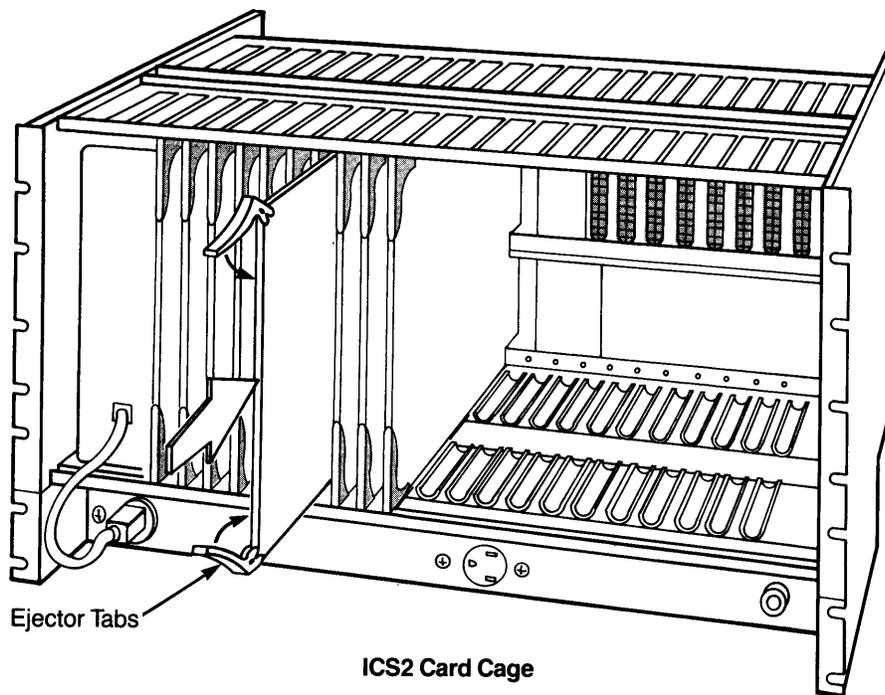
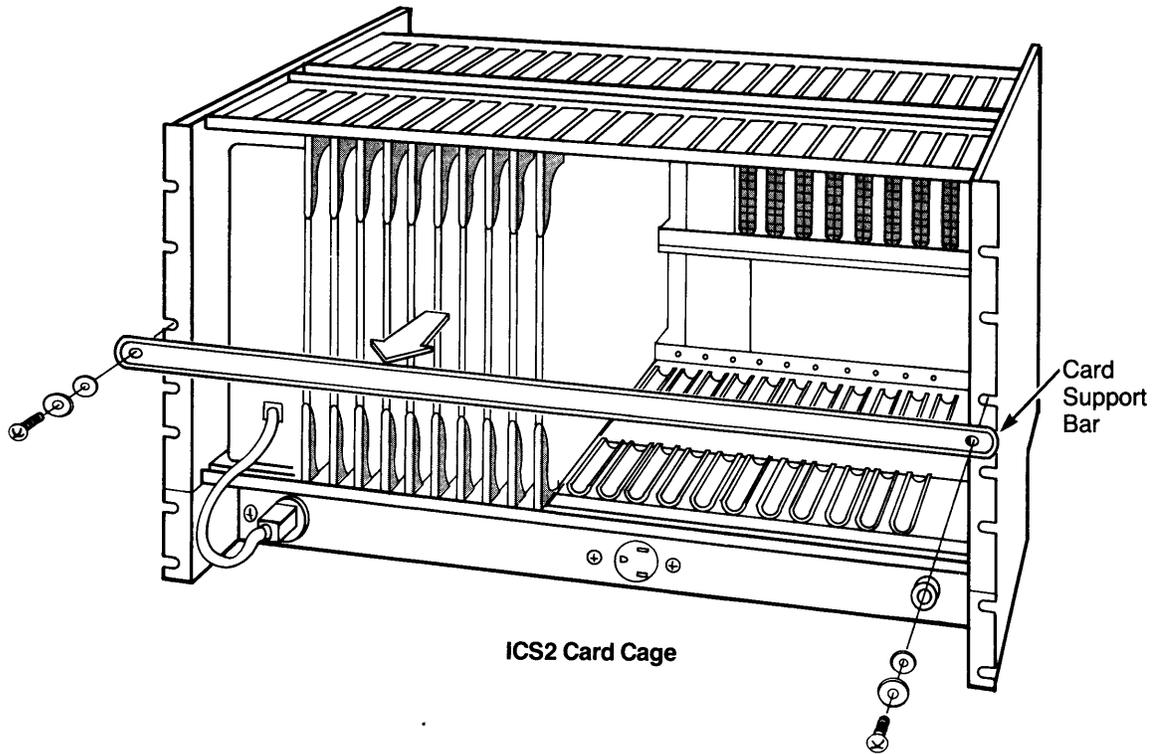


FIGURE 1-6. Changing a Line Adapter Card

PNC-II CONTROLLER CHARACTERISTICS

The PRIMENET Node Controller II (PNC-II) is a microprocessor-based communication controller that supports a proprietary token-passing ring network. PRIMENET, a proprietary X.25 based protocol, supports networks of up to 128 systems.

The PNC-II connects your system to the network, transmits, and receives packets. It provides token recovery and additional network status information. Figure 1-7 shows a PNC-II connected to two other nodes. The PNC-II has more on-board buffering than the PNC controllers originally installed in pre-Rev. 20.1 systems. Only one PNC-II board is allowed per system. The device address for PNC-II controllers is preset by the manufacturer to 7₈.

For more information on the PNC controller and PRIMENET, see the *PRIMENET User's Guide* and the *PRIMENET Planning and Configuration Guide*.

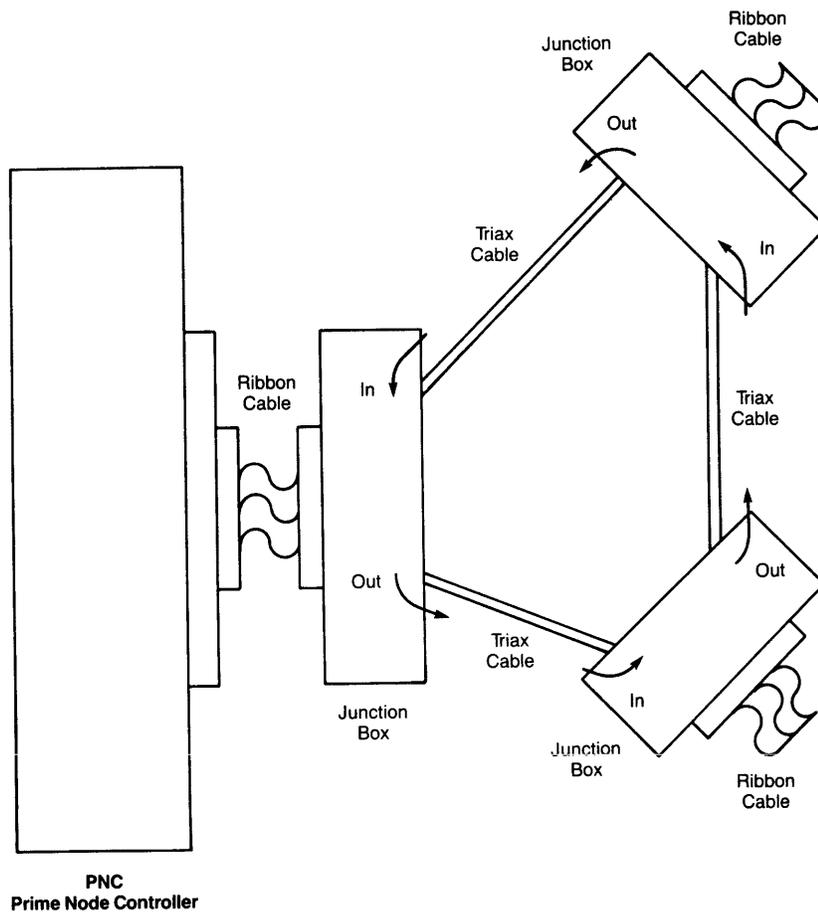


FIGURE 1-7. PRIMENET Node Controllers and Junction Boxes

LHC CONTROLLER CHARACTERISTICS

The LAN Host Controller (LHC300) is a microprocessor-based communication controller that supports an IEEE 802.3 local area network. IEEE 802.3 networks use the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access control method to transmit data at 10 Mbps over a standard media in a bus topology. Figure 1-8 shows an LHC300 board.

The LHC configuration directive assigns a 2-digit PRIMOS octal device address to a logical LHC number. Valid device addresses for an LHC are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 50₈, 51₈, 52₈, 53₈, 54₈, and 56₈.

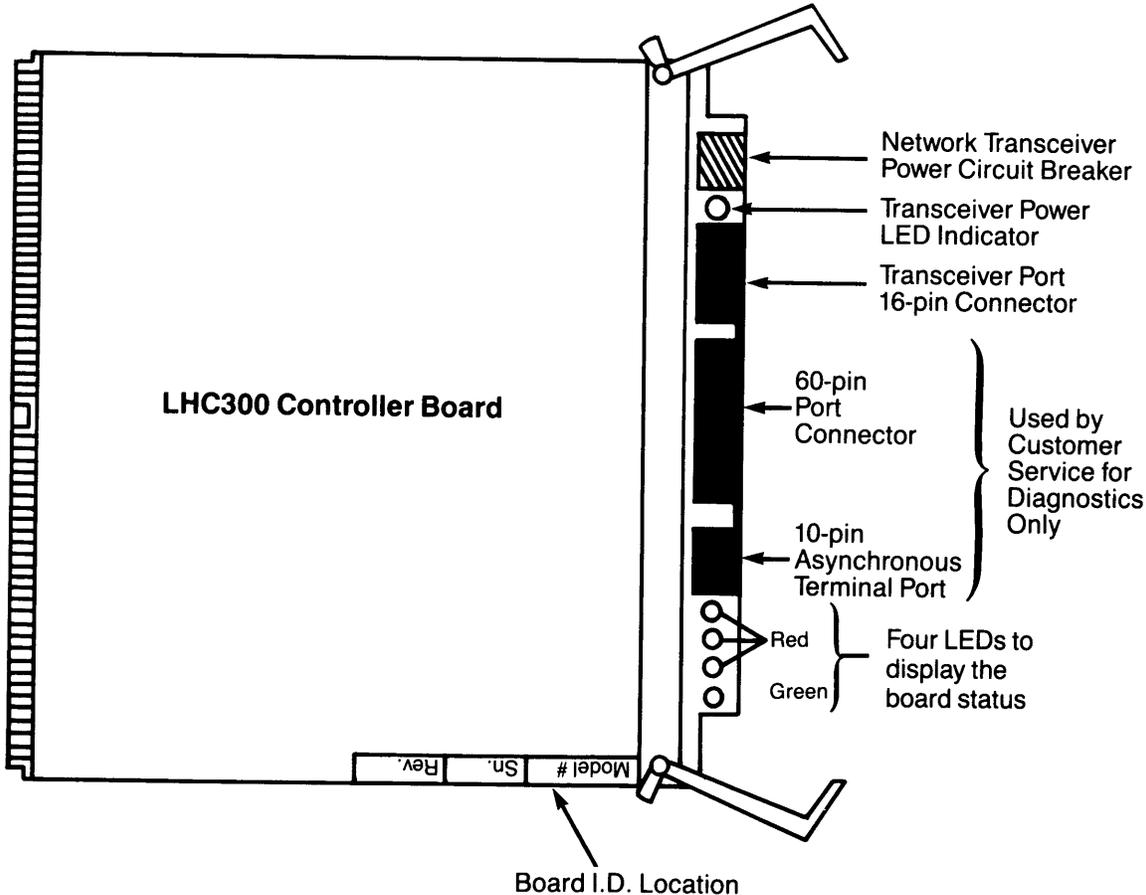


FIGURE 1-8. LAN Host Controller Board

Each LHC is assigned a unique hexadecimal Ethernet address by Prime manufacturing. The address is stamped on a metal tag attached to the device. This address uniquely identifies this node to the LAN. Use this address during NTS, PRIMENET, or TCP/IP configuration.

You can downline load and upline dump LHC controllers interactively or at cold start with the COMM_CONTROLLER command. For more information on this procedure, see Chapter 2, Operating Intelligent Controllers.

An LHC controller can support four different protocol sets

- PRIMENET
- NTS
- PRIMENET and NTS concurrently
- TCP/IP

You can install multiple LHC controllers in a 50 Series machine. However, the following configuration limits apply:

- A maximum of six LHC controllers can be installed on a single system provided you have available slots in the backplane and sufficient amperage.
- A maximum of two LHC controllers can be configured for PRIMENET on one system.
- A maximum of four LHC controllers can be configured for NTS on one system.
- A maximum of four LHC controllers can be configured for TCP/IP on one system.
- A maximum of two LHC controllers can be configured for TCP/IP on one system. However, the network perceives each controller as a separate node.
- Each LHC requires a transceiver or a port on a multiport transceiver to connect to the network.
- Each LHC cannot be located more than 50 meters from the network cable and transceiver.
- A multiport transceiver is required when more than three LHC controllers are installed in one host due to the system power supply 12-volt limitation.

For more information on LHC controllers and NTS, see the *NTS Planning and Configuration Guide*.

LTS CHARACTERISTICS

A LAN Terminal Server (LTS300) is a standalone device that permits eight asynchronous RS-232-C devices to connect to an IEEE 802.3 local area network with NTS software. Terminals connected to the LTS can communicate with any NTS host on the LAN provided the host has an LTS300 and is running NTS.

Each LTS is assigned a unique hexadecimal network address by Prime manufacturing, which is located on the underside of the LTS. The address uniquely identifies the LTS300 to the network. Use this address when you configure NTS and to downline load and upline dump the LTS.

A node is another host or an LTS. An LTS requires at least one host on the LAN be configured to downline load its operating software. You can use the `COMM_CONTROLLER` command to downline load and upline dump an LTS. See Chapter 2, *Operating Intelligent Controllers*, for more information on the `COMM_CONTROLLER` command. The `LTS BANNER` command displays the name of the booting host. Once an LTS is booted, however, it owes no affiliation to a host and is completely independent.

If your NTS configuration allows unconfigured nodes, you can install an LTS by just plugging it into the network. NTS can configure the LTS without interrupting the network or halting traffic on the LAN. For more information on LTS units, NTS, and a discussion of configured and unconfigured nodes, see the *NTS Planning and Configuration Guide*.

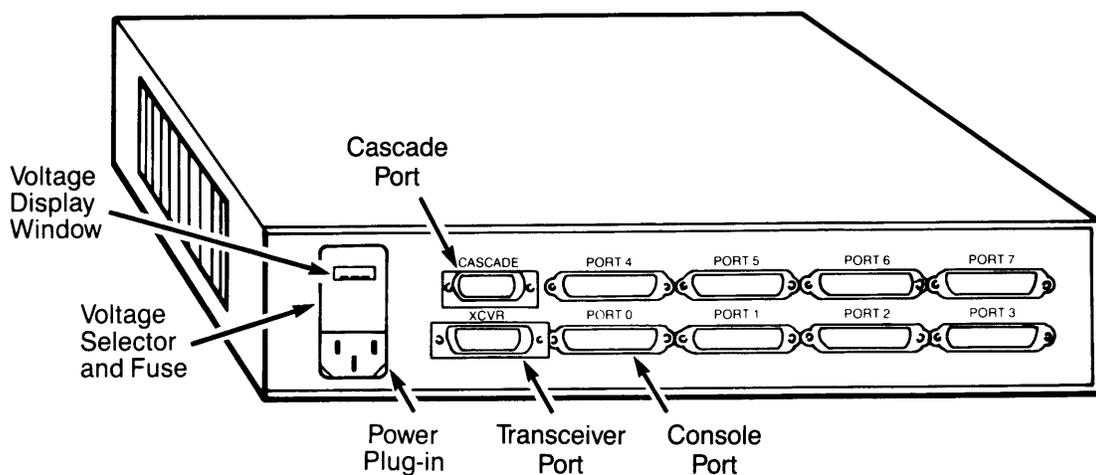


FIGURE 1-9. The Rear Panel of a LAN Terminal Server

The back panel of an LTS is shown in Figure 1-9. Each LTS has eight standard RS-232-C 25-pin connector ports numbered 0 through 7. The XCVR port connects the LTS to the transceiver, which is attached to the LAN. Each LTS also has a cascade port that allows a maximum of four LTS units to connect to a single transceiver as shown in Figure 1-10. This allows a maximum of 32 asynchronous devices to use a single network transceiver connection.

The internal memory of an LTS is preset at the factory for input devices connected to the RS-232-C ports. It recognizes the following baud rates: 110, 300, 600, 1200, 2400, 4800, 7200, 9600, and 19200.

Typically, Auto Speed Detect (ASD) is active the first time you use an LTS port. To ask the LTS to determine your terminal's baud rate press carriage return several times. The system maintains the baud rate setting parameters when the LTS is rebooted or powered off. For more information on LTS commands, see the *LTS User's Guide*.

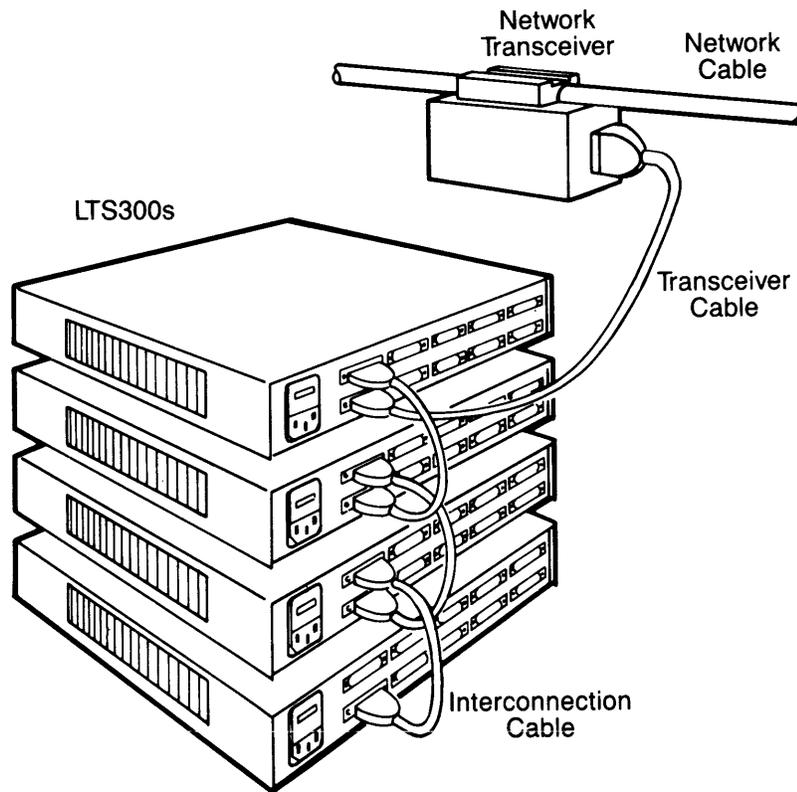


FIGURE 1-10. An LTS Cascade Configuration

OPERATING INTELLIGENT CONTROLLERS

Communication controllers are devices that direct the transmission of data between the CPU and either locally connected devices or a network. Some communication controllers are managed by a program executing in the host. Intelligent controllers, such as ICS and LHC controllers, are managed by a program executing in a microprocessor on the controller board. These programs are stored in the host and transferred to the on-board microprocessor with either configuration directives or interactive commands.

This chapter describes the `COMM_CONTROLLER` command, which provides an interactive method to initialize, downline load, upline dump, and shut down your communication controllers. Common error messages for this command, as well as related interprocess server control error messages, are listed at the end of this chapter.

Prior to Rev. 21.0, the configuration directives `SYNC ON`, `SYNC DSC`, `SYNC CNTRLR`, and `SYNC SYNCnn` initialized and loaded ICS controllers at cold start. You can accomplish this with either `SYNC` directives in your configuration file or `COMM_CONTROLLER` commands in your `PRIMOS.COMI` file. If you want to make changes while your system is running, you must use the `COMM_CONTROLLER` command. `SYNC` directives are explained in detail in Chapter 3, Useful Configuration Directives.

THE `COMM_CONTROLLER` COMMAND

The `COMM_CONTROLLER` command reboots, downline loads, upline dumps, or stops an intelligent controller while the system is running, without affecting any other controllers. You can issue the command interactively for a single controller or for a number of controllers, provided that all the affected controllers are the same type and are attached to the same system.

You must issue this command from the supervisor terminal. DSM logs unauthorized attempts to use the `COMM_CONTROLLER` command, if DSM is running when the

COMM_CONTROLLER command is issued. You can put COMM_CONTROLLER commands in your PRIMOS.COMI file; place them after the START_DSM command and before the START_NET and START_NTS commands. When you use COMM_CONTROLLER commands in your PRIMOS.COMI file or in CPL programs, use the NO_QUERY option to suppress prompts.

Note

You must have the nonchargeable translator libraries and run files (T1) installed before you can use the COMM_CONTROLLER command.

Command Format

COMM_CONTROLLER {
-HELP
-INIT
-LOAD
-SHUTDOWN
-UPLINE_DUMP
}

-DEVICE {
ICS1
ICS2
ICS3
LHC
LTS
}

{
-DEVICE_ADDRESS *nn*
-ALL
-DEST_NODE_ADDRESS *xx-xx-xx*
-DEST_NODE_NAME *name*
}

{
-PATHNAME *path*
-PROTOCOL *tokens*
}

[-NO_QUERY]

COMM_CONTROLLER Subcommands

The main COMM_CONTROLLER command is actually a command interpreter. The command interpreter parses the command line, detects input errors, and invokes one of the five subcommands. Each subcommand spawns a specialized phantom process, known as a server, to actually perform the desired operation.

The COMM_CONTROLLER subcommands support several addressing schemes, protocol tokens, and load file options for a variety of controllers. Not all subcommands and options are available for every controller. Each subcommand is described in this chapter in a separate section, which lists any exceptions and device-specific instructions.

The five COMM_CONTROLLER subcommands are listed below with a brief description of their functionality.

<i>Subcommand</i>	<i>Description</i>
COMM_CONTROLLER -HELP	Displays the command line format, a brief description of the five subcommands, and a list of options.
COMM_CONTROLLER -INIT	Initializes ICS1, ICS2, and ICS3 controllers.
COMM_CONTROLLER -LOAD	Reboots the controller and downline loads a specific file or protocol combination from the host to the controller. Valid for ICS1, ICS2, ICS3, LHC, and LTS controllers.
COMM_CONTROLLER -SHUTDOWN	Breaks all logical connections and then shuts down ICS1, ICS2, and ICS3 controllers.
COMM_CONTROLLER -UPLINE_DUMP	Writes the contents of an LHC or LTS microprocessor's memory to a file in the host for analysis or storage.

Creating Abbreviations

When a frequently used command is especially long or complicated, an abbreviation can make it easier to remember, save time, and reduce input errors. If abbreviations are allowed on your system, you can use the ABBREV command to create abbreviations for the COMM_CONTROLLER command. For example, the following command line creates the abbreviation QUIET to stop all controllers on the system for the device type specified.

```
ABBREV -ADD_COMMAND QUIET COMM_CONTROLLER -SHUT_DOWN -DEVICE %I% -ALL -NO_QUERY
```

When you issue the personal abbreviation QUIET and substitute a valid device type for the variable %I%, PRIMOS expands the abbreviation and executes the full command line. For example,

```
QUIET ICS2
```

is equivalent to

```
COMM_CONTROLLER -SHUT_DOWN -DEVICE ICS2 -ALL -NO_QUERY
```

Note

Do not use personal abbreviations in your PRIMOS.COMI file.

Any abbreviations that you create at the supervisor terminal for the COMM_CONTROLLER command are available to any user at the supervisor terminal, provided USER1 has an

abbreviations file. To avoid possible conflicts, do not choose an existing PRIMOS command or its abbreviation for a user-defined abbreviation. See the *PRIMOS Commands Reference Guide* for an extensive description of user-defined abbreviations and the ABBREV command.

THE COMM_CONTROLLER -HELP SUBCOMMAND

The COMM_CONTROLLER -HELP subcommand displays detailed information on all COMM_CONTROLLER subcommands and arguments. When you choose the -HELP subcommand, all other subcommands and options are ignored.

Command Format

COMM_CONTROLLER { -HELP }
 { -H }

When you issue the COMM_CONTROLLER command without specifying a subcommand, the command interpreter displays the help file.

THE COMM_CONTROLLER -INIT SUBCOMMAND

The COMM_CONTROLLER -INIT subcommand initializes ICS controllers. This subcommand shuts down the specified controller and activates the self-verification test programs resident in the on-board microprocessor. When testing is complete, the available memory size is returned to the CPU and the controller is ready to be started. Any error messages are displayed at the supervisor terminal and, if desired, logged by DSM. Do not specify the -INIT subcommand with the -LOAD subcommand.

This subcommand is not implemented for LHC and LTS controllers.

Command Format

COMM_CONTROLLER -INIT -DEVICE { ICS1 } { -DEVICE_ADDRESS *nn* } [-NQ]
 { ICS2 } { -ALL }
 { ICS3 }

Options

- DEVICE *type* Specifies the type of ICS controller. Valid device types are ICS1, ICS2, or ICS3. Use -DEVICE with either the -DEVICE_ADDRESS or the -ALL option.
- DEV
- DEVICE_ADDRESS *nn*
- DA Specifies an individual ICS controller's device address. Obtain this two-digit octal number with the STATUS COMM or LIST_COMM_CONTROLLERS commands. Valid ICS device addresses for Rev. 22.0 are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 52₈, 53₈, and 54₈. Commands containing invalid addresses are rejected and generate an error message that lists all controllers and their addresses.
- ALL Initializes every ICS controller of the *type* specified in the -DEVICE option on the system.
- NO_QUERY
- NQ Suppresses the Continue? prompt. Use the -NQ option whenever you include this command in a CPL program or in your PRIMOS.COMI file.

Examples

In the following examples, two ICS2 controllers reside on a single system. The first COMM_CONTROLLER command initializes the ICS2 controller at device address 10₈. The second COMM_CONTROLLER command initializes both ICS2 controllers.

Initializing One Controller:

```
OK, COMM_CONTROLLER -INIT -DEVICE ICS2 -DEVICE_ADDRESS 10
```

```
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]
```

```
ICS2_SERVER (user 185) logged in Friday, 27 Mar 88 10:53:20.
ICS2 controller(s) 10 currently active. Continue <Y or N>? Y
```

```
ICS2 controller shutdown in progress...
```

```
ICS2 prom self-verify diagnostics in progress...
```

```
ICS2 initialization operation results:
   ICS2 at address 10: SUCCESSFUL
```

```
OK,
ICS2_SERVER (user 185) logged out Friday, 27 Mar 88 10:53:44.
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

```
Phantom 185: Normal logout at 10:53
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

Initializing Multiple Controllers:

```
OK, COMM_CONTROLLER -INIT -DEVICE ICS2 -ALL
```

```
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]
```

```
ICS2_SERVER (user 185) logged in Friday, 27 Mar 88 10:53:20.  
ICS2 controller(s) 10 11 currently active. Continue <Y or N>? Y
```

```
ICS2 controller shutdown in progress...
```

```
ICS2 prom self-verify diagnostics in progress...
```

```
ICS2 initialization operation results:
```

```
    ICS2 at address 10: SUCCESSFUL
```

```
    ICS2 at address 11: SUCCESSFUL
```

```
OK,
```

```
ICS2_SERVER (user 185) logged out Friday, 27 Mar 88 10:53:44.  
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

```
Phantom 185: Normal logout at 10:53  
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

THE COMM_CONTROLLER -LOAD SUBCOMMAND

The COMM_CONTROLLER -LOAD subcommand executes an automatic shutdown and reinitialization cycle followed by a downline load of a specific file or protocol combination to the specified controller(s). It copies the object file and passes it to the on-board microprocessor.

WARNING

Do not attempt to downline load an operating device; the downline load operation will fail and the device may hang.

You must give the LHC_DLL_SERVER and LTS_DLL_SERVER phantoms LUR access rights to the directory DOWN_LINE_LOAD* and any other directory containing downline load files. You must be a member of the .NETWORK_MGT\$ access group to downline load an LTS controller. Any error messages are displayed at the supervisor terminal and, if desired, are logged by DSM.

Notes

You must stop network activity before loading an LHC. Issue the MAX ALL, STOP_NET, and STOP_NTS commands before attempting to downline load any LHC controllers.

The START_NET and START_NTS commands do not downline load LHC or LTS controllers. Both devices must be downline loaded explicitly with the COMM_CONTROLLER command before you can start the networks.

The -LOAD subcommand completely reboots a controller; do not specify the -INIT subcommand at the same time.

Command Format

```

COMM_CONTROLLER -LOAD -DEVICE { ICS1
                               ICS2
                               ICS3
                               LHC
                               LTS }

                               { -DEVICE_ADDRESS nn
                               -ALL
                               -DEST_NODE_ADDRESS xx-xx-xx
                               -DEST_NODE_NAME name }

                               { -PROTOCOL tokens }
                               { -PATHNAME path }

[-NO_QUERY]
    
```

Options

- DEVICE *type* Specifies the type of intelligent controller. Valid device types are ICS1, ICS2, ICS3, LHC, or LTS. Use with either the -DA or the -ALL option.
- DEV
- DEVICE_ADDRESS *nn* Specifies an individual ICS or LHC controller's device address. This two-digit octal number is obtained with the STATUS COMM or LIST_COMM_CONTROLLERS commands. Valid ICS device addresses at Rev. 22.0 are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 52₈, 53₈, and 54₈. Valid LHC addresses at Rev. 22.0 are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 50₈, 51₈, 52₈, 53₈, 54₈, and 56₈. Commands containing invalid addresses are rejected and generate an error message that lists all available controllers and their addresses.
- DA
- ALL Loads every controller of the *type* specified in the -DEVICE option on the system with identical protocol token combinations or the same downline load file.

-DEST_NODE_ADDRESS *xx-xx-xx-xx-xx-xx*
-DNA

Specifies the unique 12-digit hexadecimal network address of an LTS. This address is assigned by the manufacturer and is located on a metal tag attached to the LTS. All Prime LTS addresses begin with the three-digit string 08-00-2F-. When you enter only the last six digits of the device address, the **COMM_CONTROLLER** command adds the Prime LTS prefix automatically. Separate every two characters with a hyphen. You can also use the **LIST_LTS_STATUS** command to obtain the device address. Do not specify the **-DNA** option with the **-DNN** option. This option applies to LTS controllers only.

-DEST_NODE_NAME *name*
-DNN

Specifies the unique node name of an LTS. This name is assigned by **CONFIG_NTS** when the LTS is configured. Use the **LIST_LTS_STATUS** command to obtain the node name. Do not specify the **-DNN** option with the **-DNA** option. This option applies to LTS controllers only.

-PROTOCOL *tokens*
-PR

Specifies the protocol token combinations used to select a downline load file. Protocol tokens define the synchronous and asynchronous parameters available for lines connected to the controller. You must use either the **-PROTOCOL** or the **-PATHNAME** option to successfully downline load a controller.

You can specify tokens in any order provided that they are joined by an underscore. For example, **ASYNC_BSCRJE** is the same as **BSCRJE_ASYNC**. This option is functionally equivalent to the **SYNC_CNTRLR** configuration directive discussed in Chapter 3, Useful Configuration Directives. The following protocol tokens are currently available:

<i>Type</i>	<i>Tokens</i>
ICS	ASYNC, BSCRJE, BSCX25, HDLC, or SDLC
LHC	PRIMENET, NTS, or TCP

Note

WSI300 workstations require the TCP protocol.
You cannot combine TCP with any other protocol.

-PATHNAME *path*
-PN

Transfers a file containing an executable program from storage to the controller. You must use either the **-PROTOCOL** or the **-PATHNAME** option to successfully downline load a controller. *path* must be an existing PRIMOS filename no longer than 128 characters. If you are attached to the source directory, you can specify just the filename. The **DOWN_LINE_LOAD*** directory contains the following pre-built object code files for each device type:

```
DOWN_LINE_LOAD*>ICS1.DL
DOWN_LINE_LOAD*>ICS2_01.DL (ASYNC only)
DOWN_LINE_LOAD*>ICS2_02.DL (ASYNC, HDLC, SDLC)
DOWN_LINE_LOAD*>ICS2_03.DL (BSCRJE, BSCX25, HDLC, SDLC)
DOWN_LINE_LOAD*>ICS2_04.DL (ASYNC, BSCRJE, BSCX25)
DOWN_LINE_LOAD*>ICS3_01.DL (ASYNC, BSCRJE, BSCX25, HDLC, SDLC)
DOWN_LINE_LOAD*>LHC300_NTS_PRIMENET.DL
DOWN_LINE_LOAD*>LHC300_TCP.DL
```

-NO_QUERY
-NQ

Suppresses the Continue? prompt. Use the **-NQ** option whenever you include this command in a CPL program or in your PRIMOS.COMI file.

Examples

Loading One LTS: The following command line in a PRIMOS.COMI file downline loads the LTS named PAYROL.

```
COMM_CONTROLLER -LOAD -DEV LTS -DNN PAYROL -PN DOWN_LINE_LOAD*>LHC300_NTS_PRIMENET.DL -NQ
```

OK, LTS HAS BEEN RESET.

Loading an LHC Controller: LHC controllers that are running NTS and PRIMENET/LAN300 concurrently require two protocol tokens: NTS and PRIMENET. Use the -PROTOCOL option to load this combination. You must use either the -PROTOCOL or -PATHNAME option to successfully downline load a device. Connect the tokens with an underscore as shown in the following example.

```
OK, COMM_CONTROLLER -LOAD -DEVICE LHC -DEVICE_ADDRESS 37  
-PROTOCOL PRIMENET_NTS
```

```
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]  
LHC controller(s) 37 currently active. Continue <Y or N>? Y
```

```
LHC prom self-verify diagnostics in progress...
```

```
LHC downline load in progress...
```

```
LHC downline load operation results:
```

```
    LHC at address 37: SUCCESSFUL
```

```
OK,
```

```
Phantom 180: Normal logout at 13:06
```

```
Time used: 00h 00m connect, 00m 07s CPU, 00m 06s I/O.
```

Loading Several Controllers: You can load several controllers with one command line provided that the controllers:

- Are the same type
- Are located in the same backplane
- Use the same downline load file or protocol combination

The following command line loads every ICS3 controller on this system with three protocols: ASYNC, HDLC, and BSCX25.

```
OK, COMM_CONTROLLER -LOAD -DEVICE ICS3 -ALL -PROTOCOL ASYNC_HDLC_BSCX25
```

```
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]
```

```
ICS3_SERVER (user 196) logged in Friday, 27 Mar 88 10:55:12.  
Continue <Y or N>? Y
```

```
ICS3 controller shutdown in progress...
```

```
ICS3 prom self-verify diagnostics in progress...
```

```
ICS3 downline load in progress...
```

```
ICS3 run-time self-verify diagnostics in progress...
```

```
ICS3 controller startup in progress...
```

```
ICS3 downline load operation results:  
  ICS3 at address 10: SUCCESSFUL  
  ICS3 at address 11: SUCCESSFUL
```

```
OK,  
ICS3_SERVER (user 196) logged out Friday, 27 Mar 88 10:55:32.  
Time used: 00h 00m connect, 00m 03s CPU, 00m 01s I/O.
```

```
Phantom 196: Normal logout at 10:55  
Time used: 00h 00m connect, 00m 03s CPU, 00m 01s I/O.
```

THE COMM_CONTROLLER -SHUTDOWN SUBCOMMAND

The `COMM_CONTROLLER -SHUTDOWN` subcommand suspends the specified ICS controller(s). This subcommand breaks all logical connections between the controller and peripheral devices. Any error messages are displayed at the supervisor terminal and, if desired, logged by DSM.

This subcommand is not implemented for LHC and LTS controllers.

Caution

Do not shut down controllers that support complete SNA, PRIMENET/X.25, or RJE subsystems. These applications do not recover their lines automatically and must be restarted. To reestablish a logical SNA connection you must issue the `SNA_SERVER -STOP KILL` command to immediately stop the `SNA_SERVER`, request a deactivation/activation sequence from the host, and issue the `SNA_SERVER -START` command to restart the `SNA_SERVER`.

Command Format

COMM_CONTROLLER { -SHUTDOWN
-SH } -DEVICE { ICS1
ICS2
ICS3 }

{ -DEVICE_ADDRESS *nn*
-ALL }

[-NO_QUERY]

Options

- DEVICE *type*** Specifies the type of ICS controller. Valid device types are ICS1, ICS2, or ICS3. Use with either the -DEVICE_ADDRESS or the -ALL option.
- DEV**
- DEVICE_ADDRESS *nn*** Specifies an individual ICS controller's device address. Obtain this two-digit octal number with the STATUS COMM or LIST_COMM_CONTROLLERS commands. Valid ICS device addresses for Rev. 22.0 are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 52₈, 53₈, and 54₈. Commands containing invalid addresses are rejected and generate an error message that lists all available controllers and their addresses.
- DA**
- ALL** Shuts down every ICS controller of the *type* specified in the -DEVICE option on the system.
- NO_QUERY** Suppresses the Continue? prompt. Use the -NQ option whenever you include this command in a CPL program or in your PRIMOS.COMI file.
- NQ**

Examples

Suspending One Controller: The following command line example shuts down an individual ICS2 controller with the device address 11₈.

```
OK, COMM_CONTROLLER -SHUTDOWN -DEVICE ICS2 -DEVICE_ADDRESS 10
```

```
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]
```

```
ICS2_SERVER (user 197) logged in Friday, 27 Mar 88 10:54:24.  
ICS2 controller(s) 11 currently active. Continue <Y or N>? Y
```

```
ICS2 controller shutdown in progress...
```

```
ICS2 shutdown operation results:
```

```
ICS2 at address 11: SUCCESSFUL
OK,
ICS2_SERVER (user 197) logged out Friday, 27 Mar 88 10:54:44.
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

```
Phantom 197: Normal logout at 10:54
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

Suspending Several Controllers: The following command line example shuts down every ICS2 controller in the backplane.

```
OK, COMM_CONTROLLER -SHUTDOWN -DEVICE ICS2 -ALL
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]
```

```
ICS2_SERVER (user 197) logged in Friday, 27 Mar 88 10:54:24.
ICS2 controller(s) 11 36 currently active. Continue <Y or N>? Y
```

```
ICS2 controller shutdown in progress...
```

```
ICS2 shutdown operation results:
  ICS2 at address 11: SUCCESSFUL
  ICS2 at address 36: SUCCESSFUL
```

```
OK,
ICS2_SERVER (user 197) logged out Friday, 27 Mar 88 10:54:44.
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

```
Phantom 197: Normal logout at 10:54
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

THE COMM_CONTROLLER -UPLINE_DUMP SUBCOMMAND

The COMM_CONTROLLER -UPLINE_DUMP subcommand transfers the memory image from an LHC or LTS controller to a disk file in the host for subsequent analysis. This also occurs automatically when a diagnostic procedure uncovers a fault.

Only one controller can upline dump data to the host at a time. Do not attempt to upline dump an operating device; the controller will disconnect all users and stop normal operation. Any error messages are displayed at the supervisor terminal and, if desired, logged by DSM.

If a diagnostic procedure forces an upline dump, it automatically initializes the controller and reloads the protocol set. However, if you issue an on-demand upline dump, you must also issue a COMM_CONTROLLER -LOAD subcommand before you can use the controller.

Caution

Before the `COMM_CONTROLLER -UPLINE_DUMP` subcommand can open a file and write data, the `LHC_ULD_SERVER` and the `LTS_ULD_SERVER` must have LUR access rights to the directory containing the file specified by the `-PATHNAME` option or to `UPLINE_DUMP*>LAN300` for the default case.

Command Format

`COMM_CONTROLLER` { `-UPLINE_DUMP` } `-DEVICE` { `LTS` }
 { `-ULD` } { `LHC` }

 { `-DEVICE_ADDRESS nn`
 { `-DEST_NODE_ADDRESS xx-xx-xx` }
 { `-DEST_NODE_NAME name` }

 { `-PATHNAME path` }

 [`-NO_QUERY`]

Options

`-DEVICE type` Specifies the type of intelligent controller. Valid device types
`-DEV` are LHC or LTS.

`-DEVICE_ADDRESS nn`
`-DA` Specifies an individual LHC controller's device address. Obtain
 this two-digit octal number with the `STATUS COMM` or
 `LIST_COMMS_CONTROLLER` commands. Valid LHC addresses
 at Rev. 22.0 are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 50₈,
 51₈, 52₈, 53₈, 54₈, and 56₈. Commands containing invalid
 addresses are rejected and generate an error message that lists all
 available controllers and their addresses.

`-DEST_NODE_ADDRESS xx-xx-xx-xx-xx-xx`
`-DNA` Specifies the unique 12-digit hexadecimal network address of an
 LTS. This address is assigned by the manufacturer and is
 located on a metal tag attached to the LTS. All Prime LTS
 addresses begin with the three-digit string 08-00-2F-. When you
 enter only the last six digits of the device address, the
 `COMM_CONTROLLER` command adds the Prime LTS prefix
 automatically. Separate every two characters with a hyphen.
 You can also use the `LIST_LTS_STATUS` command to obtain
 the device address. Do not specify the `-DNA` option with the
 `-DNN` option. This option applies to LTS controllers only.

-DEST_NODE_NAME *name*
-DNN Specifies the unique node name of an LTS. This name is assigned with CONFIG_NTS when the LTS is configured. Use the LIST_LTS_STATUS command to obtain the node name. Do not specify the -DNN option with the -DNA option. This option applies to LTS controllers only.

-PATHNAME *path*
-PN Opens the file specified by *path*, where *path* is a PRIMOS pathname of not more than 128 characters. If you specify just a filename, the file is opened in your currently attached directory.

When a pathname is omitted, the server retrieves the current memory image from the device and stores it in a file in the directory UP_LINE_DUMP*. The format of the default upline dump filename for LHC is *LHC_hostname-deviceaddress.dd-mm-yy.hhmm*. The format of the default upline dump filename for LTS is *LTSxx-xx-xx-xx-xx-xx.ddmmyy.hhmm*. Where *hostname* is the Prime node name, *deviceaddress* is the physical device address on the Prime system, *xx-xx-xx-xx-xx-xx* is the network address of the LTS, *dd* is the day, *mm* is the month, *yy* is the year, and *hhmm* is the hour and minute the file was created.

-NO_QUERY
-NQ Suppresses the Continue? prompt. Use the -NQ option whenever you include this command in a CPL program or in your PRIMOS.COMI file.

Examples

Using the DEVICE_ADDRESS Option: In the following example, the command line transfers the contents of an LHC controller's on-board microprocessor to separate files in the host.

```
OK, COMM_CONTROLLER -ULD -DEV LHC -DA 50  

-PN UP_LINE_DUMP*>LAN300>LHC_02.ULD
```

```
[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]  

LTS has been put into UPLINE DUMP mode.
```

```
LHC_ULD_SERVER (user 197) logged in Friday, 27 Mar 88 10:54:24.  

LHC controller(s) 50 currently active. Continue <Y or N>? Y  

OK,  

LHC_ULD_SERVER (user 197) logged out Friday, 27 Mar 88 10:54:44.  

Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.  

Phantom 197: Normal logout at 10:54  

Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

Using the DESTINATION_NODE_ADDRESS Option: The COMM_CONTROLLER command can upline dump an LTS by network address as shown in the example below.

```
OK, COMM_CONTROLLER -ULD -DEV LTS -DNA F8-00-01  
-PN DOWN_LINE_LOAD*>LTS_03.ULD
```

LTS has been put into UPLINE DUMP mode.

[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]

```
LTS_ULD_SERVER (user 197) logged in Friday, 27 Mar 88 10:54:24.  
LTS controller(s)08-00-2F-F8-00-01 currently active.Continue <Y or N>? Y
```

```
OK,  
LTS_ULD_SERVER (user 197) logged out Friday, 27 Mar 88 10:54:44.  
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

```
Phantom 197: Normal logout at 10:54  
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

Using the DESTINATION_NODE_NAME Option: The COMM_CONTROLLER command can upline dump an LTS by node name as shown in the example below.

```
OK, COMM_CONTROLLER -ULD -DEV LTS -DNN SALES1  
-PN DOWN_LINE_LOAD*>LTS_03.ULD
```

[COMM_CONTROLLER Rev. 22.0 Copyright (c) 1988, Prime Computer, Inc.]

LTS has been put into UPLINE DUMP mode.

```
LTS_ULD_SERVER (user 197) logged in Friday, 27 Mar 88 10:54:24.  
LTS controller(s) SALES1 currently active. Continue <Y or N>? Y
```

```
OK,  
LTS_ULD_SERVER (user 197) logged out Friday, 27 Mar 88 10:54:44.  
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

```
Phantom 197: Normal logout at 10:54  
Time used: 00h 00m connect, 00m 02s CPU, 00m 01s I/O.
```

COMM_CONTROLLER COMMAND ERROR MESSAGES

The COMM_CONTROLLER command interpreter displays the copyright notice on the screen then it verifies the following:

- Command issued at supervisor terminal
- Adequate access rights for servers
- Correct command line syntax
- Valid options, addresses, and names

When the system detects an error, it rejects the command request and displays an appropriate error message. Normally, all error messages are also logged by DSM. The error messages listed below are the most common. The *ICS User's Guide* contains a complete list of the ICS interface error messages and boot server logic error messages.

Error: An LTS DLL multicast address is not available now.

A multicast address is not available and you cannot downline load the specified LTS at this time. Try again later.

Error: A problem exists with the downline load file. See DSM log file.

The object file specified cannot be copied to the on-board microprocessor. The DSM log file contains the specific error message.

Error: An unknown <type> controller was specified. See DSM log file.

Valid device types are ICS1, ICS2, ICS3, LHC, and LTS controllers. Other controllers are not recognized by the COMM_CONTROLLER command.

Error: Cannot specify PATHNAME and ALL together

Do not specify both options on one command line.

Error: DEST_NODE_ADDRESS contains incorrect number of hexadecimal digits.

A valid LTS destination node address is a string of six or twelve hexadecimal digits separated by hyphens.

Error: DEST_NODE_ADDRESS <address> has invalid hexadecimal digits.

One or more of the hexadecimal digits in the node address is incorrect. Check the address and try the command again.

Error: DEST_NODE_ADDRESS has too many contiguous hexadecimal digits.

A valid LTS destination node address is a string of six (*xx-xx-xx*) or twelve (*xx-xx-xx-xx-xx-xx*) hexadecimal digits separated by hyphens.

Error: DEST_NODE_ADDRESS not specified.

The -DEST_NODE_ADDRESS option was specified without the hexadecimal address string.

Error: DEST_NODE_ADDRESS option is invalid for the <type> controller.

The -DEST_NODE_ADDRESS option was specified for an ICS controller. Only LTS and LHC controllers can use this option.

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Error: DEST_NODE_ADDRESS separator "-" arranged incorrectly.

There is a misplaced hyphen in the hexadecimal address string.

Error: DEST_NODE_NAME not specified.

The -DEST__NODE__NAME option was specified without a valid LTS name.

Error: DEST_NODE_NAME too long for type.

The LTS node name supplied in the command line exceeds the maximum length of 16 characters.

Error: DEVICE <type> is invalid.

The controller *type* specified must be one of the following: ICS1, ICS2, ICS3, LHC, or LTS.

Error: DEVICE not specified.

The -DEVICE option was specified without supplying a valid controller type.

Error: DEVICE option must be specified.

The -DEVICE option was omitted from the command line.

Error: DEVICE_ADDRESS <nn> is not octal.

The device address for a communication controller must be a two-digit octal number.

Error: DEVICE_ADDRESS has more than 2 characters.

The device address for a communication controller must be a two-digit octal number.

Error: DEVICE_ADDRESS not specified.

The -DEVICE__ADDRESS option was specified without a valid address.

Error: DEVICE_ADDRESS option invalid for LTS.

Use either the -DNA or the -DNN options to identify an LTS; the -DEVICE__ADDRESS option is only for locally attached controllers.

Error: DNN option is invalid for the <type> controller.

The -DNN option is only valid for LTS controllers.

Error: INIT option invalid for the <type> controller.

The -INIT option applies only to ICS controllers.

Error: LTS not present in the NSS database.

The address of the LTS specified in the command line is not included in the Node Status Services (NSS) database. Check the address and try the command again.

Error: PATHNAME <path> is invalid.

The pathname must be an existing PRIMOS pathname.

Error: PATHNAME not specified.

The -PATHNAME option was specified without supplying a valid PRIMOS pathname.

Error: PATHNAME option can only be specified with LOAD or ULD.

The -PATHNAME option was supplied with either the -INIT or -SHUTDOWN options.

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Error: PROTOCOL option can only be specified with LOAD.

The -PROTOCOL option was supplied with either the -INIT, -SHUTDOWN, or -UPLINE_DUMP option.

Error: PROTOCOL option is invalid for the <type> controller.

The LTS and ICS1 controllers do not support the -PROTOCOL option.

Error: PROTOCOL separator "_" arranged incorrectly.

Valid protocol token combinations are connected by an underscore.

Error: PROTOCOL token <token> is duplicated.

A protocol token was supplied more than once in the command line.

Error: PROTOCOL token <token> is invalid.

The only valid protocols for Rev. 22.0 are PRIMENET, NTS, TCP, ASYNC, SYNC, HDLC, BSCRJE, and BSCX25.

Error: PROTOCOL token is not specified.

The -PROTOCOL option was specified without a valid token combination.

Error: SHUTDOWN option is invalid for the <type> controller.

The -SHUTDOWN option was specified for either an LHC or LTS controller.

Error: UPLINE_DUMP option is invalid for the <type> controller.

The -UPLINE_DUMP option was specified for an ICS controller.

Error: Cannot specify DEVICE_ADDRESS and ALL together.

Do not specify both options on one command line.

Error: Cannot specify DEST_NODE_NAME and DEST_NODE_ADDRESS and ALL options together.

Do not specify both options on one command line.

Error: Cannot specify PATHNAME and PROTOCOL together.

Do not specify both options on one command line.

Error: Cannot upline dump more than ONE device.

More than one controller was specified on the command line.

Error: Either DEST_NODE_NAME or DEST_NODE_ADDRESS or ALL option must be specified.

The device type LTS was specified without further identification.

Error: Either the DEVICE_ADDRESS or ALL option must be specified.

Either an LHC or an ICS controller was specified without further identification.

Error: ICS server has timed out. See DSM log file.

The server timed out while waiting to perform the operation. This is an internal error that should not affect subsequent attempts.

Error: Invalid PATHNAME specified.

-PATHNAME must be an existing PRIMOS pathname no longer than 128 characters.

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Error: Invalid response to a question.

The only valid answers to the Continue? prompt are Y or N.

Error: Missing COMM_CONTROLLER message.

An internal problem prevents a more specific error message. Contact your Customer Support Center.

Error: Missing proceed prompt record from MESSAGE FILE

An internal problem prevents a more specific error message. Contact your Customer Support Center.

Error: Missing affirmative answer(s) record from MESSAGE FILE

An internal problem prevents a more specific error message. Contact your Customer Support Center.

Error: No main option specified (select LOAD, ULD, SH, INIT or HELP).

The COMM_CONTROLLER command was issued without specifying an operation.

Error: Request failed - LTS not present in the node status database.

The NSS database does not include required information on the specified LTS.

Error: Request failed - the node status database not initialized.

The NSS database is not initialized; start either NTS or PRIMENET.

Error: Request failed - specified address not an LTS.

The network address specified in the command line is not an LTS.

Error: Request failed - specified name not an LTS.

The node name specified in the command line is not an LTS.

Error: Requested operation failed - file cannot be opened.

The filename supplied in the command line cannot be opened for reading or writing. Verify that the access rights are set correctly.

Error: Requested operation failed - bad file header size.

The downline load file specified contains an invalid header size. If the file is a default downline load file, this is an internal error. Call your Customer Support Center. If the file is user-supplied, verify that the file header is the correct length.

Error: Requested operation failed - file has a bad maximum packet size.

The downline load file contains at least one packet exceeding the packet size. If the file is a default downline load file, this is an internal error. Call your Customer Support Center. If the file is user-supplied, verify that all packets are the correct size.

Error: Requested operation failed - file has bad header information.

The downline load file contains header information which is unknown. If the file is a default downline load file, this is an internal error. Call your Customer Support Center. If the file is user-supplied, verify that the header information is correct.

- Error: Requested operation failed - file header has bad media type.
The downline load file specified contains an invalid media type. If the file is a default downline load file, this is an internal error. Call your Customer Support Center. If the file is user-supplied, verify that the file header contains the correct media type.
- Error: Requested operation failed - no access rights.
The requester of the specified operation does not have the appropriate access rights.
- Error: Requested operation failed - not enough packets in file.
The downline load file must contain at least one packet. If the file is a default downline load file, this is an internal error. Call your Customer Support Center. If the file is user-supplied, verify that the file header contains at least one packet.
- Error: Requested operation failed - file not found.
The downline load filename specified in the command line does not exist.
- Error: Requested operation failed - invalid device address.
The specified device address is unknown or invalid.
- Error: Requested operation failed - LAN not found.
The specified LAN name was not found.
- Error: Requested operation failed - network address not found.
The specified network address is unknown.
- Error: Requested operation failed - node name not found.
The node name specified in the command line does not exist.
- Error: Server timed out waiting for message - try again later.
The server timed out while waiting for a message. This is an internal error that should not affect subsequent attempts. Try to issue the command again.
- Error: The downline load file cannot be read.
Verify that the downline load file exists and that the access rights are correct.
- Error: The HELP file is missing
The server is unable to locate the internal file that contains the syntax and command line options for the COMM_CONTROLLER command.
- Error: The LHC logical connection not initialized - NMSr cannot reach node.
There is no active path to the LTS at this time. The Network Management Server (NMSr) cannot perform the requested operation.
- Error: The LTS is attached to a LAN that the NMSr cannot reach.
Your network is not configured to perform the specified operation.
- Error: The NMSr is currently executing a force LTS DLL - try again later.
The local Network Management Server (NMSr) can only downline load one LTS at a time.

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Error: The NMSr is currently executing a force LTS ULD - try again later.
The local NMSr can only upline dump one LTS at a time.

Error: The Network Terminal Service is not started
You must start NTS before attempting to perform an operation on an LHC or an LTS.

Error: The specified protocol token is not supported. See DSM log file.
The only valid protocols for Rev. 22.0 are PRIMENET, NTS, TCP, ASYNC, SYNC, HDLC, BSCRJE, and BSCX25.

Error: The specified protocol token combination is not supported.
The only valid protocol combinations for Rev. 22.0 supported by an LHC are PRIMENET_NTS, PRIMENET_TCP, and PRIMENET_NTS_TCP.

Error: To load an LHC the -protocol option must be specified.
You are required to specify the -PROTOCOL option when you downline load an LHC.

Error: Too many main options
You can specify only one COMM_CONTROLLER subcommand on a single command line.
Select -HELP, -LOAD, -INIT, -SH, or -ULD.

Error: Too many options on the command line
You can specify only one option from each group of options on a single command line.

Error: PRIMOS error <error code> associated with parsing the command line
PRIMOS is unable to interpret the command line. Try again.

Error: Unable to reset all LTS units because LAN not reachable.
The LAN, on which the LTS controller specified in the command line is configured, is unavailable. The devices on this LAN cannot be reset at this time.

Error: Unknown option <option>.
The option specified is not supported.

Error: You do not have the appropriate access rights. See DSM log file.
Only System Administrators, system operators, and privileged DSM users can issue the COMM_CONTROLLER command.

Failure: <controller> at device address <nn> diagnostic results: FATAL ERROR.
The COMM_CONTROLLER command was not successful. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: <controller> at device address <nn> failed operation.
The COMM_CONTROLLER command was not successful. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: <controller> at device address <nn> failed prom self-verify operation.
Initialization of a controller at device address *nn* has failed. Try again. If the second attempt fails, contact your Customer Support Center.

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Failure: <controller> at device address <nn> failed downline load operation.

Downline loading of a controller at device address *nn* has failed. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: <controller> at device address <nn> failed load start packet operation.

A controller at device address *nn* was unable to restart after loading. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: <controller> at device address <nn> failed I/O bus initialization.

Communication cannot be activated to a controller at device address *nn*. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: <controller> at device address <nn> failed upline dump operation.

Unable to copy the contents of microprocessor PROM from a controller at device address *nn*. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: System error encountered by server.

The server detected a system error and logged out. Try again. If the second attempt fails, contact your Customer Support Center.

Failure: There are missing prompt message(s) in COMM_CONTROLLER.MESSAGE file.

The file containing status messages and prompts is incomplete. Try again. If the second attempt fails, contact your Customer Support Center.

Internal Error: Expected connect message was not supplied by the server.

The server did not supply the correct connection code and the process aborted.

Internal Error: Internal inconsistency encountered by server.

The server encountered an unknown error and logged out.

Internal Error: Invalid version of downline load software.

The version number of the downline load software must match the version number specified by the COMM_CONTROLLER command.

Internal Error: Invalid version of the ICS downline load software.

The version number specified by the COMM_CONTROLLER command must match the version number of the downline load software.

Internal Error: Message received from server is too short.

The message sent by the server is not long enough to adequately identify the problem.

Internal Error: Node status database is corrupted.

The internal Node Status Service (NSS) database is corrupt and prevents the server from looking up data. Contact your Customer Support Center.

Internal Error: Unexpected message type was received by the server.

The server received an unexpected type of message during the procedure and logged out.

LHC boot server already executing - try again later.

The LHC is downline loading. Your request cannot be completed at this time.

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LHC(s) not configured caused server to abort.

No LHC controllers were found when the -ALL option was specified in the command line.

LHC upline dump server already executing - try again later.

The LHC is currently performing an upline dump. Your request cannot be completed at this time.

LTS has been reset.

The specified LTS was reset. This causes an automatic downline load.

LTS has been put into UPLINE DUMP mode.

A diagnostic procedure has initiated an automatic upline dump.

Operation aborted at your request.

The user responded N to the Continue? prompt and cancelled the requested operation.

Network Management server not executing - try again later.

The network is not running at this time. Try starting the network and reissuing the command.

Warning: <controller> at device address <nn> diagnostic results: MARGINAL ERROR

Although the COMM_CONTROLLER command was not completely successful, action was taken, and the controller is running.

Warning: DSM logging has failed.

An error prevents DSM logging at this time.

Interprocess Server Control Error Messages

Failures in the Interprocess Server Control mechanism can generate the following error messages. These messages appear when the various servers that the COMM_CONTROLLER command uses to perform tasks cannot pass messages to each other or pass an unexpected message. DSM logs the detailed diagnostic messages associated with this list.

TABLE 2-1. Interprocess Server Control Error Messages

Error: Buffer allocation failure - try again later.
 Error: Cannot allocate synchronizer timer resource.
 Error: Cannot start server phantom.
 Error: Inter-Server communication failed to deliver message to server.
 Error: Inter-Server communication failed to give message to COMM_CONTROLLER.
 Error: Inter-Server communication terminated session during receive.
 Error: Inter-Server communication terminated session during send.
 Error: Network rejected session request - no server or network error.
 Error: Resources unavailable for connection to server - try again later.
 Error: Server not responding to connection request.
 Error: Server terminated session - see DSM log file.
 Error: Timed out waiting for message from server.
 Error: Timed out while waiting to send message to server.
 Error: Resources unavailable to receive data - try again later.
 Error: Resources unavailable to transmit data - try again later.

Internal Error: Buffer allocation failure.
 Internal Error: Cannot start server phantom.
 Internal Error: Get exception failure during receive.
 Internal Error: Get exception failure during send.
 Internal Error: Get session response.
 Internal Error: Issue session request.
 Internal Error: Receive message failure.
 Internal Error: Send message failure.
 Internal Error: Server rejected connection request.
 Internal Error: Server rejected terminated abnormally. See DSM log file.
 Internal Error: Server returned bad "check message" code.
 Internal Error: Server returned bad "final message" code.
 Internal Error: Server returned bad "incident message" code.
 Internal Error: Server returned bad source function code.
 Internal Error: Timer fault.
 Internal Error: Unknown message code received from server.

USEFUL CONFIGURATION DIRECTIVES

The PRIMOS operating system is configured at every cold start based on parameters stored in the configuration file. Configuration directives define these parameters, fine-tune the system, and allocate resources where they are needed most. This chapter describes the configuration directives that define and control communication.

Configuration directives perform five basic functions:

- Control the operating system
- Set internal timers
- Establish internal tables
- Inventory hardware
- Allocate memory for the supervisor terminal

It is your responsibility as System Administrator to design a viable configuration that allocates resources to each user and establishes communication between PRIMOS and all devices. If you have any questions concerning the system startup and configuration files, consult the *System Administrator's Guide, Volume I: System Configuration* and the *Rev. 22.0 Software Installation Guide*.

Forty-eight configuration directives are currently supported. Table 3-1 provides a complete list of all configuration directives for your convenience. Each directive is accompanied by a brief description and any default values. The directives marked with the checkmark symbol (✓) are discussed further in this chapter. For more information on these and other directives that are needed to operate your system, see the *System Administrator's Guide, Volume I: System Configuration*.

At Rev. 22.0 the CAB command, described in Chapter 6, Allocating I/O Buffers, replaces the AMLBUF, NTSABF, NTSBUF, and REMBUF configuration directives. Replace your buffer directives with CAB commands in your system startup file.

TABLE 3-1. PRIMOS Configuration Directives

<i>Directive</i>	<i>Description</i>	<i>Default Value</i>
ABBREV	Permits user defined abbreviations	<i>YES</i>
√ AMLCLK	Sets the speed of the software programmable clock for the AMLC and ICS hardware	22600 ₈ (9600)
√ AMLIBL	Sets the size of the DMC AMLC input tumble tables	60 ₈ (48)
√ AMLTIM	Sets time intervals for data set signal management	<i>Ticks .2 sec. Disc 3 min. Grace 0</i>
√ ASRATE	Sets the baud rate of the supervisor terminal	1010 ₈ (300) <i>baud</i>
√ ASRBUF	Sets the capacity of I/O buffers for the supervisor terminal	<i>IN 200₈ (128) OUT 300₈ (192)</i>
√ ASYNC JUMPER	Defines three alternate speeds for asynchronous lines	113 ₈ (75) 226 ₈ (150) 3410 ₈ (1800)
COMDEV	Specifies the physical device number of the system command device	<i>Site-specific</i>
COMDVM	Activates disk mirroring of the command device	<i>NO</i>
√ DISLOG	Automatically logs out disconnected users	<i>NO</i>
√ DTRDRP	When included in the configuration file, drops the Data Terminal Ready signal when users log out	<i>DTRDRP Enabled</i>
ERASE	Sets the system default erase character	<i>ASCII 242 (")</i>
GO	Indicates the last non-comment line of the configuration file	<i>Required</i>
√ ICS CARDS	Inventories, in octal, the quantity and location of asynchronous ICS line adapter cards	<i>Site-specific</i>
√ ICS INPQSZ	Sets the size of all the ICS input queues	77 ₈ <i>halfwords</i>
√ ICS INTRPT	Sets the I/O interrupt rate for ICS controllers	12 ₈ (10)
KILL	Sets the system default kill character	<i>ASCII 277 (?)</i>
√ LHC	Assigns physical addresses to LHC controllers	<i>Site-specific</i>
LOGBAD	Displays unsuccessful login attempts at the supervisor terminal	<i>NO</i>

TABLE 3-1 PRIMOS Configuration Directives (Continued)

<i>Directive</i>	<i>Description</i>	<i>Default Value</i>
LOGLOG	Allows the LOGIN command to be issued in succession to perform an implicit LOGOUT	<i>YES</i>
LOGMSG	Displays login and logout messages at the supervisor terminal	<i>YES</i>
LOTLIM	Specifies login time limit in minutes	<i>3</i>
LOUTQM	Sets the number of minutes before an inactive user is logged out	<i>1750₈ (16 hours, 40 minutes)</i>
MAXPAG	Allocates a number of pages for physical memory	<i>All available memory</i>
MEMHLT	Halts the system when a two-bit memory parity error occurs	<i>YES</i>
MIRROR	When included in the configuration file, allows you to activate disk mirroring after system startup	<i>MIRROR enabled</i>
MTRS	Specifies the maximum magnetic tape record size	<i>14000₈</i>
√ NAMLC	Specifies the maximum number of direct connect assignable asynchronous lines	<i>0</i>
NLBUF	Specifies the number of locate buffers	<i>100₈ (64)</i>
√ NPUSR	Sets the number of phantom users	<i>4</i>
√ NRUSR	Allocates processes and workspace for PRIMENET remote login users	<i>0</i>
NSEG	Specifies the total virtual address space for a system	<i>1776₈ (1022)</i>
√ NSLUSR	Sets the number of slave processes	<i>0</i>
√ NTSASL	Specifies the maximum number of NTS assignable asynchronous lines	<i>0</i>
√ NTSUSR	Specifies the number of NTS terminal users	<i>0</i>
√ NTUSR	Specifies the total number of terminal users, including the supervisor terminal	<i>Site-specific</i>
NVMFS	Sets the number of Virtual Memory File Access (VMFA) dynamic segments available in virtual address space for the system	<i>144₈ (100)</i>
PAGING	Allocates as many as eight named paging partitions	<i>Site-specific</i>

TABLE 3-1 PRIMOS Configuration Directives (Continued)

<i>Directive</i>	<i>Description</i>	<i>Default Value</i>
PAGINM	Activates disk mirroring of the named paging device	<i>Site-specific</i>
√ SYNC CNTRLR	Maps a physical controller to a logical device address and selects a downline protocol	ASYNC
√ SYNC DSC	Defines Data Set Control actions performed by DPTX/BSCMAN for a logical line provided by an SMLC, HSSMLC, or MDLC controller	<i>line 1 2 0</i>
√ SYNC ON	Configures the synchronous communication drivers	<i>Site-specific</i>
√ SYNC SYNCnn	Maps a logical line number to a physical line number on a specified controller	<i>Site-specific</i>
SYSNAM	Specifies the system name at cold start	<i>Site-specific</i>
TYPOUT	Displays configuration directives at the supervisor terminal	NO
UPS	Controls restart after a power failure	177777 ₈ (NO)
WIRMEM	When included in the configuration file, prints the size of wired memory at the supervisor terminal during cold start	<i>Included</i>

CONFIGURATION DIRECTIVE DICTIONARY

This section describes the configuration directives that define, enable, and regulate communication between PRIMOS and devices. For more information on these and other directives, see the *System Administrator's Guide, Volume I: System Configuration*.

Note

All numerical arguments to configuration directives must be octal numbers. Calculate the appropriate values as you normally would in decimal and use the PRIMOS octal conversion function in conjunction with the TYPE command, as shown below, to display the octal equivalent of the decimal values.

```
OK, TYPE [TO_OCTAL 64]
```

```
100
```

► **AMLBUF**

The AMLBUF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your AMLBUF directives with CAB commands.

► **AMLCLK *baudrate***

Sets the speed of the software programmable clock in the AMLC hardware.

Argument

baudrate Sets the clock speed to the number of bits per second. The minimum value for *baudrate* is 35_8 (29), the maximum is 45400_8 (19200), and the default value is 22600_8 (9600).

The default speed is recommended if you are using Auto Speed Detect (ASD) on any line. If you have ICS or LHC controllers, select a *baudrate* from the table of valid speeds for the ASYNC JUMPER directive.

► **AMLIBL *DMC-size***

Sets the size of the DMC input tumble tables. Each AMLC controller multiplexes the input from all the lines it supports into a single pair of DMC tumble tables. If the AMLIBL directive is omitted from the configuration file, the default buffer size is 60_8 (48).

Argument

DMC-size The size in halfwords (one character per halfword) of the Direct Memory Channel (DMC) tumble tables. When the AMLIBL directive is set to 0, the total amount of memory available for tumble tables is divided equally between all AMLC controllers. The minimum explicitly set value is 20_8 (16). The maximum value is variable; it depends on the number of AMLC controllers configured, and the amount of space available for buffers.

If the value supplied for *DMC-size* is out of range, one of the following error messages is displayed at the supervisor terminal during cold start.

BAD AMLIBL PARAMETER. (CINIT)

This error message is displayed when the *DMC-size* specified is less than 20_8 (16) halfwords.

INPUT BUFFERS TOO LARGE. (AMINIT)

This message is displayed when the total *DMC-size* specified for all the DMC tumble tables on the system is greater than the amount of available memory.

► **AMLTIM** *ticks disctime gracetime*

Sets time intervals for the three variable event timers used in data set signal management.

Arguments

ticks The interval (in tenths of a second) between carrier check operations. At the end of each period, PRIMOS checks each line for carrier signal loss. If a loss has occurred and the DISLOG directive enabled, the process is logged out. The value for *ticks* must be greater than 0. The default is 2 (0.2 seconds).

disctime Sets the interval of time (in tenths of a second) after a disconnect during which the DTR signal is low. The minimum amount of time before the line can be used is *disctime* and the maximum is twice *disctime*. The value zero disables this feature. *disctime* must be greater than the value supplied for *ticks*. The default is 3410₈ (1800 decimal, which is 3 minutes). For NTS users the disctime is ignored.

If modems and dialup lines are disconnected or drop the DTR signal, PRIMOS clears the line. The user can call back and establish a new session.

gracetime The minimum grace period (in tenths of a second) for a terminal line that has an active carrier but is not connected to a logged-in process. *gracetime*, in effect, defines the minimum time for a caller or NTS user to login once connected. (The actual grace period varies from *gracetime* to twice *gracetime*.) The default value of 0 disables the grace period. The specified value (if not 0) must be greater than *ticks* and is rounded to the nearest multiple of *ticks*. The value of *gracetime* should be large enough to enable PRIMOS to generate a forced logout of a previous user and enable another user to complete a login attempt.

Notes

The AMLTIM directive affects the operation of Auto Speed Detect (ASD). No standard settings for the AMLTIM parameters can be recommended if your installation uses ASD, but the following values for *ticks*, *disctime*, and *gracetime* work under most circumstances:

AMLTIM 24 3410 1000

Set the value for *ticks* to at least 24₈. Set the value for *disctime* to at least twice that of *ticks*, preferably larger than 400₈. Set a value of 1000₈ for *gracetime*. ASD uses up a portion of *gracetime* before a user logs in.

► **ASRATE** *rate*

Sets the baud rate of the supervisor terminal. The four valid bitstrings for *rate* are shown below with the corresponding baud rate.

<i>Bitstring</i>	<i>Baud Rate (Decimal)</i>
0110	110
1010	300 (default)
2010	1200
3410	9600

ASRATE ensures that any subsequent configuration error messages are transmitted to the supervisor terminal at the correct speed. ASRATE is the first directive in the configuration file.

► **ASRBUF** 0 *INBUF-size* *OUTBUF-size*

Sets the sizes of the supervisor terminal I/O buffers.

Arguments

INBUF-size The size in halfwords (two characters per halfword) of the supervisor terminal input buffer. The default is 200₈ (128). If 0 is specified, the buffer size remains at its previously set value (which is usually the default size).

OUTBUF-size The size in halfwords (two characters per halfword) of the supervisor terminal output buffer. The default is 300₈ (192). The minimum value (other than 0) is 100₈ (64). If 0 is specified, the buffer size remains at its previously set value (which is usually the default size).

If frequent messages are sent to the supervisor terminal and noticeable delays occur, enlarge the *OUTBUF-size*.

If you use screen formatted commands, such as LAB, USAGE, and DSM SIM commands, at the supervisor terminal, increase the *OUTBUF-size* to 2000 to prevent character loss. You can also use the command DELAY 0 0 to speed up printing screen formatted commands on your hard-copy supervisor terminal.

If you use RESUS on a terminal with a faster baud rate than the supervisor terminal, enlarge the *OUTBUF-size*.

► **ASYNC JUMPER *J1 J2 J3***

Defines three alternate line speeds for asynchronous lines. If the ASYNC JUMPER directive is not specified, the default values for *J1*, *J2*, and *J3* are 113₈, 226₈, and 3410₈ bps which correspond to 75, 150, and 1800 bps, respectively. You can choose other values from the following list. The speeds you can use on lines configured for Auto Speed Detect (ASD) are marked with an asterisk (*). ICS lines and NTS assignable lines support all of the speeds listed.

AMLC lines, however, support ASYNC JUMPER speeds only when they are configured for ASD. The default speeds are wired at the factory with small jumper cables on each AMLC controller board. When the default speeds are changed, these jumper cables must be rewired. The speeds specified in the ASYNC JUMPER directive must agree with the hardwired speeds on the controller board.

The ASYNC JUMPER directive makes the same three alternate speeds available for all controllers on your system. Which three speeds you choose is up to you, but when these speeds are used for AMLC lines as well as NTS or ICS lines, they must match the hardware jumper speeds on the AMLC boards. NTS and ICS lines support the full list of speeds shown below.

<i>Speed (bps)</i>	<i>Speed (bps)</i>
62 ₈ (50)	3410 ₈ (1800)
113 ₈ (75)	4540 ₈ (2400)*
156 ₈ (110)*	7020 ₈ (3600)
226 ₈ (150)	11300 ₈ (4800)*
310 ₈ (200)	16040 ₈ (7200)
454 ₈ (300)*	22600 ₈ (9600)*
1130 ₈ (600)*	45400 ₈ (19200)*
2260 ₈ (1200)*	program AMLCLK

In the following example, an ICS3 controller supports dialup lines used by 300 and 1200 baud modems, as well as a 19200 baud terminal used to transmit asynchronous characters to a PAD to form standard X.25 data packets. Set the ASYNC JUMPER directive in the system configuration file to make these three speeds available systemwide. Then with the SET_ASYNC command, configure the individual lines to recognize and use the jumper speeds.

```
ASYNC JUMPER 454 2260 45400
/*Set jumper speeds to 300, 1200, and 19200 bps
SET_ASYNC -LINE 155 -PRO TTY -SPEED_DETECT -SPEED J1
/*300 baud modem
SET_ASYNC -LINE 163 -PRO TTY -SPEED_DETECT -SPEED J2
/*1200 baud modem
SET_ASYNC -LINE 178 -PRO TTY -SPEED_DETECT -SPEED J3
/*19200 terminal
```

► **DISLOG *value***

Enables or disables automatic logout when a line is disconnected. When the incoming Data Carrier Detect (DCD) signal drops or becomes logically low, a line is assumed to be disconnected.

The DISLOG directive is particularly useful for installations with port selectors or dialup modems. A security problem can exist if a user is disconnected without logging out of PRIMOS. The next user to dial that line is actively logged into the system without going through any validation procedures, such as a login password, or any additional site-specific procedures. To prevent this from happening, specify DISLOG YES or DISLOG *line_number*.

Values

NO Does not log out the user of any line if the user's line is disconnected. (Default)

YES Logs out any user whose line is disconnected. YES is recommended if you are using ASD systemwide.

line_number Logs out only the user of the line specified when the line is disconnected, where *line-number* is the octal line number. Individual lines require a separate DISLOG directive. Per-line DISLOG is recommended for dialup lines using ASD connected to modems or port selectors.

The SET_ASYNC command can also provide per-line DISLOG functionality. See Chapter 4, Configuring Asynchronous Lines, for more information on the SET_ASYNC -DISLOG and -NO_DISLOG options.

A global DISLOG YES directive takes precedence over a per-line directive. For example, when there are several per-line directives and a DISLOG YES directive, DISLOG is enabled on every line.

NTS lines are automatically logged out on disconnect whether or not DISLOG is enabled.

► **DTRDRP**

PRIMOS raises a Data Terminal Ready (DTR) signal on dialup lines to permit the modem or port selector to automatically answer the next user. After the dialup connection is made, the DTR signal is maintained until a user logs out, or hangs up the phone. When the connection is broken, PRIMOS briefly drops the DTR signal to terminate the session and then raises it to make the line available for the next user.

If specified, the DTRDRP directive automatically forces the dropping of the DTR for any user when that user logs out, regardless of the period set by the *gracetime* value of the AMLTIM directive.

DTRDRP is useful for installations using port selectors or dialup modems. (Users who have logged out can also issue the PRIMOS DROPDTR command explicitly.)

► **ICS CARDS *device-address config-word***

Inventories the quantity and location of the asynchronous Line Adapter Cards (LACs) for each ICS2 or ICS3 controller. PRIMOS uses the ICS CARDS directives to verify the actual configuration of LACs at both cold and warm starts.

ICS controllers maintain line numbers and configuration information for asynchronous lines from cold start to shutdown whether or not this directive is used. For example, line 121 will always be line 121 regardless of whether a LAC is removed. However, the ICS CARDS directive verifies that the asynchronous configuration has not changed. If the ICS CARDS directive is omitted for any ICS2 or ICS3 on your system, its configuration is not checked at cold start.

When you add or remove a LAC, you must change the ICS CARDS directive for that controller, specifically the *config-word*.

Arguments

device-address The address of the ICS2 or ICS3 controller. Valid addresses are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 52₈, 53₈, and 54₈.

config-word An octal map of an ICS card cage on which each bit corresponds to one of the sixteen slots. A bit with a value of 1 means that an asynchronous LAC is present in that slot. A bit with a value of 0 means that either a synchronous LAC is present in that slot or the slot is empty.

Procedure

Use the following four-step process to calculate the *config-word*:

1. Fill in the ICS Card Cage Inventory in Figure 3-1. If a slot in the card cage contains an asynchronous LAC, enter 1 in that position. If a synchronous LAC is present or the slot is empty, enter zero.
2. Use the table to convert this binary number to octal.
3. Write the octal equivalent for each block in the spaces provided. The result is the *config-word*.
4. Repeat steps 1 through 3 for each LAC card cage on your system.

For further details on ICS input queues, see the *ICS User's Guide*.

ICS CARDS Error Messages: The ICS CARDS directive must agree with the actual physical configuration at cold or warm starts. When the directive detects unexpected, faulty, or missing LACs, an error message is displayed. Each message contains the controller's device address *dd* and the specific slot number *ss*.

ICS device <dd> has returned the wrong number of status words.

Inconsistent ASYNC cold start configuration for ICS device <dd>:
an async line card has been found where not expected in slot <ss>.

Inconsistent ASYNC cold start configuration for ICS device <dd>:
faulty line card in slot <ss> where an async line card was expected.

Inconsistent ASYNC cold start configuration for ICS device <dd>:
sync line card in slot <ss> where an async line card was expected.

Inconsistent ASYNC cold start configuration for ICS device <dd>:
slot <ss> is empty where an async line card was expected.

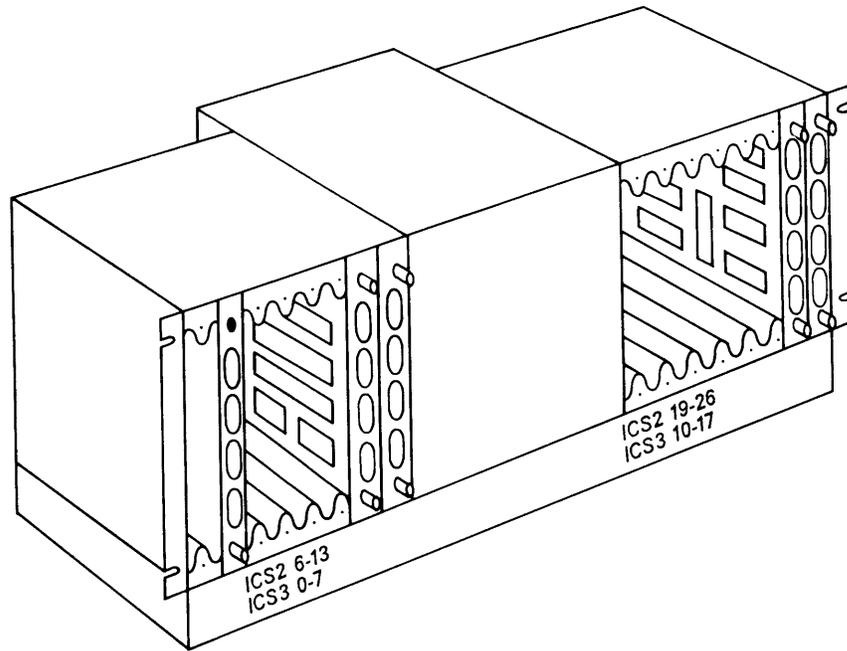
Inconsistent ASYNC warm start configuration for ICS device <dd>:
an async line card has been inserted into slot <ss>.

Inconsistent ASYNC warm start configuration for ICS device <dd>:
the async line card in slot <ss> is now inoperable.

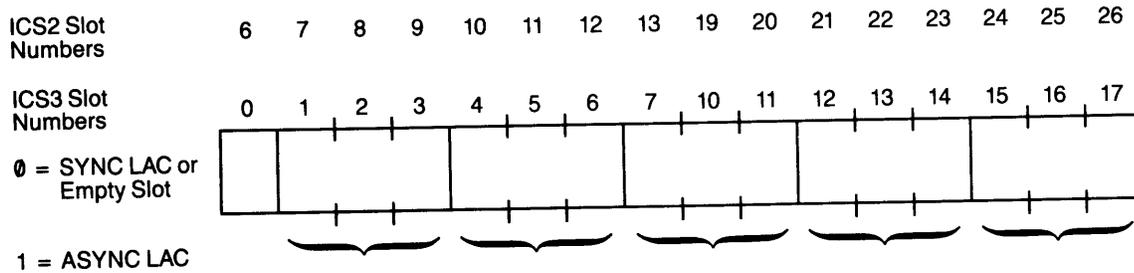
Inconsistent ASYNC warm start configuration for ICS device <dd>:
the async line card in slot <ss> has been removed or is now inoperable.

Inconsistent ASYNC warm start configuration for ICS device <dd>:
a sync line card has been inserted into slot <ss>.

ICS Card Cage



ICS Card Cage Inventory



Conversion Table

Binary	000	001	010	011	100	101	110	111
Octal	0	1	2	3	4	5	6	7

FIGURE 3-1. ICS CARDS Directive Template

► **ICS INPQSZ *DMQ-size***

Sets the size of all the ICS input queues: one pair for every eight lines. In general, the default size is adequate unless there are high-volume, high-input rate devices, such as block mode terminals, and memory is limited. When an invalid *DMQ-size* is supplied, cold start fails and an error message is displayed at the supervisor terminal.

Argument

DMQ-size The size in halfwords, (one character per halfword) of the DMQ buffers. *DMQ-size* must be less than 1777₈ and equal to one less than a power of two. The default is 77₈ halfwords (63). Examples of possible queue sizes are 17₈, 37₈, 77₈, 177₈, 377₈, and 777₈.

► **ICS INTRPT *rate***

Sets the asynchronous interrupt rate for ICS controllers.

Argument

rate Specifies the number of interrupts per second. The minimum value is 12₈ (10) (default). The recommended value is 36₈ (30). The maximum value is 144₈ (100). The interrupt rate must be in multiples of 10 milliseconds.

Calculating Interrupt Rates: In most cases it is not necessary to increase the ICS interrupt rate. If increased buffer sizes do not correct perceptible bursts of output for block mode devices and full-screen graphics packages, increase the interrupt rate to improve performance. For more information on I/O interrupt rates read the section, The ICS I/O Interrupt Rate, on page 6-5. To set a value between 12₈ and 144₈, use Table 3-2.

TABLE 3-2. *ICS Interrupt Rates*

<i>Interrupt Rate</i>	<i>Decimal Equivalent</i>	<i>Time Between Interrupts (ms)</i>
12 ₈	10	100
13 ₈	11	90
14 ₈	12	80
15 ₈ ,16 ₈	13,14	70
17 ₈ ,20 ₈	15,16	60
21 ₈ -24 ₈	17-20	50
25 ₈ -31 ₈	21-25	40
32 ₈ -41 ₈	26-33	30
42 ₈ -62 ₈	34-50	20
63 ₈ -144 ₈	100	10

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When the value supplied for the ICS INTRPT rate is less than the minimum or greater than the maximum, the ICS INTRPT directive substitutes the minimum value, 12₈, or the maximum value, 144₈, as appropriate, and cold start continues. In both cases the following message is displayed.

```
BAD ICS DIRECTIVE: INTRPT
```

► LHC *number address*

Sets the address assignment for a LAN300 Host Controller (LHC) to agree with its logical controller number. The most recent LHC directive overrides any existing address assignment.

Arguments

number Indicates the logical number assigned to the LHC in the NTS configuration file. *number* ranges from 0 through 7. This number is also used in the PRIMENET and NTS configuration files.

address Specifies the LHC controller's physical device address in octal. Valid addresses are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 50₈, 51₈, 52₈, 53₈, 54₈, and 56₈.

Use the LIST_COMM_CONTROLLERS command to display the current logical controller number and the octal device address. You can obtain the two-digit octal device address with the STATUS COMM command, as well. The LHC directive detects several error conditions, typically missing or out-of-range arguments. When an error is recognized, the directive is aborted and no action is taken unless indicated below.

Bad LHC directive, LHC number must be between 0-7.

This message is displayed when the logical controller number is out of range.

Bad LHC directive, missing arguments.

This message is displayed when either one or both numerical arguments are omitted.

LHC directive ignored, device at <nn> is not an LHC.

This message is displayed when an attempt is made to associate an LHC with a device address *nn* that is currently being used by another type of controller.

LHC directive ignored, no LHC at address <nn>.

This message is displayed when an attempt is made to associate an LHC with a physical device address *nn* that is currently not in the system.

LHC <n> overrides LHC <m> with address <nn>.

This warning message is displayed to alert the System Administrator when more than one LHC is mapped to a single physical device address. Remember, the most recent directive takes precedence over any existing directives for LHC *m*, and the LHC *n* is assigned to address *nn*.

► **NAMLC *number***

Specifies the maximum number of local assignable asynchronous lines that can be used simultaneously. The default is 0. You must refer to the formula shown in Table 3-3 when you calculate the value for NAMLC. If *number* exceeds the total number of lines configured as assignable lines, the following message is displayed at cold start:

Warning: There are not enough async lines present on this system to support the <number> assignable lines requested by the NAMLC directive.

TABLE 3-3. *Total Number Of Processes at Rev. 22.0*

NTUSR	Number of local terminal users
NPUSR	Number of phantom users
NRUSR	Number of remote PRIMENET users
NSLUSR	Number of slave users
+ <u>NTSUSR</u>	<u>Number of NTS terminal users</u>
< or = 960	Total number of interactive users
NAMLC	Number of local assignable lines
+ <u>NTSASL</u>	<u>Number of NTS assignable lines</u>
< 1024	Total number of processes

► **NPUSR *number***

Sets the total number of phantom users available. The default and minimum is 4. The maximum is 1700₈ (960). You must refer to the formula shown in Table 3-3 when you calculate the value for NPUSR.

At Rev. 22.0 a new process type, system server replaces most phantoms previously required by the operating system. Certain products, however, continue to require phantoms. Whenever you install a new product, refer to the product's installation guide to determine if it requires a phantom.

► **NRUSR *number***

Specifies the total number of concurrent PRIMENET remote login users. The default and minimum is 0. The maximum is 77₈ (63). You must refer to the formula shown in Table 3-3 when you calculate the value for NRUSR.

Dialup users who connect through modems to your system are considered local users and are not included in NRUSR. Similarly, NTS users are not included in this total.

Note

The total number of processes available to remote and slave users combined was increased to 249 at Rev. 21.0. You can configure up to 127 remote logthrough users as well. However, only 249 can be active at one time. An attempt to exceed that limit produces an error message stating that the resource is temporarily unavailable.

► **NSLUSR *number***

Specifies the total number of slave processes or other NPX users available to access files on a local system for remote users. Each remote user requires a local slave process for the duration of the session. NTS users must configure at least one slave to receive messages from operators on other nodes. The default and minimum value is 0. The maximum value is 77₈ (63). You must refer to the formula shown in Table 3-3 when you calculate the value for NSLUSR.

If all slave users are assigned when a remote user makes an attach request, the following error message is displayed.

```
No NPX slaves available (ATTACH)
```

Note

The total number of processes available to remote and slave users combined was increased to 249 at Rev. 21.0. You can configure up to 127 remote log-through users as well. However, only 249 can be active at one time. An attempt to exceed that limit produces an error message stating that the resource is temporarily unavailable.

► **NTSABF**

The NTSABF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your NTSABF directives with CAB commands.

► **NTSASL *number***

Specifies the maximum number of NTS assignable lines that can be used simultaneously on your system. The default is 0. You must refer to the formula shown in Table 3-3 when you calculate the value for NTSASL.

► **NTSBUF**

The NTSBUF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your NTSBUF directives with CAB commands.

► **NTSUSR *number***

Specifies the maximum number of simultaneous NTS terminal users. The default is 0 and the maximum is 1000₈ (512). You must refer to the formula shown in Table 3-3 when you calculate the value for NTSUSR.

► **NTUSR *number***

Specifies the number of local terminal users, including the supervisor terminal. NTS terminal users are not included in this total. NTUSR must be included in your configuration file. The minimum value of *number* is 2₈ and the maximum is 1000₈ (512). NTUSR has no default value. You must refer to the formula shown in Table 3-3 when you calculate the value for NTUSR.

If you attempt to specify more terminal users than the actual number of physical lines available, the following message is displayed.

```
Warning: The <number> directly-connected login lines requested by the
NTUSR directive exceed the <actual number> async lines present on
this system. Only <actual number> login lines will be available.
```

► **REMBUF**

The REMBUF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your REMBUF directives with CAB commands.

► **SYNC**

The four SYNC directives are detailed below. Here is a summary of their purposes:

SYNC CNTRLR Associates a device address with a logical controller number and a communications protocol.

SYNC DSC Specifies data set control information.

SYNC ON Enables the configuration of synchronous communication drivers.

SYNC SYNCnn Associates a controller's physical line with a logical line number.

Note

At Rev. 21.0 the COMM_CONTROLLER command duplicated the functionality of the existing SYNC configuration directives for ICS controllers. You can use either one or a combination of both. See Chapter 2, Operating Intelligent Controllers, for a complete description of the COMM_CONTROLLER command.

► **SYNC CNTRLR *controller device-address protocol***

Assigns a physical controller address to a logical controller number with a particular protocol. This directive must be given before any SYNC SYNCnn directive. It enables MDLC, ICS2, or ICS3 controllers to handle synchronous communications.

Arguments

controller The logical controller number. Valid values are 0, 1, or 7. Any other number produces the error message:

BAD SYNC CONTROLLER MAPPING COMMAND.

The value 7 is for SDLC or ASYNC_SDLC only and allows multiple controllers (that only support SDLC) to be configured. You can have more than one controller number 7.

device-address The physical device address of the specified controller given in octal. Valid ICS addresses are 10₈, 11₈, 15₈, 16₈, 17₈, 32₈, 35₈, 36₈, 37₈, 52₈, 53₈, and 54₈. The manufacturer usually gives ICS2 or ICS3 controllers an address of 10₈ or 11₈, and ICS1 controllers an address of 36₈ or 37₈. Your customer service representative can help you change the preset on-board address if you have several controllers. The default values are address 50₈ for controller 0 and 100000₈ (disabled address) for controller 1. Note that device address 50₈ is usually an MDLC. If you use controller 1, its address must not conflict with the address of any other peripheral controller.

protocol One or more tokens, specifying communications protocols. The tokens select files to be downline loaded into an ICS2 or ICS3 controller. Use this argument only with an ICS2 or ICS3. See Table 3-4 for valid protocol combinations.

Entering a protocol token for a controller other than an ICS2 or ICS3 controller causes the following error message to be displayed:

Error: Controller <xx> does not support sync protocols
(COMINI)

where *xx* is the device address of the controller.

Useful Configuration Directives

If the protocol token is omitted, the following error message appears:

```
Error: protocol combination not supported on <nnn>  
       device address <dd> (BTPCC).
```

Note

If the SYNC CNTRLR directive is omitted entirely, the default protocol (ASYNC) is loaded to any ICS controllers.

If you map one logical controller to a previously mapped address, SYNC automatically disables (without warning) the previously mapped controller, setting its address to 100000₈. A new mapping directive enables the disabled controller. For example, the following directives map controller 1 to address 10₈ and controller 0 to address 11₈:

```
SYNC CNTRLR 1 10 ASYNC_HDLC  
SYNC CNTRLR 0 11 BSCRJE_BSCX25
```

The *protocol* argument selects appropriate downline load files to support the specified protocol combination.

You can also disable a logical controller by setting its address to blank or to 100000₈. For example, either of the following directives can disable controller 0:

```
SYNC CNTRLR 0 100000  
SYNC CNTRLR 0
```

Valid Protocol Token Combinations: Valid protocol tokens are ASYNC, SDLC, HDLC, BSCX25, and BSCRJE. Table 3-4 lists valid protocol token combinations and downline load file numbers. You can enter the protocol tokens in any order on the command line, provided that they are separated by an underscore, as shown in Table 3-4. Available memory for protocols is limited in the ICS2. You can choose as many as four protocols for an ICS2. ICS3 controllers have sufficient memory to support any combination of protocols. If you want all five protocols on your ICS3, use the downline load file ICS3_01.DL

To conserve space, you can delete unused downline load files from the DOWN_LINE_LOAD* directory.

► SYNC DSC *line strap proc recv*

Specifies data set control (DSC) information used by DPTX/BSCMAN for a logical line provided by SMLC or MDLC controller. Use SYNC DSC for DPTX/BSCMAN only. If specified, SYNC DSC must appear after any SYNC SYNCnn directives.

TABLE 3-4. ICS Downline Load Files and Protocol Combinations

<i>DLL File</i>	<i>Protocol Token Combination</i>
ICS2_01.DL	ASYNC.DL
ICS2_02.DL	ASYNC_HDLC_SDLC
ICS2_03.DL	BSCRJE_BSCX25_HDLC_SDLC
ICS2_04.DL	ASYNC_BSCRJE_BSCX25
ICS3_01.DL	ASYNC_BSCRJE_BSCX25_HDLC_SDLC

Arguments

line The logical line number (00-07) represented by *nn* in the SYNC SYNCnn directive.

strap A bit pattern that indicates specific data set signals to be strapped on by the software. Speed select (the 10₈ bit) is for European equipment. The bits for forming the pattern are as follows:

01₈ Data Terminal Ready (DTR). The default is 1.

02₈ Request to Send (RTS).

10₈ Select fast data set. 00 selects slow data set. (Europe only.)

proc The data set control procedure to be used for transmitting data. The procedures are as follows:

1 No data set orders. Usually used with DTR and RTS strapped on, with modems used for four-wire full-duplex service.

2 Use data set orders as follows: issue RTS, wait for clear to send (CTS), send, drop RTS. Usually used with most half-duplex modems. The default is 2.

3 Use data set orders as follows: wait for .NOT. Carrier Detect (CD), issue RTS, wait for CTS, send, drop RTS. Rarely used, but may be necessary with 201-series modems only if lines are very noisy. Try 2 first.

recv Indicates whether the receiver is to be turned on before or after transmitting. The settings are as follows:

- 0 Turn on receiver before transmitting. This setting provides a faster response and should be used if possible. The default is 0.
- 1 Turn on receiver after transmitting. This setting must be used with two-wire 201-series modems. This setting may be tried on other two-wire systems only if problems appear that cannot be solved by other means.

The default setup, if no DSC is specified, is the equivalent of including the following line in the configuration file:

```
SYNC DSC line 1 2 0
```

► SYNC ON

Configures synchronous communication drivers for the synchronous communication controllers.

SYNC ON must be specified when synchronous lines are used for products other than PRIMENET. The default configuration for SYNC ON is given below.

<i>Logical Line Number</i>	<i>Logical Controller</i>	<i>Controller Address</i>	<i>Controller Physical Line Number</i>
00	0	50 ₈	0
01	0	50 ₈	1
02	0	50 ₈	2
03	0	50 ₈	3
04	1	100000 ₈	0
05	1	100000 ₈	1
06	1	100000 ₈	2
07	1	100000 ₈	3

Logical lines 00 to 03 are mapped to logical controller 0. The physical device address is 50₈, with physical line numbers 0 to 3. (Note that the MDLC device address is usually 50₈ or 51₈.)

Logical lines 04 to 07 are mapped to physical lines 0 to 3 on logical controller 1. Controller 1's physical address is 100000₈, indicating that the controller is disabled. To enable controller 1, set its address to a valid device address (50₈ or 51₈) with the SYNC CNTRLR directive.

You can change the default configuration with the SYNC CNTRLR and SYNC SYNCnn directives, which are described in this chapter. SYNC CNTRLR changes the mapping of the logical controller to the physical address. SYNC SYNCnn changes the mapping of a single logical line number.

You may use either directive separately. If you need both directives, you *must* give the SYNC CNTRLR directive(s) first. In other words, you must assign the controller its correct physical address before you assign any new SYNC lines to it.

Always specify synchronous line configuration explicitly. Do not rely on the default configuration for lines to be used or for lines to be left unused.

Be sure to override the default configuration when synchronous lines are configured on two controllers, one of which is not device address 50₈.

► **SYNC SYNCnn controller line-number**

Maps a logical line number to a physical line number on a specified logical controller.

SYNC SYNCnn is used for X.25/RJE, but not for SDLC.

Arguments

- nn** The logical line number. The values are 00 to 07.
- controller** The logical controller number set by a SYNC CNTRLR directive. The values are 0₈, 1₈, or 100000₈. Use 0₈ or 1₈ to identify a controller. Use 100000₈ when the specified line is not to be configured or allocated memory. (7 is not accepted.) The default is 100000₈.
- line-number** The physical line number on the specified controller onto which the logical line number is mapped. (For ICS2 or ICS3 sync LAC physical line numbering, see the *ICS User's Guide*.) If the controller is an ICS1, *line-number* must be 0. The default values map SYNC00 to SYNC03 to physical lines 0 to 3 on the first controller, and SYNC04 to SYNC07 to physical lines 0 to 3 on the second controller. This value must be specified unless *controller-number* is 100000₈ or is unspecified.

For example, the following directive assigns logical line 4 to physical line 3 on controller 1:

```
SYNC SYNC04 1 3
```

Setting the controller number either to a blank or to 100000₈ disables a logical line number. For example, either of the following directives disables logical line 07:

```
SYNC SYNC07  
SYNC SYNC07 100000
```

Giving any value for *controller-number* other than 0, 1, blank, or 100000, produces the following error message:

```
BAD SYNC LINE MAPPING COMMAND
```

CONFIGURING ASYNCHRONOUS LINES

Asynchronous communication is a method of transmitting data in which each character is sent separately. The time intervals between transmissions can vary. Therefore, each character is identified by a start bit and followed by one or more stop bits.

Asynchronous lines connect terminals, modems, and peripheral devices, such as printers and plotters, to your system. Figure 4-1 shows a typical system and the types of devices that communicate via asynchronous lines.

The first part of this chapter discusses how to configure your system's asynchronous communication lines with the `SET_ASYNC` command and its companion, the `CONVERT_AMLC_COMMANDS` utility. The second part provides background information on how to select protocols, determine line numbers, and use Auto Speed Detect.

For information on configuring synchronous lines for devices that use half-duplex or packet data exchanges, see the explanation of the `SYNC` directives in Chapter 3, Useful Configuration Directives.

`SET_ASYNC` is a functional replacement, with extensions, for the `AMLC` command. It accepts data in the form of command line options that are straightforward and easy to understand.

Caution

The `AMLC` command became obsolete at Rev. 20.2. You cannot use the `AMLC` command on systems with more than 255 lines. For information on the `AMLC` command, see Appendix A, Obsolete and Rarely Used Commands.

If your `PRIMOS.COMI` file contains `AMLC` commands, use the `CONVERT_AMLC_COMMANDS` utility to translate them to their equivalent `SET_ASYNC` commands. Before upgrading your `PRIMOS.COMI` file read the two following sections, the `SET_ASYNC` Command on page 4-4, and the `CONVERT_AMLC_COMMANDS` Utility on page 4-17.

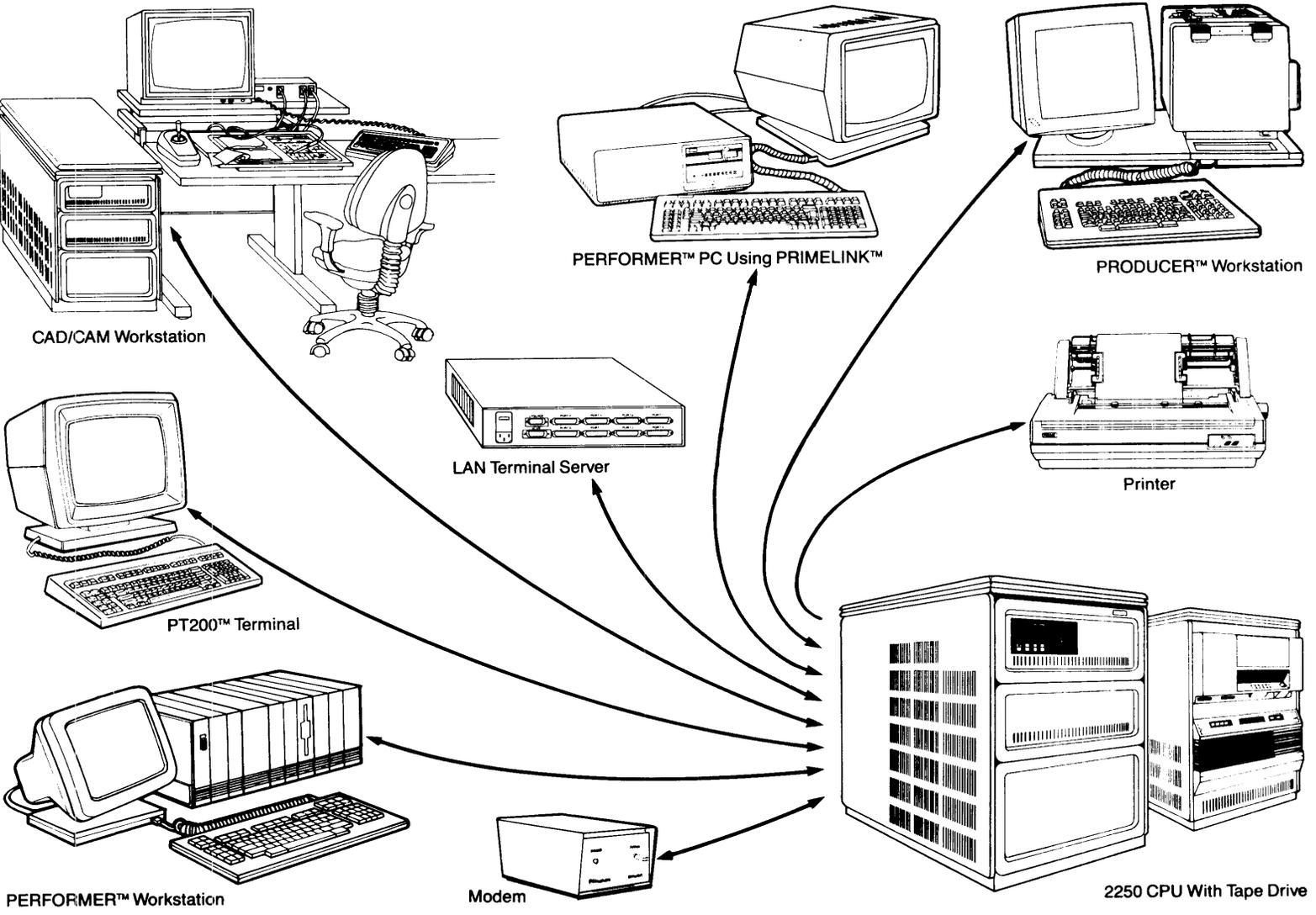


FIGURE 4-1. Asynchronous Lines Connect Terminals and Peripherals to Your System

HOW TO CONFIGURE ASYNCHRONOUS LINES

Use this procedure to configure asynchronous lines. The parameters take effect the next time you cold start your system.

Procedure

1. Calculate the values for the following configuration directives:

NTUSR	Number of local terminal users
NPUSR	Number of phantom users
NRUSR	Number of remote PRIMENET users
NSLUSR	Number of slave users
+ NTSUSR	<u>Number of NTS terminal users</u>
< or = 960	Total number of interactive users
NAMLC	Number of local assignable lines
+ NTSASL	<u>Number of NTS assignable lines</u>
< 1024	Total number of processes

At PRIMOS Rev. 22.0 4050, 4150, 6150, 6350, and 6550 systems support as many as 960 interactive users. All other systems support as many as 600.

For instructions on calculating these values, see Chapter 3, Useful Configuration Directives, and the *System Administrator's Guide, Volume 1: System Configuration*.

2. Use the PRIMOS octal conversion function in conjunction with the TYPE command, as shown below, to display the octal equivalent of the decimal values.

```
TYPE [TO_OCTAL 64]
100
```

3. Use EMACS or ED to include these values in your configuration file.
4. Optionally, use the CAB command to change buffer sizes to fine-tune the system and increase performance. This command is described in Chapter 6, Allocating I/O Buffers.
5. Use the SET_ASYNC command in your PRIMOS.COMI file to define assignability, protocols, baud rates, and other parameters for asynchronous lines.

THE SET_ASYNC COMMAND

The SET_ASYNC command defines terminal line characteristics for an individual asynchronous line or a range of consecutively numbered lines. These lines can be local lines connected to AMLC and ICS controllers, as well as NTS lines connected to an LTS.

Usually, you put SET_ASYNC commands in your PRIMOS.COMI file, so that all asynchronous lines are configured on your system at cold start. However, you can also use the SET_ASYNC command while the system is running to alter the characteristics of a particular line. Individual users can temporarily change the characteristics of their own line or any lines that they have assigned. These changes remain in effect until the user logs out or issues another SET_ASYNC command.

Certain options, such as -USER_NUMBER, -ASSIGNABLE, -DISLOG, -SPEED_DETECT, -LOOP_LINE, and their converses, are hardware or configuration dependent. These options are reserved for the System Administrator and DSM privileged users.

WARNING

At Rev. 22.0 the meaning of the -USER_NUMBER option changed. Prior to Rev. 22.0, you could eliminate unused default buffers by changing the user number associated with the line. This is no longer necessary or possible at Rev. 22.0, because the buffers are now associated with the line, not with the user number. You must use the CAB command to change the size of the buffers logically associated with the line instead.

Users also can issue the TERM command interactively at the keyboard or in a LOGIN.CPL file to specify full-duplex or half-duplex mode, disable the break character (CONTROL-P), and recognize XON/XOFF. For a detailed description of the TERM command, see the *PRIMOS Commands Reference Guide*.

Caution

SET_ASYNC accepts decimal numbers only. Octal numbers are *not* supported.

Command Format

SET_ASYNC { -DISPLAY [-LINE *n*]
 -LINE *n* [-TO *n*]
 -HELP } [Options]

Arguments

- DISPLAY** Displays the current characteristics for the line.
- HELP** Displays the format of the command and a complete list of available options. The options that are restricted for the System Administrator's use are clearly marked.
- LINE *n*** Configures a line (or lines) with the selected options, where *n* is the required *decimal* line number or, when used with the -TO option, the first line number in a series configured with identical options. Valid line numbers range from 0 to 511 for local lines and from 1024 to 1536 NTS lines.
- TO *m*** Configures a range of consecutively numbered lines with identical options, where *m* specifies the last line number in a series beginning at the line number *n* given in -LINE. The value *m* must be greater than *n*.

There are many options to the SET_ASYNC command. An alphabetical list of options and valid abbreviations is provided in Table 4-1 for your convenience.

TABLE 4-1. SET_ASYNC Options and Abbreviations

Option	Abbreviation	Option	Abbreviation
-ASSIGNABLE *	-ASGN	-NO_ECHO	-NO_ECHO
-CHAR_LENGTH	-CL	-NO_ERROR_DETECTION	-NO_ERRDET
-DATA_SENSE_ENABLE	-DSE	-NO_LINE_FEED	-NOLF
-DATA_SET_CONTROL	-DSC	-NO_LOOP_LINE *	-NOLOOP
-DATA_SET_SENSE	-DSS	-NO_REVERSE_XOFF	-NOREVXOFF
-DEFAULT	-DEF	-NO_SPEED_DETECT *	-NOSD
-DISLOG *	-DISLOG	-NO_XOFF	-NO_XOFF
-DISPLAY	-DP	-PARITY	-PAR
-ECHO	-ECHO	-PROTOCOL	-PRO
-ERROR_DETECTION	-ERRDET	-REVERSE_XOFF	-REVXOFF
-HELP	-H	-SPEED	-SPEED
-LINE	-LINE	-SPEED_DETECT *	-SD
-LINE_FEED	-LF	-STOP_BITS	-SB
-LOOP_LINE *	-LOOP	-SYSTEM	-SYS
-NO_DATA_SENSE_ENABLE	-NODSE	-TO	-TO
-NO_DATA_SET_CONTROL	-NODSC	-USER_NUMBER *	-USER
-NO_DISLOG *	-NO_DISLOG	-XOFF	-XOFF

(*) = Restricted to the System Administrator

Note

These options replace the octal bitstrings used by the obsolete AMLC command. To find out the SET_ASYNC equivalent of a given AMLC command, use the interactive form of the CONVERT_AMLC_COMMANDS utility described on page 4-17.

Options

-ASSIGNABLE *status* Indicates if the line is an assignable line, where *status* can be either YES or NO (default). This option is restricted to the System Administrator. You must specify SET_ASYNC -LINE *n*
-ASGN -ASGN NO to convert a previously assignable line to a regular login line. For more information, see Chapter 5, Assignable Asynchronous Lines.

-CHAR_LENGTH *n* Sets the number of information and parity bits per character. *n* can be 5, 6, 7, or 8 (default). Character length can be adjusted for the nonstandard character sizes required by Baudot terminals, telex lines, or foreign devices. PRIMOS right-justifies the bits in a byte, sets the leftmost bits to zero, and forces the high-order bit on. Use -CL 8 with the Prime ECS protocols TTY8 and TTY8HS because these protocols toggle the high-order bit on and off to access special characters.
-CL

The example below uses one stop bit.

	<i>Length</i>	<i>Bit pattern</i>	
-CL 5	STOP	000XXXXX	START
-CL 6	STOP	00XXXXXX	START
-CL 7	STOP	0XXXXXXX	START
-CL 8	STOP	XXXXXXXX	START

-DATA_SENSE_ENABLE
-DSE Enables the DATA_SET_SENSE protocol, also known as reverse channel protocol. Use this option for transmitting control information or for controlling the flow of data to devices that do not recognize XON/XOFF. NO_DATA_SENSE_ENABLE is the default.

-NO_DATA_SENSE_ENABLE
-NODSE Disables the DSS protocol (reverse channel). This is the default.

-DATA_SET_CONTROL Required by modems and port selectors to recognize when a block of information is transmitted. This is the default. -DSC
-DSC is ignored by terminals. Do not use -DSC on NTS lines.

-NO_DATA_SET_CONTROL
-NODSC Disables the -DSC option.

-DATA_SET_SENSE *ready_value*
-DSS Supports devices that toggle an RS-232-C pin (usually pin 8) to

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indicate when they are busy/ready instead of using XON/XOFF. The DSS protocol sets *ready_value* as either HIGH (pin signal raised) or LOW (pin signal lowered). The default is HIGH. Some devices use pins other than pin 8. If this is the case, ask your Customer Support Center to arrange your cables so that the data set sense signal is wired into the pin used for carrier detect.

If you use the -DSS, you must specify -NO_XOFF and use -DSE and -NO_DSE to enable and disable flow control.

Data set sense is also referred to as buffered protocol or reverse channel protocol.

-DEFAULT
-DEF

Sets all options to their default settings, shown in Table 4-2 on page 4-8, unless you specify other options in the command line. For example, the -DEFAULT option can be used to configure a line for a 9600-baud terminal:

```
SET_ASYNC -DEFAULT -LINE 78 -SPEED 9600
```

-DISLOG

Automatically logs out the user if the line is disconnected or the carrier signal is logically low. DISLOG cannot be used for NTS lines and is restricted to the System Administrator. This option overrides the functionality of the global configuration directive DISLOG NO for individual lines. For more information on the DISLOG directive, see Chapter 3, page 3-9.

-NO_DISLOG

Disables DISLOG. -NO_DISLOG is restricted to the System Administrator. The global configuration directive DISLOG YES overrides a per-line SET_ASYNC -NO_DISLOG command.

-ECHO

Sets the line so that characters echo on the screen (full-duplex). This is the default.

-NO_ECHO

Sets the line so that characters do not echo on the screen (half-duplex). -ECHO is the default.

-ERROR_DETECTION
-ERRDET

This is used only for testing. When an input buffer overflows or when a parity error is detected, the incoming character is replaced with an ASCII 225, NAK. -NO_ERROR_DETECTION is the default.

-NO_ERROR_DETECTION
-NO_ERRDET

Prevents the line from sending an ASCII NAK character if an input parity or input buffer overflow error is sensed. This is the default.

TABLE 4-2. *Default Settings for Asynchronous Lines
Provided by the SET_ASYNC -DEFAULT Option*

<i>Option</i>	<i>Default Setting</i>
-ASSIGNABLE NO	Line is a login line.
-CHAR_LENGTH 8	Character length is 8 bits.
-DATA_SET_CONTROL	Enables modems and port selectors to recognize when information is being transmitted.
-ECHO	Full-duplex line.
-LINE_FEED	Echo both LINE FEED and RETURN for each RETURN.
-NO_DATA_SENSE_ENABLE	Data Set Sense is disabled.
-NO_DISLOG	Disables automatic disconnect.
-NO_ERROR_DETECTION	Input parity or input buffer overflow are not flagged with an ASCII NAK (negative acknowledgement) in the input buffer.
-NO_LOOP_LINE	Line is not in loopback mode.
-NO_REVERSE_XOFF	Reverse Flow Control is not enabled.
-NO_SPEED_DETECT	Disables Auto Speed Detect.
-PARITY NONE	Line parity disabled.
-PROTOCOL TTY	Line uses the terminal protocol.
-SPEED 1200¹	Line speed is 1200 bits per second.
-STOP_BITS 1	One stop bit.
-XOFF	CONTROL-S stops and CONTROL-Q resumes the flow of data from the system to the terminal.

-LINE_FEED Echos a line feed character for the RETURN key. This option is
-LF valid only when **-NO_ECHO** (half-duplex) is specified. This is
the default.

-NO_LINE_FEED Does not echo a line feed character for RETURN. **-LINE_FEED**
-NOLF is the default.

¹Use the **-SPEED** option with the **-DEFAULT** option for terminals that operate at other speeds.

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-LOOP_LINE
-LOOP Verifies if data is accurately transmitted. A software-enabled hardware loopback is used to send and return data on the same line. This option is used only by the System Administrator for testing.

-NO_LOOP_LINE
-NOLOOP Disables the **-LOOP_LINE** option. This is the default. This option is restricted to the System Administrator.

-PARITY *value*
-PAR Sets the line parity to the desired setting or disables parity. *value* can be ODD, EVEN, or NONE (default). Parity checking is a common method of error detection. The transmitting device appends a parity bit to the end of each character based on the number of zeros or ones in the character. The receiving device calculates the parity as it reads the character, and, if the parity calculated agrees with the parity bit setting, accepts the character.

-PROTOCOL *name*
-PRO Defines the format and relative timing of data, where *name* may be any of the following:

TTY TTYUPC TT8BIT TTY8
TRAN TTYNOP ASD TTY8HS

For more information, see the sections Standard Communication Protocols on page 4-22, and Enabling Auto Speed Detect on page 4-26.

Do not use ASD or TTYNOP on an NTS line.

The obsolete protocols TTYHS, TRANHS, and TTYHUP are supported for older model 5054 AMLC controller boards.

-REVERSE_XOFF
-REXOFF Enables Reverse Flow Control (RFC) for asynchronous lines. **-NO_REVERSE_XOFF** is the default. RFC sends XOFF characters to a device when the PRIMOS input buffer is 60% full. When the input buffer drops to 20% full, an XON character is sent to the device to indicate that transmission can resume.

RFC also attempts to prevent DMQ input queue overruns for all ICS3 controllers and any ICS2 controllers that are not using BSC and ASYNC protocols.

Choose this option only for lines connected to devices that can interpret XON and XOFF characters (such as PT45™, PST100™, PT200™, and PT250™ terminals).

-NO_REVERSE_XOFF
-NOREVXOFF Disables Reverse Flow Control for the line. This is the default.

-SPEED *value* Sets the baud rate for the line, where *value* may be any of the following baud rates:

50	200	2400	19200	
75	300	3600	CLOCK	(2)
110	600	4800	J1	(3)
134.5	1200 (1)	7200	J2	(3)
150	1800	9600	J3	(3)

- (1) Supplied with the -DEFAULT option
- (2) Speed set with AMLCLK directive
- (3) Speeds set with the ASYNC JUMPER directive

You can have as many as eight different speeds configured on your system at one time. For further information on the ASYNC JUMPER and AMLCLK directives, see Chapter 3, Useful Configuration Directives.

The maximum speed for the last AMLC line is 300 baud. The recommended speed is 110 baud. For more information see the section, AMLC I/O Interrupt Rate, on page 6-5.

At Rev. 22.0 ICS lines can use any speed from the list above.

-SPEED_DETECT
-SD Enables Auto Speed Detect to determine the speed of incoming data on the line. -SPEED_DETECT is equivalent to the protocol ASD. It is particularly useful for dialup lines. When you use this option, set the sample speed to -SPEED 9600. This option is restricted to the System Administrator. Do not use -SPEED_DETECT on an NTS line.

-NO_SPEED_DETECT
-NOSD Disables Auto Speed Detect. This option is restricted to the System Administrator.

-STOP_BITS *n*
-SB Signals the receiving device to wait for the next character, where *n* defines the number of stop bits to use, either 1 (default) or 2. All characters have 1 start bit, 1 parity bit, 7 information bits, and either 1 or 2 stop bits. Some devices that operate at slower speeds require 2 stop bits between characters. For this reason, an 8-bit character length and 2 stop bits totaling 11 bits are often used for devices that operate at 110 baud.

-SYSTEM
-SYS Restores the line characteristics to the cold-start values contained in the PRIMOS.COMI file, or the most recent values set by SET_ASYNC command issued at the supervisor terminal.

-XOFF Recognizes CONTROL-Q and CONTROL-S (-XON and -XOFF) to stop and start the flow of data on the line from the host to the terminal. This is the SET_ASYNC default.

-NO_XOFF Disables CONTROL-S and CONTROL-Q. Use this option for devices that transmit these control key sequences for other reasons. -XOFF is the default.

Obsolete Option

-USER_NUMBER *n* Associates a buffer with a physical line, where *n* is the decimal user number. The default value is the line number specified in the -LINE option, plus 2. This option is restricted to the System Administrator.
-USER

WARNING

Prior to Rev. 22.0, you could eliminate unused default buffers by changing the user number associated with the line. This is no longer necessary or possible at Rev. 22.0, because the buffers are now associated with the line, not with the user number. You must use the CAB command to change the size of the buffers logically associated with the line instead.

Examples

Groups: The SET_ASYNC command line can configure a group of terminals attached to consecutive lines with a specific option or group of options. In the command line below, reverse flow control is enabled for ten terminals.

```
SET_ASYNC -LINE 129 -TO 138 -DEF -PRO TTY -SPEED 9600 -REVOFF
```

Unused Lines: If you have a line or group of lines that are not connected to terminals, use the TTYNOP to prevent the CPU from wasting time attempting to interpret random electrical noise as commands. Use TTYNOP for any unused lines on a controller board. The following command configures five lines that are not currently connected to any devices.

```
SET_ASYNC -LINE 172 -TO 176 -PRO TTYNOP
```

Printers: TTYNOP is useful for printers, plotters, and other peripheral devices that do not carry on an interactive dialog with the CPU. The SET_ASYNC command shown below configures a line connected to a plotter.

```
SET_ASYNC -LINE 81 -PRO TTYNOP -SPEED 300
```

Modems: The SET_ASYNC command can configure dialup lines to automatically detect incoming baud rates and temporarily adjust the line's baud rate. This enables the dialup user to communicate with the Prime host. Modems also require DSC to recognize blocks of incoming data. If you have dialup lines or modems, include the DTRDRP, AMLTIM, LOUQTM, ASYNC JUMPER, and, optionally, DISLOG directives in your configuration file. In the example below, one SET_ASYNC command sets ASD, DSC, a sample speed of 9600 baud, and a per-line DISLOG to log out the user if the line is disconnected.

```
SET_ASYNC -LINE 28 -DEF -SPEED_DETECT -SPEED 9600 -DSC -DISLOG
```

Internal Clocks: The last line of the last AMLC controller, in this example the eighth controller, sets the AMLC I/O interrupt rate for all lines attached to AMLC controllers. For more information on hardware defined clocks and timers, read the section, The AMLC I/O Interrupt Rate, in Chapter 6. The following SET_ASYNC command configures the line to ignore any incoming signals and sets the timer to 10 interrupts per second.

```
SET_ASYNC -LINE 127 -PRO TTYNOP -SPEED 110 -SB 2
```

Assignable Lines: One SET_ASYNC command line can create a group of assignable lines. In this example, there are six assignable lines and the corresponding value of NAMLC is six. After issuing the ASSIGN command, the user can issue the SET_ASYNC command interactively to change the protocol or specify other options.

```
SET_ASYNC -LINE 194 -TO 199 -ASGN YES -PRO TRAN
```

Specific Devices: Issue individual SET_ASYNC commands for lines attached to devices that require special protocols, speeds, or options. The following command configures a line for an Arabic terminal.

```
SET_ASYNC -LINE 87 -PRO TT8BIT -PAR ODD -SPEED 9600
```

Some facilities use hard-copy terminals that cannot print lowercase characters. A SET_ASYNC command for such a device is shown below.

```
SET_ASYNC -LINE 17 -PRO TTYUPC -SPEED 110 -CL 7 -SB 2
```

The SET_ASYNC command can change flow control management from the standard XON/XOFF to DATA_SET_SENSE recognition for devices that toggle an RS-232-C pin. As shown in the command line below, DATA_SET_SENSE always requires DATA_SENSE_ENABLE and -NO_XOFF to operate.

```
SET_ASYNC -LINE 39 -DEF -DSE -DSS -NO_XOFF
```

Diagnostics: It is possible to run diagnostics without changing any existing parameters. The following SET_ASYNC command issued from the supervisor terminal returns the data transmitted on line 71 back to the host and inserts a special character, an ASCII NAK, to flag errors.

```
SET_ASYNC -LINE 71 -LOOP -ERRDET
```

Making Interactive Changes: The `SET_ASYNC -DISPLAY` and `-SYSTEM` options are particularly useful when you change your line's configuration from your terminal. In the following example, the `-DISPLAY` option is used to show the line's current characteristics. The `SET_ASYNC` command is issued interactively to change the speed from 9600 baud to 1200 baud and set the line to full-duplex. The `-DISPLAY` option is used a second time to verify these changes.

```
OK, SET_ASYNC -DISPLAY
```

```
[Set_Async Rev 22.0 (c) Prime Computer, Inc. 1988]
```

```
LINE = 20
  PARity      = NONE      NO_ECHO
  PROtocol    = TTY       NO_XOFF
  SPEED       = 9600      NO_LOOP
  Stop_Bits   = 1         Line_Feed
  Char_Length = 8         NO_Data_Sense_Enable
  REVerse_XOFF = OFF      NO_ERROr_DETectiOn
  ASSiGNable  = NO       NO_Speed_Detect
  Data_Sense_Set = LOW    NO_DISLOG
  Owner Process = 22     NO_Data_Set_Control
```

```
OK, SET_ASYNC -ECHO -SPEED 1200
```

```
OK, SET_ASYNC -DISPLAY
```

```
[Set_Async Rev 22.0 (c) Prime Computer, Inc. 1988]
```

```
LINE = 20
  PARity      = NONE      ECHO
  PROtocol    = TTY       NO_XOFF
  SPEED       = 1200      NO_LOOP
  Stop_Bits   = 1         Line_Feed
  Char_Length = 8         NO_Data_Sense_Enable
  REVerse_XOFF = OFF      NO_ERROr_DETectiOn
  ASSiGNable  = NO       NO_Speed_Detect
  Data_Sense_Set = LOW    NO_DISLOG
  Owner Process = 22     NO_Data_Set_Control
```

Use the `-SYSTEM` option to return the line to its cold start values when you are finished. Once again, you can issue the `SET_ASYNC -DISPLAY` to verify this.

```
OK, SET_ASYNC -SYSTEM
```

```
OK, SET_ASYNC -DISPLAY
```

```
[Set_Async Rev 22.0 (c) Prime Computer, Inc. 1988]
```

```
LINE = 20
  PARity      = NONE      NO_ECHO
  PROtocol    = TTY       NO_XOFF
  SPEED       = 9600      NO_LOOP
  Stop_Bits   = 1         Line_Feed
  Char_Length = 8         NO_Data_Sense_Enable
  REVerse_XOFF = OFF      NO_ERROr_DETectiOn
  ASSiGNable  = NO       NO_Speed_Detect
  Data_Sense_Set = LOW    NO_DISLOG
  Owner Process = 22     NO_Data_Set_Control
```

SET_ASYNC Error Messages

The SET_ASYNC command verifies command line options before it defines or changes an asynchronous line's characteristics. Typical errors involve contradictory, ambiguous, or incorrect values in the command line. If an error is detected, the command is aborted and no action is taken. One of the error messages below is displayed and you are returned to command level. However, if any error occurs that is termed WARNING in the error messages below, the command is processed.

All error messages display the line number that you specified, if possible. This is especially helpful when you specify multiple line numbers.

Bad buffer number. (SET_ASYNC)

The -USER_NUMBER option specified an invalid or out-of-range buffer number.

Bad line number. (SET_ASYNC)

An invalid or out-of-range line number was specified.

Bad protocol. (SET_ASYNC)

An invalid or unsupported protocol was specified.

Buffer in use. (SET_ASYNC)

An attempt was made to specify a buffer that is currently assigned to and in active use by another user or process.

-CHAR_LENGTH 8 must be specified with a -PARITY value of NONE (line <n>). (SET_ASYNC)

The user specified odd or even parity with a character length of 8 bits. PRIMOS uses the parity (eighth) bit for data.

-DATA_SENSE_ENABLE cannot be specified because -DISLOG was previously set (line <n>). (SET_ASYNC)

An attempt was made to specify DSE for a line using DISLOG. DISLOG interprets some DSE signals as logically low signals and disconnects the line.

-DISLOG cannot be specified because -DATA_SENSE_ENABLE was previously set (line <n>). (SET_ASYNC)

An attempt was made to specify -DISLOG for a line using DSE. DSE translates logically low signals into XONs and XOFFs and cannot recognize a DISLOG disconnect.

Duplicate parameter. (SET_ASYNC)

A parameter was specified more than once in the command line.

Incompatible USER_NUMBER and ASSIGNABLE options specified (line <n>). (SET_ASYNC)

The user number zero was associated with a login line *n* or a nonzero user number was associated with an assignable line *n*.

Invalid ASD use. (SET_ASYNC)

The ASD protocol was specified for an NTS line. NTS hardware contains similar functionality and all NTS lines are configured to detect and adjust transmission speeds.

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Invalid <argument> value <x> (line <n>). (SET_ASYNC)

An invalid, unrecognized, or missing argument value *x* was specified for *argument* on line *n*.

Invalid line number(s) specified. (SET_ASYNC)

The line number or -TO number specified was out of range or otherwise invalid.

Invalid option for an assignable line. (SET_ASYNC)

You cannot specify -SPEED_DETECT for an assignable line.

Invalid parameter setting. (SET_ASYNC)

The value supplied in the command line was inconsistent or invalid.

Invalid protocol value <protocol name> (line <n>). (SET_ASYNC)

The *protocol name* entered is not one of the expected values. See the section, Standard Communication Protocols, on page 4-22, for a detailed description of the protocols currently supported.

Invalid sample speed for ASD <speed>. (SET_ASYNC)

The baud rate specified in the command line was not one of the following recognized ASD values: 110, 300, 600, 1200, 2400, 4800, 9600, or 19200. Read the description of valid ASD speed on page 4-23 for more information.

Invalid speed value <baud rate> (line <n>). (SET_ASYNC)

The *baud rate* entered was not one of the expected values. See the -SPEED option described on page 4-10 for a list of valid speeds.

Invalid use of assign line buffer. (SET_ASYNC)

An attempt was made to specify for a login line a buffer reserved for assignable lines.

Invalid use of DISLOG. (SET_ASYNC)

An attempt was made to specify DISLOG for a line using DSE. DISLOG interprets some DSE signals as logically low and disconnects the line.

Invalid use of remote buffer. (SET_ASYNC)

An attempt was made to specify a buffer reserved for PRIMENET remote users for an assignable, login, or NTS line.

Line in use. (SET_ASYNC)

A user issued a SET_ASYNC command for a line that is actively in use by another user or process.

Line is assigned by another user (line <n>). (SET_ASYNC)

A user issued a SET_ASYNC command for a line that is assigned by another user.

Line is not assignable (line <n>). (SET_ASYNC)

A user issued a SET_ASYNC -LINE *n* -ASGN YES command for a login line. Only the System Administrator and DSM privileged users can change a login line to an assignable line and vice versa.

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Line <n> now supports user <number>. The buffer sizes for line <n> remain the same. Please use the CAB command to change buffer sizes. (SET_ASYNC)

The buffers normally mapped to line *n* are now associated with line *number*. It is strongly recommended that you do not do this. Use a CAB command to change the size of the buffers logically associated with the line.

Line not owned by you. (SET_ASYNC)

A user issued a SET_ASYNC command for a line currently assigned or actively used by some other user or process.

Line not present on the system. (SET_ASYNC)

The line number specified in the command line is not a valid line number on your system.

Line number MUST be specified. (SET_ASYNC)

The SET_ASYNC command was issued from the supervisor terminal without the required line number.

Line number <n> is not assigned to you

You cannot change the characteristics of a line assigned to another user.

Line number specified with the -TO option must be greater than the line number specified with the -LINE option. (SET_ASYNC)

The -TO line number was less than or equal to the -LINE argument.

No buffers available. (Line <n>) (SET_ASYNC)

An attempt was made to associate buffers with line *n* when all available buffers were in use.

No NTS available. (SET_ASYNC)

An attempt was made to configure an NTS line before NTS is running.

-<option> and -NO_<option> cannot both be specified at the same time (line <n>). (SET_ASYNC)

An option and its converse were specified for line *n* at the same time. For example, specifying both -XOFF and -NO_XOFF for the same line produces this error message.

-SPEED_DETECT cannot be specified for an assignable line (line *n*). (SET_ASYNC)

You cannot use the -SPEED_DETECT option on an assignable line.

-SPEED_DETECT cannot be specified when making a line assignable (line *n*). (SET_ASYNC)

You cannot use the -SPEED_DETECT option on an assignable line.

Speed value <baud rate> cannot be set (line <n>). (SET_ASYNC)

The *baud rate* selected for line *n* is valid but is not available in the current physical terminal configuration.

The <option name> option is not supported on NTS lines (line <n>). (SET_ASYNC)

One or more of the following options were specified for an NTS line *n*:
-SPEED_DETECT, -NO_SPEED_DETECT, -DISLOG, -NO_DISLOG,
-DATA_SET_CONTROL, or -NO_DATA_SET_CONTROL.

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The <protocol name> protocol is not supported on NTS lines (line <n>). (SET_ASYNC)
The TTYNOP or ASD protocol was specified for an NTS line *n*.

Unknown return code detected (line <n>). (SET_ASYNC)
An unexpected error prevented SET_ASYNC from setting a line's characteristics. If subsequent attempts to issue the command fail, contact your Customer Support Center.

Unexpected error in CL\$PIX. (SET_ASYNC)
An unexpected error prevented SET_ASYNC from returning an error message. If subsequent attempts to issue the command fail, contact your Customer Support Center.

You cannot refer to an NTS line when NTS is not started (line <n>). (SET_ASYNC)
This message is displayed when line *n* is an NTS line and NTS has not been started.

Warning: LINE_FEED option not meaningful unless -NO_ECHO is specified (line <n>). (SET_ASYNC)
This message is intended to notify the operator that -LINE_FEED was specified for line *n*. -LINE_FEED is only meaningful if the line is half-duplex. This combination is ignored.

Warning: ECHO option not meaningful unless LINE_FEED is specified (line <n>). (SET_ASYNC)
This message is intended to notify the operator that ECHO was specified for line *n*. -LINE_FEED is only meaningful if the line is half-duplex. This combination is ignored.

Warning: Range specified crosses invalid lines. Lines <n> to <m> have been skipped.
(SET_ASYNC)
The SET_ASYNC -LINE *n* -TO *m* option included line numbers between 512 and 1536.

THE CONVERT_AMLC_COMMANDS UTILITY

CONVERT_AMLC_COMMANDS is a utility that translates AMLC commands to their equivalent SET_ASYNC commands. By using this utility, you can easily translate the AMLC commands in your existing PRIMOS startup command input file without altering the other commands or corrupting your original file. This utility processes commands line by line. After the conversion is finished, you can combine similar lines. Interactive mode is particularly useful when you are learning how to use SET_ASYNC.

CONVERT_AMLC_COMMANDS is not an installed PRIMOS command. It is supplied in the directory TOOLS as CONVERT_AMLC_COMMANDS.RUN. If you wish, you can copy this file into the directory CMDNC0 and invoke it as a regular PRIMOS command, or add the TOOLS directory to your personal command search rules list.

Utility Format

```
R TOOLS>CONVERT_AMLC_COMMANDS { input-file output-file }  
                                -INTERACTIVE  
                                -HELP
```

Options

- input-file output-file* Translates AMLC commands contained in the input file to their SET_ASYNC equivalents, and stores them in the output file. Other commands are written unchanged to the output file. The input file can be your current PRIMOS.COMI, or any other file that contains AMLC commands. The output file is created by this utility. Do not choose the input file or any other existing file as your output file. Both filenames are required.
- INTERACTIVE**
-INTER Queries you for an AMLC command, translates the command, and displays the SET_ASYNC equivalent on the screen. Type QUIT to exit from interactive mode and return to PRIMOS.
- HELP**
-H Shows the syntax of the command line.

Note

CONVERT_AMLC_COMMANDS generates a separate SET_ASYNC command for each AMLC command it processes. Each bit in the AMLC command config_word is translated individually. This utility cannot recognize when consecutive lines have identical AMLC commands and combine them into a single SET_ASYNC command.

Examples

The following message is displayed when you invoke the -HELP option.

```
OK, RESUME TOOLS>CONVERT_AMLC_COMMANDS -HELP  
  
[CONVERT_AMLC_COMMANDS Rev. 22.0 (c) Prime Computer 1988]  
USAGE:  
CONVERT_AMLC_COMMANDS{inputpathname outputpathname|-Help|-INTERactive}
```

Configuring Asynchronous Lines

The following example demonstrates interactive mode:

```
OK, RESUME TOOLS>CONVERT_AMLC_COMMANDS -INTER
[CONVERT_AMLC_COMMANDS Rev. 20.2 (c) Prime Computer 1985]

>AMLC 4 TTY 2413 020006

SET_ASYNC -LINE 4 -PRO TTY -DEF -SPEED CLOCK -LF -PAR NONE -ASGN NO -USER 6

>AMLC 5 TTY 2413 020007

SET_ASYNC -LINE 5 -PRO TTY -DEF -SPEED CLOCK -LF -ASGN NO -USER 7

>AMLC 7 TTY 2213 020020

SET_ASYNC -LINE 7 -PRO TTY -DEF -SPEED 300 -LF -ASGN NO -USER 16

>AMLC 10 TRAN 2313 020000

SET_ASYNC -LINE 8 -PRO TRAN -DEF -LF -ASGN YES

>AMLC 11 TRAN 2313

SET_ASYNC -LINE 9 -PRO TRAN -DSC -NO_LOOP -SPEED 1200
-NO_REV_XOFF -SB 1 -PAR NONE -CL 8 -ASGN NO

> AMLC TTY 61 2413 0

SET_ASYNC -LINE 49 -PRO TTY -DEF -SPEED CLOCK -LF -ASGN YES -NO_XOFF

> AMLC TTY 137 2713 20000

SET_ASYNC -LINE 95 -PRO TTY -DEF -SPEED J3 -LF -ASGN YES

> AMLC TTYNOP 106 2713 0

SET_ASYNC -LINE 70 -PRO TTYNOP -DEF -SPEED J3 -LF -ASGN YES -NO_XOFF

> AMLC 77 0213 0

SET_ASYNC -LINE 63 -PRO TRAN -DEF -NO_DSC -SPEED 300 -LF
-ASGN YES -NO_XOFF

> AMLC 111 2313 2000

SET_ASYNC -LINE 73 -PRO TRAN -DEF -LF -ASGN YES -NO_XOFF -DSS LOW

> AMLC 65 TTY 2213 0

SET_ASYNC -LINE 53 -PRO TTY -DEF -SPEED 300 -LF -ASGN YES -NO_XOFF

>QUIT

OK,
```

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In the following example the CONVERT_AMLC_COMMANDS utility is given an input file called PRIMOS.COMI. An abbreviated listing of this file is provided.

```
CONFIG -DATA CONFIG          /* Name of config file for startup
COMO PRIMOS.COMO            /* Open como file to record this startup
ADDISK 3660 14061 3462 71261 /* Add partitions to the system
COMO -NTTY                  /* Turn off echo to supervisor terminal
AMLC TTY      0 2413 20002   /* User terminal set to 9600 baud
AMLC TTY      1 2413 20003   /* User terminal set to 9600 baud
AMLC TTY      2 2413 20004   /* User terminal set to 9600 baud
AMLC TTY      3 2413 20005   /* User terminal set to 9600 baud
AMLC TTY      4 2413 20006   /* Set TTY Protocol and 9600 baud
AMLC ASD      4              /* Enable ASD, Retain TTY and baud
AMLC TTY      5 2313 20007   /* Dial-in line set to 1200 baud
AMLC TTY      6 2413 20010   /* ONTEL line set at 9600 baud
AMLC TTY      7 2413 20011   /* OAS terminal set to 9600 baud
AMLC TTY     10 2413 20012   /* Forms terminal set to 9600 baud
AMLC TTY     11 2413 20013   /* Unused line
AMLC TTY     12 2413 20014   /* Unused line
AMLC TTY     13 2413 20015   /* Unused line
AMLC TTYNOP   14 2413 20000
/* Laser Printer set at 9600 baud
AMLC TRAN     15 2413 20000
/* Assigned Line for 9600 baud Printer
AMLC TTYNOP   16 2313 20000
/* OASTAT Printer set at 1200 baud
AMLC TTYNOP   17 2213 20000
/* Letter Quality Printer set at 300 baud
CO SYSTEM>DSM.SHARE.COMI 7   /* Install DSM database
CO SYSTEM>BASICV.SHARE.COMI 7 /* Share BASICV
CO SYSTEM>DBG.SHARE.COMI 7   /* Share DBG
CO SYSTEM>EMACS.SHARE.COMI 7 /* Share EMACS
CO SYSTEM>FORMS.SHARE.COMI 7 /* Share FORMS
CO SYSTEM>MIDASPLUS.SHARE.COMI 7 /* Share MIDASPLUS
CO SYSTEM>OAS.SHARE.COMI 7   /* Share OAS
CO SYSTEM>INFORMATION.SHARE.COMI 7 /* Share Prime INFORMATION
CO SYSTEM>SPOOL.SHARE.COMI 7 /* Share the spooler
CLOSE 7                    /* Close file unit 7
SHARE SYSTEM>ED2000 2000    /* Share the Editor
SHARE SYSTEM>S2050 2050 700
R SYSTEM>S4000 1/1
SHARE 2050
R SYSTEM>SP4000 1/10
PROP PRO -START            /* Start printer PRO
START_DSM
START_NET
START_NTS
/*
COMO -END -TTY             /* Close como file, turn on echo
CO -END                    /* End of Primos.comi startup
```

The source filename, PRIMOS.COMI, and the target filename, CONVERT.COMI, are supplied in the command line, as shown below.

```
OK, RESUME TOOLS>CONVERT_AMLC_COMMANDS PRIMOS.COMI CONVERT.COMI
[CONVERT_AMLC_COMMANDS Rev. 22.0 (c) Prime Computer 1988]
OK,
```

Configuring Asynchronous Lines

CONVERT_AMLC_COMMANDS processes the input file, creates the output file in your current directory, and returns to PRIMOS. When you list the contents of your directory with an LD command, the output filename appears. An abbreviated listing of the target file CONVERT.COMI is shown below. Notice that CONVERT_AMLC_COMMANDS has translated only AMLC commands. All the other commands are the same as before.

```
CONFIG -DATA CONFIG          /* Name of config file for startup
COMO PRIMOS.COMO            /* Open como file to record this startup
ADDISK 3660 14061 3462 71261 /* Add partitions to the system
COMO -NTTY                  /* Turn off echo to supervisor terminal
SET_ASYNC -LINE 0 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 2 /* User termin
SET_ASYNC -LINE 1 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 3 /* User termin
SET_ASYNC -LINE 2 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 4 /* User termin
SET_ASYNC -LINE 3 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 5 /* User termin
SET_ASYNC -LINE 4 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 6 /* Set TTY Pro
SET_ASYNC -LINE 4 -PRO ASD                                     /* Enable ASD,
SET_ASYNC -LINE 5 -PRO TTY  -DEF -LF -ASGN NO -USER 7         /* Dial-in line
SET_ASYNC -LINE 6 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 8 /* ONTEL line
SET_ASYNC -LINE 7 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 9 /* OAS termina
SET_ASYNC -LINE 8 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 10 /* Forms termi
SET_ASYNC -LINE 9 -PRO TTY  -DEF -SPEED CLOCK -LF -ASGN NO -USER 11 /* Unused line
SET_ASYNC -LINE 10 -PRO TTY -DEF -SPEED CLOCK -LF -ASGN NO -USER 12 /* Unused line
SET_ASYNC -LINE 11 -PRO TTY -DEF -SPEED CLOCK -LF -ASGN NO -USER 13 /* Unused line
SET_ASYNC -LINE 12 -PRO TTYNOP -DEF -SPEED CLOCK -LF -ASGN YES
/* Laser Printer set at 9600 baud
SET_ASYNC -LINE 13 -PRO TRAN -DEF -SPEED CLOCK -LF -ASGN YES
/* Assigned Line for 9600 baud printer
SET_ASYNC -LINE 14 -PRO TTYNOP -DEF -LF
/* OASTAT Printer set at 1200 baud
SET_ASYNC -LINE 15 -PRO TTYNOP -DEF -SPEED 300 -LF
/* Letter Quality Printer set at 300 baud
CO SYSTEM>DSM.SHARE.COMI 7 /* Install DMS database
CO SYSTEM>BASICV.SHARE.COMI 7 /* Share BASICV
CO SYSTEM>DBG.SHARE.COMI 7 /* Share DBG
CO SYSTEM>EMACS.SHARE.COMI 7 /* Share EMACS
CO SYSTEM>FORMS.SHARE.COMI 7 /* Share FORMS
CO SYSTEM>MIDASPLUS.SHARE.COMI 7 /* Share MIDASPLUS
CO SYSTEM>OAS.SHARE.COMI 7 /* Share OAS
CO SYSTEM>INFORMATION.SHARE.COMI 7 /* Share Prime INFORMATION
CO SYSTEM>SPOOL.SHARE.COMI 7 /* Share the spooler
CLOSE 7 /* Close file unit 7
SHARE SYSTEM>ED2000 2000 /* Share the Editor
SHARE SYSTEM>S2050 2050 700
R SYSTEM>S4000 1/1
SHARE 2050
R SYSTEM>SP4000 1/10
PROP PRO -START /* Start printer PRO
START_DSM
START_NET
START_NTS
COMO -END -TTY /* Close como file, turn on echo
CO -END /* End of Primos.comi startup
```

STANDARD COMMUNICATION PROTOCOLS

Standard communication protocols allow the orderly transfer of data. These protocols usually define the format and relative timing of the information exchanged for a specific device. SET_ASYNC supports several asynchronous protocols that govern the actions taken by the PRIMOS Asynchronous Device Interface Modules (ASYNC DIMs). The acceptable values for the SET_ASYNC -PROTOCOL option are TTY (the default), TRAN, TT8BIT, TTYUPC, TTYNOP, TTY8, TTY8HS, and ASD. NTS lines do not support ASD and TTYNOP. The following sections discuss the basis for protocol selection.

Protocols for older model AMLC boards (model 5054) are discussed in Appendix A, *Obsolete and Rarely Used Commands*, on page A-4.

TRAN: TRAN, the transparent protocol, is often used by lines connected to peripheral devices or to other computers. Choose TRAN when it is not necessary to echo input, convert *carriage returns* to *line feeds*, or specifically acknowledge *carriage returns* and *line feeds*. The key sequence CONTROL-P has no special meaning under this protocol and is passed through to the program. All characters pass as data unless XON/XOFF flow control is set.

TTY: TTY, the terminal protocol, is the protocol assigned at cold start to lines controlling interactive terminals. When the TTY protocol is chosen, all input from the terminal is echoed if the line is set for full-duplex; both a *carriage return* and a *line feed* are echoed following each *carriage return*. The high-order bit (the ASCII code parity bit) of each character input from the terminal is forced on. CONTROL-P and BREAK are interpreted as a QUIT command if the terminal is connected to the system as a user terminal.

If no protocol is given in the SET_ASYNC command line, TTY is assigned by the operating system.

If the line is an assignable line, CONTROL-P, BREAK, and *line feed* input from the terminal are ignored and discarded. A *carriage return* entered at the terminal is transmitted as a new line (or line feed) to the program requesting input.

Most terminals use this protocol and separate SET_ASYNC commands can be issued for each of your terminals. However, when terminals are attached to a series of consecutive lines, this protocol can be assigned to the entire group with only one command line as follows:

```
SET_ASYNC -LINE 14 -TO 35 -DEF -PRO TTY -SPEED 9600
```

TT8BIT: TT8BIT behaves in the same manner as the TTY protocol except that the high-order bit (ASCII parity bit) is not forced on for each character entered at the terminal. All control characters are handled in the same manner as the TTY protocol.

This protocol may not be used for remote users and is recommended only for local Arabic DM5E/PLUS terminals.

To use this protocol, you must set the line parity to ODD, as shown in the example below:

```
SET_ASYNC -LINE 5 -PRO TT8BIT -PAR ODD -SPEED 9600
/* Line 5: odd parity enabled, 9600 baud
```

TTYUPC: TTYUPC, the uppercase translating protocol, avoids sending lowercase output to terminals or peripheral devices that cannot print lowercase characters. This is the only difference between TTY and TTYUPC protocols.

TTYNOP: TTYNOP instructs the asynchronous DIM to ignore all traffic on the line. If you have a line that is not connected to a terminal, use this protocol to avoid wasting CPU time in attempts to interpret random noise on this line as valid commands. NTS lines do not support TTYNOP.

```
SET_ASYNC -LINE 51 -PRO TTYNOP
```

TTY8 and TTY8HS: TTY8 adapts the standard terminal protocol, TTY, for devices that use Prime ECS. If you have model number 5052 or 5054 AMLC controller boards, use TTY8HS, a functional equivalent of TTY8 specifically designed for this hardware.

ASD: ASD allows PRIMOS to detect and automatically adjust the line's speed to agree with an incoming signal. Set the line's speed to 9600 baud and enable ASD. Depending on how you configure the line, PRIMOS can detect baud rates of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 bits per second. Use ASD on login lines only. The system rejects any attempt to issue the ASD protocol for an assignable line or an NTS line. ASD can also be enabled with the SET_ASYNC option -SPEED_DETECT. For further information, read the section, Enabling Auto Speed Detect, on page 4-26.

DETERMINING LINE NUMBERS

A maximum of 960 login lines can be attached to your system, including one line for the supervisor terminal. Local lines are attached to your AMLC and ICS controllers; NTS lines are connected to LTS units. Both types are identified by number. Local line numbers begin at 0 and cannot exceed 511. NTS line numbers start at 1024 and cannot exceed 1536.

Determine the decimal line number required to reconfigure an asynchronous line with SET_ASYNC by issuing either the LOGIN, LOGOUT, or STATUS USERS commands. These methods apply when the default line number assignments are used. If you cannot use these methods to determine a line number, use the procedure shown in Appendix B, Determining Physical Line Numbers.

Using LOGIN and LOGOUT

You can generally determine the physical line number from the user number that is displayed after login or logout by using the following formula:

$$\text{Physical Line Number} = \text{User Number} - 2$$

The following examples show how to apply this formula.

```
Login please.  
LOGIN TINMAN  
Password? ██████████  
TINMAN (User 11) Logged in Friday, 28 Aug 88 14:01:20.  
Welcome to PRIMOS version 22.0  
Copyright (c) Prime Computer, Inc. 1988.  
Last Login Thursday, 27 Aug 87 10:54:40.
```

In this example, TINMAN is User 11 on line number 9 ($11 - 2 = 9$). Zero is the first valid line number on all Prime systems. In the following example, DOROTHY is User 2 on line number 0 ($2 - 2 = 0$).

```
OK, LO  
  
DOROTHY (User 2) Logged out Tuesday, 25 Aug 88 17:59:12.  
Time used: 08h 41m connect, 04m 20s CPU, 01m 06s I/O.
```

Using STATUS USERS

The STATUS USERS command, as shown below, displays the user ID, the user number in decimal, the line number in decimal, and the devices currently in use.

In the example shown on page 4-25, W.WITCH, user number 40, is attached to physical line number 38. G.WITCH, user number 65, is a remote user and is assigned a virtual line from a pool reserved for remote users with the NRUSR directive. This is indicated by the abbreviation *rem* in the line number field.

WIZARD, user numbers 17, 38, 88, 93, and 119, is logged in at two devices. Although this user name appears five times in this display, WIZARD is attached to only two physical line numbers (lines 15 and 36). WIZARD, user number 88, is a phantom process. It is not associated with a terminal and does not require a line. WIZARD, user number 93, is assigned line 78 indicated in the display by the characters AL78. WIZARD, user number 119, is a batch process.

OK, STATUS USERS

User	User No (In Decimal)	Line No	Devices (AL in Decimal)
SYSTEM	1	asr	<OZSYS1> AL77
DOROTHY	2	0	<MUNCH8> <KANSAS> <OZSYS1>
TOTO	6	4	<MUNCH8> <KANSAS> <OZSYS1>
RAINBOW	7	5	<KANSAS> <MUNCH8> <OZSYS1>
TINMAN	11	9	<OZSYS1>
SCARECROW	14	12	<OZSYS1> <KANSAS>
WIZARD	17	15	<OZSYS1>
Y.B.ROAD	22	20	<MUNCH8> <EMCITY>
AUNTI.EM	24	22	<KANSAS> (to BARN)
UNCLE.H	25	23	<KANSAS> (to BARN)
LION	30	28	<FOREST> <OZSYS1> <CASTLE>
WIZARD	38	36	<OZSYS1> <EMCITY>
W.WITCH	40	38	<BROOM1> <OZSYS1> <CASTLE>
MONKEY	41	slave	<CASTLE>
BALLOON	43	slave	<EMCITY>
G.WITCH	65	rem	<MUNCH8> (from NORTH1)
F.BAUM	66	1024	<OZSYS1>
A.FREID	67	1025	<OZSYS1>
LB.MAYER	68	1026	<OZSYS1>
KIP.Y	69	1027	<OZSYS1>
H.ARLEN	70	1028	<OZSYS1>
WIZARD	88	phant	<EMCITY>
YTSMAN	91	phant	<OZSYS1>
WIZARD	93	phant	<EMCITY> <OZSYS1> AL78
LOGIN_SERVER	94	LSr	<OZSYS1> (3)
NTS_SERVER	95	ncm	<OZSYS1>
TIMER_PROCESS	96	kernel	<OZSYS1>
NETMAN	98	nsp	<OZSYS1>
TAPE_PHANTOM	100	phant	<OZSYS1>
LQ.PRINTER	101	phant	<OZSYS1> PRO
BATCH_SERVICE	103	phant	<OZSYS1> (2)
DSMSR	105	dsm	<OZSYS1>
DSM_LOGGER	106	dsm	<OZSYS1>
SYSTEM_MANAGER	108	dsm	<OZSYS1>
PRINT_SERVER	111	phant	<OZSYS1>
NM_SERVER	114	phant	<OZSYS1>
RAINBOW	117	child	<KANSAS> <MUNCH8> <OZSYS1>
WIZARD	119	batch	<EMCITY> <OZSYS1>

The STATUS USERS command displays NTS users after PRIMENET remote login users. NTS line numbers start at 1024. There are five NTS users in the preceding example.

The supervisor terminal is connected to a special local port and uses a separate line that is configured with the ASRATE directive. This is indicated by the abbreviation *asr* in the line number field.

ENABLING AUTO SPEED DETECT

Auto Speed Detect (ASD) is particularly useful if your system has dialup lines. Configure dialup lines with ASD and a sample speed of 9600 baud. A user who makes the telephone connection presses the carriage return key. PRIMOS uses this carriage return to determine the device's baud rate. If the baud rate is one of the supported SET_ASYNC speeds or an ASYNC JUMPER speed, PRIMOS changes the rate at which it sends data out over the line to match the device's baud rate.

After PRIMOS has determined the line speed, the Login Please message is displayed and the user is allowed to log in. When the user logs out, or after a forced logout, the line returns to ASD. To disable ASD and set a specific speed, issue a SET_ASYNC -LINE *n* -NO_SPEED_DETECT -SPEED *value* command.

Do not specify ASD for an NTS line. NTS hardware contains similar functionality and all NTS lines are automatically configured to detect and adjust transmission speeds.

Interactive users cannot specify the -PRO ASD or -SPEED_DETECT options for the SET_ASYNC command. These are privileged options that are restricted for the System Administrator's use.

There are two methods of enabling ASD. The SET_ASYNC command allows you to specify a protocol and ASD in one command line:

```
SET_ASYNC -LINE 248 -PRO TTY -SPEED_DETECT -SPEED 9600
```

ASD can also be enabled with two command lines. First, configure the line as you normally would, using the SET_ASYNC -PROTOCOL option to specify the appropriate protocol for the line. Then set ASD explicitly as an alternate protocol for the line with a subsequent SET_ASYNC command.

```
SET_ASYNC -LINE 5 -PRO TTY -SPEED 9600
SET_ASYNC -LINE 5 -PRO ASD
```

When the system enables ASD, it reconfigures the line for character length 7, odd parity, and 1 stop bit, to prepare to recognize the carriage return and determine the speed of the line. After the user is logged in, the character length, parity, and stop bits are set to the values set in the PRIMOS.COMI file.

If it is necessary, use the `SET_ASYNC` command interactively to change these line characteristics after you establish the connection. Interactive changes to line characteristics are in effect for the current session only; when you log out, ASD is reenabled.

How you use the `ASYNC JUMPER` directive depends on whether your system uses AMLC boards, ICS controllers, or both.

- For AMLC boards, the `ASYNC JUMPER` directive tells PRIMOS how the hardware jumpers are set. To set the jumpers to other non-default speeds, have a representative from your Customer Support Center change the hardware settings. If you do not use the `ASYNC JUMPER` directive with AMLC lines, only baud rates of 110, 300, 1200, and 9600 are detected.
- All AMLC controllers must be jumpered identically for ASD to detect all speeds on every AMLC controller.
- The `ASYNC JUMPER` directive makes these speeds available to ICS controllers.
- For a mixture of both AMLC boards and ICS controllers, the speeds in the `ASYNC JUMPER` directive must match the hardware-jumpered speeds on the AMLC board.

For further details on these directives, see Chapter 3, Useful Configuration Directives, and the *System Administrator's Guide, Volume I: System Configuration*.

ASSIGNABLE ASYNCHRONOUS LINES

Assignable asynchronous lines are a class of communication lines that are used by programs or devices rather than interactive terminal users. The first part of this chapter shows how to assign, configure, and release assignable lines with the `ASSIGN ASYNC`, `SET_ASYNC`, and `UNASSIGN ASYNC` commands. The second part discusses the `NTS_ASSOCIATE`, `NTS_UNASSOCIATE`, and `NTS_LIST_ASSOCIATE` commands. These commands allow NTS users to define, release, and display the active paths between devices.

SERIAL DEVICES

Bit serial devices process a series of consecutive parts, such as the bits of a character, to form a whole. Typical serial devices are certain printers, and certain hard-copy terminals when these terminals are used as printers. The following Prime products require assignable lines to communicate with the host computer.

- 30/60 cps hard-copy terminal (Product Number 3115F)
- 300 lpm matrix lineprinter/plotter (Product Number 3126F)
- 200 cps bidirectional matrix printer (Product Number 3350F)
- 200 cps bidirectional hard-copy terminal (Product Number 3351F)
- 55 cps bidirectional letter quality printer (Product Number 3185)
- 600 lpm, 96 character matrix printer (Product Number 3226F)
- High-performance PRIME MEDUSA™ work station (Product Number PW 95)
- 10 ppm laser page printer (Product Number 3410)

Prime supports several other serial devices, such as plotters, card readers and punches, microcomputers, optical scanning devices, and other compatible devices from other vendors. Refer to your device's installation guide for specifics or contact your Customer Support Center.

COMMON APPLICATIONS

Assignable asynchronous lines can be used for the following purposes:

- To connect a personal computer, using PRIMELINK™, to a Prime host.
- To initiate an NTS connection request along a previously defined path between devices.
- To connect spoolers and serial printers.
- To transmit sensitive data or software between systems. In this case, both systems assign the line number corresponding to their end of the line.

SECURITY CONSIDERATIONS

As System Administrator, you may choose to enforce a discretionary access control policy with respect to assignable asynchronous lines. For example, you can prevent any user from assigning a line connected to a printer by setting a device ACL on the line itself.

For more information on developing an access policy for your site and instructions on setting device ACLs, see the *System Administrator's Guide, Volume III: System Access and Security*.

ASSIGNING ASYNCHRONOUS LINES

To assign an asynchronous line to a specific device, use the following procedure.

1. Include the NAMLC and NTSASL directives in your configuration file to provide an adequate number of assignable lines.
2. Use a SET__ASYNC -LINE *n* -ASGN YES command in your PRIMOS.COMI file to indicate that the line is assignable.
3. Include the CAB command in your PRIMOS.COMI file to change the sizes of these buffers from their default settings or issue the commands interactively (optional).
4. Issue an ASSIGN ASYNC -LINE *n* command from your terminal or the supervisor terminal to assign the line.
5. Issue an NTS__ASSOCIATE command to establish an NTS connection.
6. Issue a SET__ASYNC -LINE *n* [options] command from your terminal to change the speed, protocol, or configuration of the line (optional).

Note

Printers on the Spooler subsystem are assigned lines when the PROP -START command is issued. PROP -START only assigns lines for printers. You must assign lines for any other devices.

Chapter 4, Configuring Asynchronous Lines, provides a detailed explanation of the SET_ASYNC command. Chapter 3, Useful Configuration Directives, briefly describes the NAMLC and NTSASL directives. For detailed information on the CAB command, read Chapter 6, Allocating I/O Buffers. If you have questions concerning the PRIMOS.COMI file, consult the *Rev. 22.0 Software Installation Guide*.

THE ASSIGN ASYNC COMMAND

The ASSIGN command gives you complete and uninterruptible control over a device. This prevents any other user, process, or device from using the assigned resource until you are finished. There are several valid device types, such as disks, tape drives and, in this case, asynchronous communication lines. The *PRIMOS Commands Reference Guide* contains a complete description of the ASSIGN command for all device types.

Note

At Rev. 21.0, the decimal ASSIGN ASYNC command replaced the octal ASSIGN AMLC command. Although command lines issued in the old format are supported at this time, it is strongly recommended that you use the new decimal format. ASSIGN AMLC does not work for systems with more than 255 lines.

ASSIGN ASYNC allows you to assign a line or a range of consecutive lines in one command line. If you want to change the protocol, speed, or configuration of the line, issue the appropriate SET_ASYNC command from your terminal. These changes remain in effect until you issue the UNASSIGN command or log out.

Before you can assign an NTS line, it must be mapped by the System Administrator with the NTS_ASSOCIATE command.

NTS users are allowed twenty seconds to complete each connection request before the ASSIGN command terminates.

Command Format

```
ASSIGN ASYNC -LINE n [-TO m]
```

Options

- LINE *n*** The first line number in a series to be assigned, where *n* specifies the required *decimal* line number to be assigned, or when used with the -TO option.
- TO *m*** Conveniently assigns a consecutive range of lines from *n* to *m*, inclusive, where *n* and *m* are *decimal* line numbers.

Examples

For example, to assign line number 8 and change the speed, issue the following commands:

```
ASSIGN ASYNC -LINE 8
SET_ASYNC -LINE 8 -SPEED 9600
```

These two commands replace the old command format,

```
ASSIGN AMLC TTY 10 2413
```

To save time when you are assigning several consecutive lines, you can issue one ASSIGN ASYNC command as in the following example:

```
ASSIGN ASYNC -LINE 250 -TO 255
```

THE UNASSIGN ASYNC COMMAND

UNASSIGN ASYNC is a companion to the ASSIGN ASYNC command. All use of an asynchronous line is relinquished when you issue an UNASSIGN ASYNC command. Line numbers are specified in decimal. If you have assigned a range of consecutive lines, they can be released with one command line using the -TO option.

Use the UNASSIGN command to break a permanent connection over an NTS line. NTS users are allowed twenty seconds to complete each disconnect request before the UNASSIGN command terminates.

Users can unassign only those lines that they have assigned. The operator or System Administrator has the rights to unassign any line or device from the supervisor terminal, regardless of who assigned it or from which terminal it was assigned.

Command Format

UNASSIGN ASYNC -LINE *n* [-TO *m*]

Options

- LINE *n* Where *n* specifies the required *decimal* line number to be unassigned, or, when used with the -TO option, the first line number in a series to be released.
- TO *m* Unassigns a consecutive range of lines from *n* to *m*, inclusive, where *n* and *m* are *decimal* line numbers.

Examples

For example, to release a range of five lines from line number 8 to line number 12, issue the following command:

```
UNASSIGN ASYNC -LINE 8 -TO 12
```

If you have assigned several lines, you may, of course, issue individual UNASSIGN ASYNC commands for each line when you are finished using it.

For example, lines 250 to 255 are assigned lines. Lines 250 and 253 are used for transmitting financial records from the host to branch offices. When the transmission is complete, these lines are released with the following command lines:

```
UNASSIGN ASYNC -LINE 250
UNASSIGN ASYNC -LINE 253
```

Lines 251, 252, 254, and 255 remain assigned to their processes or devices, and lines 250 and 253 are now available.

Note

Do not follow a decimal ASSIGN ASYNC command with an octal UNASSIGN AMLC. In limited situations this works, but it is generally better not to combine octal and decimal formats.

ASSIGN and UNASSIGN Error Messages

The ASSIGN ASYNC and UNASSIGN ASYNC commands verify your command line options before assigning or releasing asynchronous lines. If an error, typically an omitted or invalid command line option, is detected, the line is not assigned. One of the error messages listed below is displayed, and you are returned to command level.

Connection request rejected. (ASSIGN)

A request to assign an LTS line was refused by the LTS. This may be due to the fact that the line has a connection currently established, as a terminal connected into either this or another Prime system, or as an assigned line by another Prime system.

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Connection request timed out. (ASSIGN)

More than 20 seconds has expired during an attempt to assign an LTS line. This could indicate that the target LTS is either powered down or does not exist on the LAN.

Device not assigned. (ASSIGN)

A user attempted to unassign a device that had not been assigned.

Device output queue full. (ASSIGN)

The connection management output queue did not process the connect or disconnect request block generated by the ASSIGN or UNASSIGN command. This error message may indicate either a temporary failure of PRIMOS to communicate with the LHC controller, or a problem with the LHC controller itself. This may be a temporary problem. If the command is reissued, it may succeed.

Improper command usage or arguments. (ASSIGN)

An incorrect option was specified in the command line or an argument was missing.

Invalid range specified. (ASSIGN)

The lines, included in the range specified, are not assignable lines or one or both end points are out of range.

Line not associated. (ASSIGN)

The ASSIGN command was issued to assign an NTS PRIMOS line number that has not been previously associated with an NTS_ASSOCIATE command.

Line number must be specified. (ASSIGN)

An ASSIGN ASYNC or UNASSIGN ASYNC command was issued without specifying a line number. The line number cannot be omitted from the command line.

Line number out of range. (ASSIGN)

The line number specified was less than 0 or greater than 256 for local lines or, for NTS lines, less than 1024 or greater than 1279.

No room. (ASSIGN)

The maximum number of assignable lines allocated by NTSASL or NAMLC is currently assigned. Either UNASSIGN a currently assigned line, or increase NTSASL and cold start the system.

No XCB available for request. (ASSIGN)

This message usually indicates a software failure, either in PRIMOS or the LHC. Contact your Customer Support Center.

NTS not started. (ASSIGN)

The ASSIGN or UNASSIGN command was issued for an NTS line before NTS was started.

Request queue full. (ASSIGN)

The connection management queue is full, and has not had an available entry for approximately 10 seconds. This usually indicates an NTS connection manager (NTS_SERVER) failure.

The device is in use. (ASSIGN)

The ASSIGN command was issued for a terminal line or an assignable line that is currently assigned by another user. This message is also seen when an UNASSIGN command is issued for a terminal line or a line that was assigned by another user.

THE NTS_ASSOCIATE COMMAND

The NTS_ASSOCIATE command defines a permanent or temporary path from a physical line attached to an LTS to a logical line number in the Prime host. As System Administrator, you must associate a line before a user can issue an ASSIGN, UNASSIGN, or interactive SET_ASYNC command for the line.

Note

The NTSDIM polls all NTS lines consecutively. Choose NTS assignable line numbers that are close to 1024 plus NTSUSR to avoid wasting system resources servicing unused lines and to improve performance.

Command Format

```
NTS_ASSOCIATE { -LINE number -LTS_NAME name -LTS_LINE number [-PERM] }
               { -HELP }
```

Arguments

- | | |
|-----------------------------------|---|
| -LINE <i>number</i> | Indicates the <i>decimal</i> line number in the Prime host. Valid NTS line numbers range from 1024 through 1536. Assignable NTS line numbers usually start at 1024 plus the decimal value of NTSUSR. |
| -LTS_NAME <i>name</i>
-LNAME | Specifies the logical name of a particular LTS. The Network Administrator gives each LTS on a LAN a unique name when it is added to the configuration with CONFIG_NTS. LTS names can be a maximum of 16 characters long and must follow the same format and rules as PRIMENET node names. You can list LTS names with the LIST_LAN_NODES command. |
| -LTS_LINE <i>number</i>
-LLINE | Specifies the LTS line number. <i>number</i> can range from 0 through 7. |

- PERMANENT** Establishes a stable connection that is reconnected automatically if a disconnect occurs. A temporary connection cannot recover if the carrier signal is lost for three minutes and is unassigned automatically. A connection is permanent until the line is unassigned. A permanent connection can be removed by reissuing the NTS_ASSOCIATE command without supplying this option. Permanent connections are recommended for spooler lines.
- PERM**
- HELP** Displays the command format and options.
- H**

For more information on CONFIG_NTS, see the *NTS Planning and Configuration Guide*.

Examples

Making a Temporary Association: The following NTS_ASSOCIATE command issued from the supervisor terminal maps the logical PRIMOS line number 1153 to the physical line number 1 attached to the LTS SCIENCE.LAB.

```
OK, NTS_ASSOCIATE -LNAME SCIENCE.LAB -LLINE 1 -LINE 1153
[NTS_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
OK,
```

Making a Permanent Association: The NTS_ASSOCIATE command can create a permanent association to an LTS line supporting a printer. In the following example, the association between the PRIMOS line number 1154 and the printer attached to line 0 of the LTS MATH.DEPT is stable. The link to the printer recovers from network failures automatically.

```
OK, NTS_ASSOCIATE -LNAME MATH.DEPT -LLINE 0 -LINE 1154 -PERM
[NTS_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
OK,
```

It is also possible to make an existing association permanent. Reissue the NTS_ASSOCIATE command with the -PERM option and specify the PRIMOS line number as shown in the next example.

```
OK, NTS_ASSOCIATE -LNAME MATH.DEPT -LLINE 1 -LINE 1155
[NTS_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
OK, NTS_ASSOCIATE -LINE 1155 -PERM
[NTS_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
OK,
```

THE NTS_LIST_ASSOCIATE COMMAND

The NTS_LIST_ASSOCIATE command displays the current associations between PRIMOS line numbers and LTS line numbers. Active connections can be specified by PRIMOS line number or by LTS name and LTS line number. If the command is issued without options, information for all associations is displayed. Permanent connections are indicated in the display by the letter P.

Command Format

```
NTS_LIST_ASSOCIATE { -LINE number
                    -LTS_NAME name [-LTS_LINE number]
                    -HELP }
```

Arguments

-LINE *number* Indicates the *decimal* line number in the Prime host. Valid NTS line numbers range from 1024 through 1536.

-LTS_NAME *name*
-LNAME Specifies the logical name of a particular LTS. You can list LTS names with the LIST_LAN_NODES command.

-LTS_LINE *number*
-LLINE Specifies the LTS line number. *number* can range from 0 through 7.

-HELP
-H Displays the command format and options.

Examples

Listing All Active Associations:

```
OK, NTS_LIST_ASSOCIATE
[NTS_LIST_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
```

Primos line #	LTS Name	LTS line #
1153	SCIENCE.LAB	1
1154 [p]	MATH.DEPT	0
1155 [p]	MATH.DEPT	1

* [p] denotes a permanent association.
OK,

Listing Associations for an LTS:

```
OK, NTS_LIST_ASSOCIATE -LNAME MATH.DEPT  
[NTS_LIST_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
```

Primos		LTS
line #	LTS Name	line #
1154	[p] MATH.DEPT	0
1155	[p] MATH.DEPT	1

* [p] denotes a permanent association.
OK,

Listing Associations for an Individual Line:

```
OK, NTS_LIST_ASSOCIATE -LINE 1153  
[NTS_LIST_ASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
```

Primos		LTS
line #	LTS Name	line #
1153	SCIENCE.LAB	1

OK,

THE NTS_UNASSOCIATE COMMAND

The NTS_UNASSOCIATE command removes a permanent or temporary path from a physical line attached to an LTS to a logical line number in the Prime host. Only the System Administrator can unassociate a line. If a line is currently assigned by another user, it cannot be unassociated until it is unassigned.

There are two ways to remove a connection: by specifying the *primos_line_number* or by specifying the *lts_name* and *lts_line_number*. Use the NTS_LIST_ASSOCIATE command to display a list of all currently associated lines.

Command Format

```
NTS_UNASSOCIATE { -LINE number  
                  -LTS_NAME name -LTS_LINE number  
                  -HELP }
```

Arguments

- LINE *number* Indicates the *decimal* line number in the Prime host. Valid NTS line numbers range from 1024 through 1536.

- LTS_NAME *name*
-LNAME Specifies the logical name of a particular LTS. You can list LTS names with the LIST_LAN_NODES command.

- LTS_LINE *number*
-LLINE Specifies the LTS line number. *number* can range from 0 through 7.

- HELP Displays the command format and options.
- H

Examples

Unassociating an LTS line: The following command line breaks the connection between the host and line 1 on the LTS MATH.DEPT.

```
OK, NTS_UNASSOCIATE -LNAME MATH.DEPT -LLINE 1
[NTS_UNASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
OK,
```

Unassociating a PRIMOS line: The following command line releases the PRIMOS line number 1153 from any active association.

```
OK, NTS_UNASSOCIATE -LINE 1153
[NTS_UNASSOCIATE Rev. 21.0 Copyright (c) 1986, Prime Computer, Inc.]
OK,
```

NTS_ASSOCIATE, NTS_LIST_ASSOCIATE, and NTS_UNASSOCIATE Error Messages

If the syntax of the command line is incorrect, a resource is not available, or there is a problem with NTS, one of the error messages below is displayed and the command is rejected.

Both an LTS name and an LTS line number are required. (NTS_UNASSOCIATE)

One of these options was issued without the other on the command line. No action is taken on this command.

Either a PRIMOS line number, or an LTS name and line number is required. (NTS_UNASSOCIATE)

No command arguments were issued on the NTS_UNASSOCIATE command line.

Insufficient access rights. (NTS_ASSOCIATE)

An attempt has been made by an unauthorized user to associate an NTS PRIMOS line.

Insufficient access rights. (NTS_UNASSOCIATE)

An attempt has been made by an unauthorized user to unassociate an NTS PRIMOS line.

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LTS line already associated. (NTS_ASSOCIATE)

An attempt has been made to associate an LTS that is already associated with another PRIMOS line number.

LTS line not associated. (NTS_UNASSOCIATE)

An attempt has been made to unassociate an LTS that is not associated.

-LTS_LINE argument is not permitted without -LTS_NAME. (NTS_LIST_ASSOCIATE)

Command was issued with insufficient arguments to identify the line's LTS.

Line <n> is assigned to username <user number>; it must be unassigned first. (NTS_UNASSOCIATE)

The System Administrator has made an attempt to unassociate PRIMOS line number *n* that is already assigned to username <user number>. It must be unassigned first. Any line may be unassigned from the supervisor terminal using the UNASSIGN ASYNC command.

Line is not associated. (NTS_LIST_ASSOCIATE)

Command was issued for an unassociated PRIMOS line number.

Line not associated. PRIMOS line number, -LTS_NAME, and -LTS_LINE arguments must be supplied. (NTS_ASSOCIATE)

An attempt has been made to associate a previously unassociated PRIMOS line number without all the proper arguments. In this case, all three arguments must be supplied.

No associations. (NTS_LIST_ASSOCIATE)

There are no active associations on NTS.

No associations with the specified LTS. (NTS_LIST_ASSOCIATE)

There are no active associations for the specified LTS.

No associations with the specified LTS and LTS line number. (NTS_LIST_ASSOCIATE)

There is no active association for the line number indicated on the specified LTS.

Network Terminal Service is not started. (NTS_ASSOCIATE)

An attempt has been made to make an association when network terminal service is not currently started.

Network Terminal Service is not started. (NTS_LIST_ASSOCIATE)

The command was issued when network terminal service was not currently started.

Network Terminal Service is not started. (NTS_UNASSOCIATE)

An attempt has been made to break an association when network terminal service is not currently started (or not configured).

No other options may be specified with -HELP. (NTS_ASSOCIATE)

The command was issued when -HELP is found on the command line with -LINE, -LTS_NAME, or -LTS_LINE.

No other options may be specified with -HELP. (NTS_LIST_ASSOCIATE)

The command was issued when -HELP is found on the command line with -LINE, -LTS_NAME, or -LTS_LINE.

Assignable Asynchronous Lines

No other options may be specified with -HELP. (NTS_UNASSOCIATE)

The command was issued when -HELP is found on the command line with -LINE, -LTS_NAME, or -LTS_LINE.

No NTS assignable lines are configured. (NTS_ASSOCIATE)

An attempt has been made to associate an NTS PRIMOS line when there are no NTS assignable lines configured in the system (NTSASL = 0). This configuration directive must be changed if NTS assignable lines are to be utilized, and the system cold started.

PRIMOS line already associated. (NTS_ASSOCIATE)

An attempt has been made to associate a PRIMOS line number that is already associated.

PRIMOS line number is required. (NTS_ASSOCIATE)

A PRIMOS line number has not been specified in the command when required.

PRIMOS line not associated. (NTS_UNASSOCIATE)

An attempt has been made to unassociate a PRIMOS line number that is not associated.

PRIMOS line number not permitted with -LTS_NAME. (NTS_LIST_ASSOCIATE)

The PRIMOS line number must be specified alone.

The LTS line number must be between 0 and 7. (NTS_ASSOCIATE)

An attempt has been made to issue an NTS_ASSOCIATE command for an LTS line number that is out of range. Valid LTS line numbers currently range from 0 through 7.

The LTS line number must be between 0 and 7. (NTS_LIST_ASSOCIATE)

An attempt has been made to issue an NTS_LIST_ASSOCIATE command for an LTS line number that is out of range. Valid LTS line numbers currently range from 0 through 7.

The LTS line number must be between 0 and 7. (NTS_UNASSOCIATE)

An attempt has been made to issue an NTS_UNASSOCIATE command for an LTS line number that is out of range. Valid LTS line numbers currently range from 0 through 7.

The -LTS_NAME and -LTS_LINE arguments are not allowed when a PRIMOS line number is specified. (NTS_UNASSOCIATE)

Issued when an NTS_UNASSOCIATE command contains a PRIMOS line number and either an LTS name or an LTS line number. Reissue the command with just the PRIMOS line number, or both the LTS name and line number.

The PRIMOS line number must be between 1024 and 1279. (NTS_ASSOCIATE)

An attempt has been made to associate a PRIMOS line that is not in the NTS line range. These lines cannot be associated.

The PRIMOS line number must be between 1024 and 1279. (NTS_LIST_ASSOCIATE)

The command was issued for a PRIMOS line that is not in the NTS line range.

The PRIMOS line number must be between 1024 and 1279. (NTS_UNASSOCIATE)

An attempt has been made to unassociate a PRIMOS line that is not in the NTS line range. These lines cannot be associated or unassociated.

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The specified LTS is not configured. (NTS_ASSOCIATE)

An attempt has been made to use an LTS name that has not been previously configured with a MAC address (by CONFIG_NTS). If necessary, this LTS can be added with NTS started by CONFIG_NTS (without stopping NTS).

The specified LTS is not configured. (NTS_LIST_ASSOCIATE)

An attempt has been made to use an LTS name that has not been previously configured with a MAC address (by CONFIG_NTS). If necessary, this LTS can be added with NTS started by CONFIG_NTS (without stopping NTS).

The specified LTS is not configured. (NTS_UNASSOCIATE)

An attempt has been made to use an LTS name that has not been previously configured with a MAC address (by CONFIG_NTS). If necessary, this LTS can be added with NTS started by CONFIG_NTS (without stopping NTS).

The specified PRIMOS line is not assignable. (NTS_ASSOCIATE)

An attempt has been made to associate a PRIMOS line that is not currently assignable.

When -LTS_NAME or -LTS_LINE is specified, the other is required. (NTS_ASSOCIATE)

An attempt has been made to issue an NTS_ASSOCIATE command without both LTS name and LTS line number. This form of the command requires the presence of both.

ALLOCATING I/O BUFFERS

The PRIMOS operating system allocates storage locations in memory, called I/O buffers, for every interactive user process. I/O buffers effectively compensate for differences between device baud rates and internal event timers. This chapter discusses how PRIMOS uses I/O buffers to store, forward, and manage the flow of characters.

Prior to PRIMOS Rev. 22.0, I/O buffers for each asynchronous line were permanently resident in memory, even when a particular line was not in use. At PRIMOS Rev. 22.0, I/O buffers are allocated only when required.

A new internal data structure contains the initial buffer size, current buffer size, and a status value for each line on a per-line basis. When a line is currently in use, the status value is active and I/O buffers are allocated. When a user logs out or a line is unassigned, the line's status changes to inactive and the I/O buffers are released.

Two new commands CAB (Change Async Buffer) and LAB (List Async Buffer) allow you, as System Administrator, to set, change, and display the current and initial buffer sizes on your system. System Administrators and users with access to the DSM functions CHANGE_ASYNC_BUFFER\$ and LIST_ASYNC_BUFFER\$ can use these commands interactively for any line on the system. Users can only use the LAB command to display their own line's buffers.

I/O buffers are required by all interactive processes including: local terminal users, PRIMENET remote login users, NTS terminal users, local assignable lines, and NTS assignable lines.

The default buffer sizes in characters for interactive processes are

<i>Line Type</i>	<i>Local</i>	<i>Remote</i>	<i>NTS</i>
		Total Characters	
Input Buffer Size	256	260	256
Output Buffer Size	384	130	384
DMQ Buffer Size	31	***	***

The default buffer sizes are large enough for most devices to operate efficiently. However, increasing buffer sizes for block-mode devices and interactive graphics packages can improve response time, prevent character loss, and correct perceptible bursts of output on screen. As System Administrator, you can fine-tune your system for any device or application that requires special buffers.

Note

At Rev. 22.0, the CAB command, described on page 6-8, replaces the REMBUF, AMLBUF, NTSBUF, and NTSABF configuration directives. Replace your buffer directives with CAB commands.

Systems upgrading from PRIMOS Rev. 20.0, 20.1, 20.2, or 21.0 can use the CONVERT_BUFFER_DIRECTIVES utility to translate obsolete directives. You should read this chapter carefully before upgrading your files.

ASYNCHRONOUS CHARACTER PROCESSING

When you type a character at your terminal, it is transmitted from the keyboard over an asynchronous line to a communications controller. Asynchronous devices, such as terminals, are directly connected to either AMLC or ICS controllers, or an LTS, which communicates to the host through an LHC controller. Figure 6-1 illustrates the flow of data from the input device to PRIMOS.

There is a table resident in main memory that contains specific information on each line's initial, default, and current buffer sizes. When a user logs in, the system obtains the initial buffer size from the table and allocates memory for the line's input, output, and, where appropriate, DMQ buffers. The total amount of space used for I/O buffers depends on how many lines are currently active.

AMLC, ICS, and LHC controller boards receive characters from many lines and store them in either a Direct Memory Channel (DMC) tumble table, a Direct Memory Queue (DMQ) input queue, or a Direct Memory Transfer (DMT) input buffer, respectively.

Each type of controller is supported by a special process known as an Asynchronous Device Interface Module (ASYNC DIM). The three ASYNC DIMs are AMLDIM, ASYNDM, and NTSDIM. Periodic I/O interrupts trigger the ASYNC DIMs to read incoming data, analyze flow control signals, and perform any per-character processing. In general, the ASYNC DIMs decode the bits that designate line number and protocol before transferring the character to the appropriate area in main memory.

Each asynchronous line has a fixed area in memory called an input buffer. Input buffers have pointers to indicate positions within the buffer as follows: write pointers indicate to the ASYNC DIMs where to put the next character; read pointers indicate to PRIMOS which character to process next. Characters are processed and any output characters are passed to the appropriate output buffer. Both types of buffer are referenced by line number.

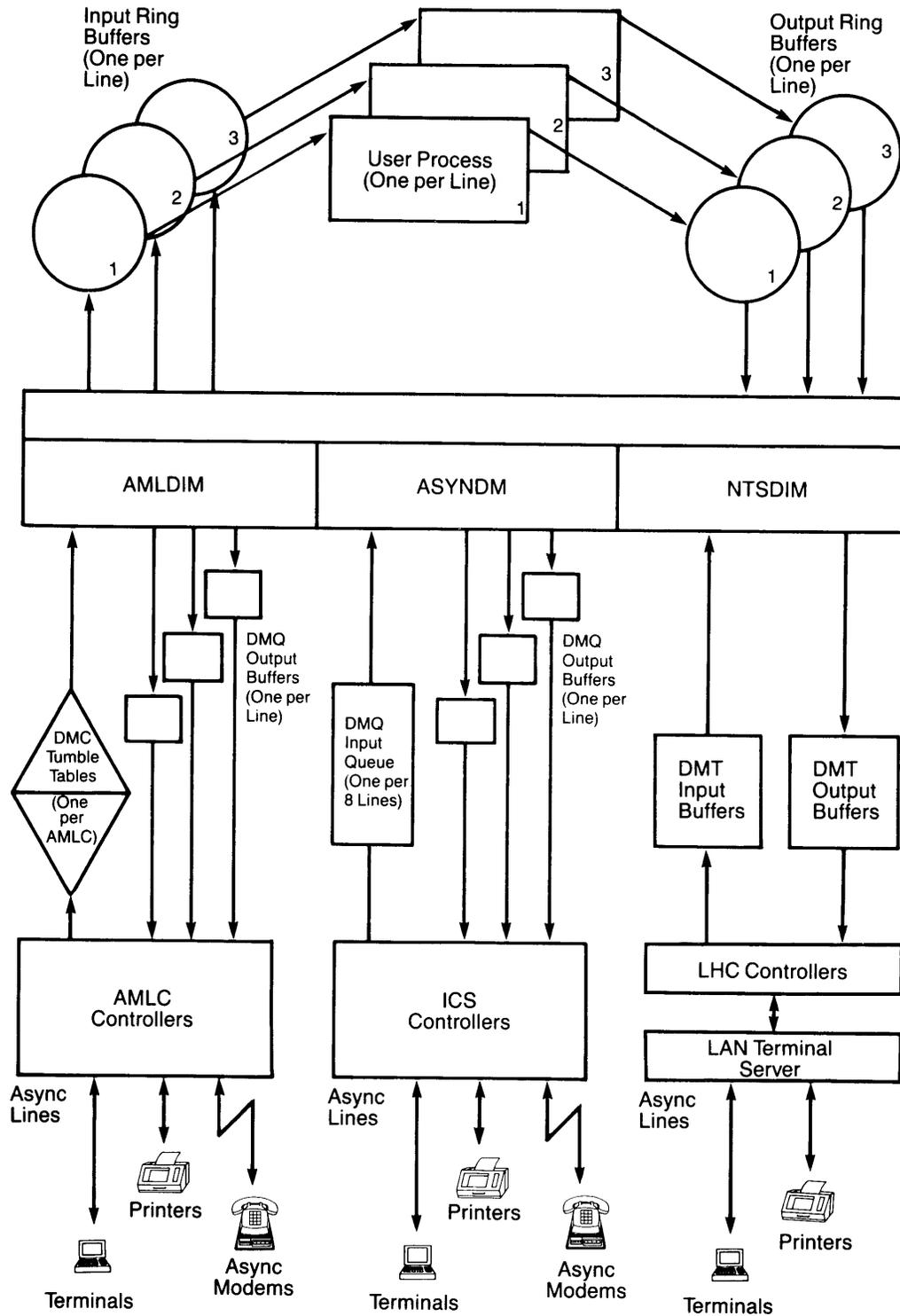


FIGURE 6-1. Input and Output Buffers and Queues for Asynchronous Lines

The ASYNC DIMs retrieve the data from the output buffer, identify the target line number, apply the correct communications protocol for the output device (for example TTYUPC), and pass the character to the appropriate DMQ or DMT output buffer. The communication controllers accept data from the output buffers at regular intervals and separate the characters by line numbers. The controllers then transmit each character to the specified device at the correct baud rate.

The system maintains DMQ output buffers for each local line. DMT output buffers are maintained for each LHC controller. Input and output buffers are maintained for every asynchronous line.

If you do not change buffer sizes with CAB commands in the system startup file, PRIMOS uses the default values. The default buffer sizes are sufficient for most devices, but the default DMQ input size can be too small when the line speed is greater than 1200 baud.

Block-mode terminals, asynchronous links from one computer to another, serial graphics devices, and certain printers require different buffer sizes to operate efficiently. Refer to the installation guide for your device for the buffer sizes recommended by the manufacturer, or consult your Customer Support Center.

The CAB command defines the buffer sizes for all interactive processes. Instructions for changing buffer sizes are provided in the section, The CAB Command, on page 6-8.

I/O INTERRUPT RATES

I/O interrupt rates determine how often the controllers interrupt the ASYNC DIMs to service the I/O buffers and queues shown in Figure 6-1. The default interrupt rate for AMLC and ICS controllers is ten interrupts per second. Ideally, this rate is sufficient to service the buffers without interrupting the ASYNC DIMs too frequently. A higher interrupt rate increases the amount of CPU time spent servicing the buffers and thus reduces performance.

In some cases performance can be improved by changing the size of the I/O buffers and queues. The sections on determining buffer capacity explain how to do this. The default interrupt cycle can cause perceptible delays in a highly interactive graphics package. Increasing the interrupt rate to 30 per second and enlarging the output buffers improves response. On a system with both AMLC and ICS controllers, the baud rate of the last physical AMLC line controls the rate for processing AMLC interrupts. The ICS INTRPT directive sets the rate for ICS interrupts.

The AMLC I/O Interrupt Rate

Each AMLC controller reads incoming characters from all the lines attached to it and transfers them to a two-part storage area called a DMC tumble table. When the current tumble table buffer is full, the AMLC controller switches the incoming stream of characters to the other tumble table buffer and notifies the AMLDIM process.

The controllers also interrupt the AMLDIM on a regular basis. The frequency of these regular interrupts is determined by the baud rate of the last physical AMLC line. When the AMLDIM process executes, it reads each character in the tumble table, identifies the line that it came from, and transfers it to the line's input buffer. If the line is full-duplex, the characters are also sent to the line's output buffer.

Caution

The default AMLC I/O interrupt rate is ten interrupts per second. This requires that the last AMLC line be configured for 110 baud. You may configure this line as high as 300 baud. However, increasing this line's baud rate beyond 300 baud (30 interrupts per second) results in a *severe* performance degradation. For this reason, do not assign this line or connect it to a high-speed device. Reserve this line for a very slow terminal or a printer. If your hardware resources permit, configure this line to use the TTYNOP protocol and run at 110 baud.

The AMLC I/O interrupt rate is calculated by dividing the baud rate of the system's highest-numbered AMLC line (that is, the last line of the last AMLC board) by the total character size (11 bits for 110 baud, 10 bits for other speeds).

The ICS I/O Interrupt Rate

The ICS INTRPT configuration directive sets the I/O interrupt rate for ICS controllers. It is independent of the speed or use of any ICS lines. The default and minimum value is 12_8 (10) interrupts per second. The maximum is 144_8 (100) interrupts per second. If the value selected is out of range (too high or too low), the ICS controller defaults to the maximum or minimum value, as appropriate. The procedure for calculating the ICS interrupt rate is explained in Chapter 3, Useful Configuration Directives, and in the *ICS User's Guide*.

DETERMINING INPUT BUFFER CAPACITY

OAS, FORMS, PRIMEWAY™, DPTX, and PRIME/SNA™ products use block-mode terminals, which require large input buffers. The default input buffer size allows 255 type-ahead characters on terminals using character-mode input. When a burst-type device sends more than 256 characters in a burst, the buffer overflows and characters are lost. The overflow characters are not echoed back to the screen. If the terminal is in block mode when the

input buffer overflows and the screen termination characters are discarded, the terminal may lock.

Input Buffer Recommendations

<i>Application</i>	<i>Input Buffer Size</i>
OAS on a PT65	1664 Characters
DPTX	3968 Characters
FORMS/PRIMEWAY	1664 Characters or the maximum screen size from the application FD plus twice the number of fields on screen
PRIME/SNA	2048 Characters fixed screens (24 x 80 only), 4096 Characters convertible screens (24 x 80) and (27 x 132)
Character Mode Terminals	255 characters (Default)

DETERMINING OUTPUT BUFFER CAPACITY

The default output buffer size is generally sufficient for all character-mode terminals. If full screens of data are painted at 9600 baud or greater, a larger output buffer can increase throughput. If the output buffer size for high-speed devices is too small, throughput can be slow. Perceptible bursts of output can occur on block-mode terminals using the following applications: OAS on the PT65, FORMS, PRIMEWAY, DPTX, and PRIME/SNA. PRIME MEDUSA, EDMS™, and other products that send serial graphic output over asynchronous lines require an output buffer size greater than the maximum screen size; 4000 is recommended.

For improved throughput, set the output buffer capacity to equal or exceed the number of characters that the line can transmit in 1/2 second:

$$\text{Output buffer capacity} = \frac{\text{characters per second}}{2}$$

For example, a 9600-baud line sends 960 10-bit characters per second to a laser printer. The optimal output buffer size for this line is 480 characters.

DETERMINING DMQ BUFFER CAPACITY

The DMQ buffer capacity depends on the line speed, character length, and the interrupt rate. The DMQ buffer stores 1 character per halfword. The DMQ buffer size must be one less than a power of two. Legal buffer capacity values are 0, 15, 31, 63, 127, 255, 511, and 1023. Use the following formula to calculate the DMQ size and use the next higher value listed in Table 6-1.

$$\text{DMQ Size} = \frac{\text{line speed divided by bits per character}}{\text{I/O interrupt rate per second}}$$

For example,

$$\text{DMQ Size} = \frac{9600 \text{ divided by } 10}{10} = 96$$

Compare the result of 96 to the list of legal values in the paragraph above, and round up to the next valid size, which is 127.

When DMQ buffer capacity is too small, the effective speed of the device decreases. When the DMQ capacity is too large, devices with small input buffers can overflow. Serial printers often either have very small internal buffers, or wait until their buffers are nearly full before sending an XOFF (or using DSS) to tell PRIMOS to stop sending output.

Table 6-1 shows the recommended DMQ buffer sizes when the default interrupt rate (10) is used.

TABLE 6-1. *DMQ Buffer Capacity With an Interrupt Rate of Ten*

<i>Line Speed (Baud rate)</i>	<i>Characters Per Second</i>	<i>Recommended DMQ Capacity</i>
50	5	15
75	7	15
110	10	15
134.5	13	15
160	15	15
200	20	15
300	30	15
600	60	15
1200	120	15
1800	180	31
2400	240	31
3600	360	63
4800	480	63
7200	720	127
9600	960	127
19200	1920	255

THE CAB COMMAND

The CAB command sets and changes the input, output, and, where appropriate, DMQ buffers for interactive processes. You can use CAB commands in your PRIMOS.COMI file to define a line's initial and default buffer sizes, as well as interactively, to change buffer sizes while the system is running.

Note

You must issue this command from the supervisor terminal. Users with access to the DSM function CHANGE_ASYNC_BUFFER\$ can issue the CAB command from any terminal provided they use the -ON *nodename* option.

When a CAB command executes, it changes the default and current buffer sizes in the async data table to the most recently specified value. If the line associated with the buffer is not logged in, the CAB command only changes the default buffer size. If the line is logged in, the CAB command changes both the default and current buffer sizes. If you issue the INITIALIZE_COMMAND_ENVIRONMENT (ICE) command, the line's buffer sizes return to their default values.

It is no longer necessary to set the buffer size for all assignable lines to the maximum required by any device or application. You can either establish buffer sizes at cold start by including a CAB command for the line in the PRIMOS.COMI file, or issue an interactive CAB command when you assign the line.

The decimal CAB command is a functional replacement for octal AMLBUF, NTSABF, NTSBUF, and REMBUF configuration directives. These directives are obsolete at PRIMOS Rev. 22.0. Replace any buffer directive in your configuration file with CAB commands in your system startup file.

Command Format

$$\text{CAB} \left\{ \begin{array}{l} \text{-HELP} \\ \text{-LINE } n \left[\begin{array}{l} \text{-IBS } size \\ \text{-OBS } size \\ \text{-DMQS } size \end{array} \right] \text{[-TO } m \text{ (-EXCEPT } y_1 \dots y_{10})] \\ \text{-NTSABF} \left[\begin{array}{l} \text{-IBS } size \\ \text{-OBS } size \end{array} \right] \\ \text{-NTSBUF} \\ \text{-REMBUF} \end{array} \right\} \text{[-ON } node]$$

Options

- HELP** Displays the format of the command and a list of valid command line options. When you select -HELP all other options are ignored.
- LINE *n*** Specifies a single line, where *n* is the required decimal line number, or when used with the -TO option, the first line number in a series allocated identical buffer sizes. Valid line numbers range from 0 to 511 for direct-connect lines. Do not specify -LINE with the -NTSABF, -NTSBUF, or -REMBUF options.
- IBS *size*** Specifies the size of the input buffer, where *size* is the decimal number of 8-bit characters that the buffer can store. *size* can range from 10 to 4096 characters. If *size* is omitted or equals zero, the current buffer size is used. The default value at cold start is 256 characters.
- OBS *size*** Specifies the size of the output buffer, where *size* is the decimal number of 8-bit characters that the buffer can store. *size* can range from 100 to 4096 characters. If *size* is omitted or equals zero, the current buffer size is used. The default value at cold start is 384 characters.
- DMQS *size*** Specifies the size of the DMQ buffer for direct connect lines, where *size* is the decimal number of 8-bit characters that the buffer can store. At Rev. 22.0 valid *sizes* are 0, 15, 31, 63, 127, 255, 511, and 1023 characters. If *size* is omitted or equals zero, the current buffer size is used. The default value at cold start is 31 characters. Do not specify -DMQS with the -NTSABF, -NTSBUF, or -REMBUF options.
- TO *m*** Specifies a range of consecutively numbered lines allocated identical buffer sizes, where *m* specifies the last number in a series beginning at the line number *n* given in -LINE. The value of *m* ranges from 1 to 511 and must be greater than *n*. You can use -TO with the -EXCEPT option, if desired.
- EXCEPT *y₁...y₁₀*** Excludes up to 10 lines from a range specified with the -TO option, where *y* is a valid decimal line number less than *m*.
- NTSABF** Specifies the initial and default buffer size for all NTS assignable lines. Use with the -IBS and -OBS options.
- NTSBUF** Specifies the initial and default buffer size for all NTS terminal lines. Use with the -IBS and -OBS options.
- REMBUF** Specifies the initial and default buffer size for all PRIMENET remote login lines. Use with the -IBS and -OBS options.

-ON *node* Allows a user with access to the DSM function CHANGE_ASYNC_BUFFER\$ to issue the CAB command from any terminal, where *node* is the node name of the system. If the node name is omitted, the CAB command is executed on the local system.

Examples

Modifying Buffers For an Individual Line: The following command line modifies the input, output, and DMQ buffer sizes for line 3.

```
OK, CAB -LINE 3 -IBS 512 -OBS 512 -DMQS 63  
[CAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]  
OK,
```

Modifying Buffers For a Range Of Lines: The following command line modifies only the output buffers for lines 14 through 27. The input and DMQ buffers remain unchanged.

```
OK, CAB -LINE 14 -TO 27 -OBS 1000  
[CAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]  
OK,
```

Making Exceptions: The following command line modifies the buffer sizes for a range of consecutive lines. The buffers for the two lines specified with the -EXCEPT option remain unchanged.

```
OK, CAB -LINE 20 -TO 45 -EXCEPT 34 41 -IBS 400 -OBS 1000 -DMQS 127  
[CAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]  
OK ,
```

Modifying Buffers For Remote Users: The CAB command can change buffer sizes for PRIMENET remote login lines as well as NTS login, and NTS assignable lines. You cannot change the buffer sizes for an individual remote line, however. Any changes are made to all lines in the group. The command line below increases input and output buffers for all NTS login lines.

```
OK, CAB -NTSBUF -IBS 1000 -OBS 1000  
[CAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]  
OK,
```

Modifying Buffers With DSM: If your DSM Administrator specifically gives you access to the DSM function CHANGE_ASYNC_BUFFER\$ in your system's DSM configuration file, you can issue the CAB command from any terminal. Your access rights are verified whenever you use the -ON *node* option. If the node name is omitted, the CAB command is executed on the local system.

```
OK, CAB -LINE 7 -OBS 1000 -ON DESIGN  
[CAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]  
OK,
```

CAB Command Error Messages

Before changing buffer sizes, the CAB command determines if the command line options are valid and appropriate. It processes requests to change input and output buffers before DMQ buffers. When the command detects an error, it displays one of the error messages below and returns you to command level.

Array too small. (AS\$DBA)

The number of lines configured exceeds the size of the buffer allocation table.

Bad buffer size. (AS\$DBA)

The buffer size specified in the command line is out of range or invalid.

Bad key in call. (AS\$DBA)

This is an internal error that indicates a faulty parameter was passed by the calling procedure.

Bad lag value. (AS\$DBA)

The LAG threshold value set by either the NTSBUF or NTSABF configuration directive exceeds the maximum number of characters in the buffer.

Bad line number. (AS\$DBA)

The line number specified in the command line is invalid or beyond the range of lines currently configured on your system.

Bad offset. (AS\$DBA)

The command line specifies an invalid line number or range of numbers.

Bad version number. (AS\$DBA)

The calling procedure specifies an invalid version number for CAB.

Buffer already allocated. (AS\$DBA)

The line specified in the command line already has buffers associated with it.

Buffer can't hold existing data. (AS\$DBA)

An attempt was made to reduce the size of an existing buffer that contained more characters than the size specified in the CAB command.

Buffer not allocated. (AS\$DBA)

No action was taken on the command line. Try again to issue the CAB command again.

Buffer size must be zero. (AS\$DBA)

Inconsistent or null values were supplied on the command line.

DMQ buffer not allowed. (AS\$DBA)

The -DMQS option was specified for an NTS line or PRIMENET remote login line. Only AMLC and ICS controllers use DMQ buffers. Any requests to change input or output buffer size are processed.

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DMQ buffer not allowed for this line. (AS\$DBA)

The -DMQS option was specified for an NTS or PRIMENET remote login line. Only AMLC and ICS controllers use DMQ buffers. Any requests to change input or output buffer size are processed.

Do not own line. (AS\$DBA)

An attempt was made to change buffers for a line actively in use by another.

Can't lock QCB. (AS\$DBA)

The lock for the queue control block associated with the DMQ buffer is currently held by another user. Try the command again.

Can't unlock QCB. (AS\$DBA)

The lock for the queue control block associated with the DMQ buffer cannot be released. Try the command again.

Can't chg DMQ of last AMLC. (AS\$DBA)

The last line of the last AMLC controller on your system is used for clocking purposes. You cannot change the size of this DMQ buffer.

Insufficient locks. (AS\$DBA)

The user or calling application does not have the correct access rights to change the buffer sizes for a line.

Insufficient memory to allocate these buffers. (AS\$DBA)

There is currently not enough space available in dynamic memory to allocate buffers of the requested size.

Line number must be zero. (AS\$DBA)

Do not specify the -LINE option with the -NTSABF, -NTSBUF, or -REMBUF options.

New buffer is too small to hold the data in the existing buffer. (AS\$DBA)

An attempt was made to reduce the size of a buffer currently containing more data than the requested size can store. Try requesting a larger buffer size.

Too many keys in call. (AS\$DBA)

The calling procedure supplied too many parameters.

Unable to allocate DMQ buffer. (AS\$DBA)

The system allocated input and output buffers, but due to a communication failure with the AMLC or ICS controller, did not allocate DMQ buffers.

Unable to change DMQ buffer size. (AS\$DBA)

The system changed the size of the input and output buffers, but due to a communication failure with the AMLC or ICS controller, did not change the size of the DMQ buffers.

Unable to deallocate DMQ buffer. (AS\$DBA)

The system released the input and output buffers. However, due to a communication failure with the AMLC or ICS controller, the system is unable to release the memory used for the line's DMQ buffer.

Unable to lock initial buffers. (AS\$DBA)

The control block associated with the buffers is currently held by another user.

Unable to lock line. (AS\$DBA)

The lock associated with the buffers for the line are held by another user.

XOFF too small. (AS\$DBA)

The XOFF threshold is less than 10 characters. Issue the command again with a larger buffer size.

XOFF too large. (AS\$DBA)

The XOFF threshold is greater than the number of characters in the buffer. Issue the command again with a larger buffer size.

XON too large. (AS\$DBA)

The XON threshold is greater than the number of characters in the buffer. Issue the command again with a larger buffer size.

You do not own this line. (AS\$DBA)

The line number supplied in the command line is currently in use by another user.

You are not an authorized user. (AS\$DBA)

A user can change the buffer sizes for his own line or assignable lines. Only a System Administrator or user with specific DSM access rights can change the buffer sizes of any line.

THE LAB COMMAND

The LAB command lists the current and default buffer sizes for your login and assignable lines. Issue this command at the supervisor terminal for information on all input, output, and DMQ buffers on the system. If the output generated is more than twenty-three lines, the LAB command paginates the display.

Note

Users with access to the DSM function LIST_ASYNC_BUFFER\$ can issue the LAB command from any terminal provided they use the -ON *nodename* option.

Command Format

$$\text{LAB} \left\{ \begin{array}{l} \text{-HELP} \\ \text{-LINE } n \text{ [TO } m \text{ (-EXCEPT } y_1 \sim y_{10})]} \\ \left[\begin{array}{l} \text{-NTSABF} \\ \text{-NTSBUF} \\ \text{-REMBUF} \end{array} \right] \end{array} \right\} \left[\begin{array}{l} \text{-ON } \textit{node} \\ \text{-ALL} \\ \text{-ACTIVE} \\ \text{-NO_HEADER} \\ \text{-NO_WAIT} \end{array} \right]$$

Options

- HELP** Displays the format of the command and a list of valid command line options. When you select **-HELP** all other options are ignored.
- LINE *n*** Requests buffer information on a single line where *n* is the required decimal line number, or when used with the **-TO** option, the first line number in a series. Valid line numbers range from 0 to 511. Do not specify **-LINE** with the **-NTSABF**, **-NTSBUF**, or **-REMBUF** options.
- TO *m*** Requests buffer information on a range of consecutively numbered lines, where *m* specifies the last number in a series beginning at the line number *n* given in **-LINE**. The value of *m* ranges from 1 to 511 and must be greater than *n*. You can use **-TO** with the **-EXCEPT** option, if desired.
- EXCEPT *y₁...y₁₀*** Excludes up to 10 lines from a range specified with the **-TO** option, where *y* is a valid decimal line number less than *m*.
- NTSABF** Requests buffer information on all NTS assignable lines.
- NTSBUF** Requests buffer information on all NTS terminal lines.
- REMBUF** Requests buffer information on all PRIMENET remote login lines.
- ON *node*** Allows users with access to the DSM function `LIST_ASYNC_BUFFER$` to display the buffer sizes from any terminal, where *node* is the node name of the remote system. If the node name is omitted, the LAB command is executed on the local system.
- ACTIVE** Requests information on all lines currently in use. Do not specify **-ACTIVE** with the **-LINE** or **-ALL** options.
- ALL** Requests information on all lines configured on the system. Do not specify **-ALL** with the **-ACTIVE** option.
- NO_HEADER**
-NH Suppresses the top header and entry type headers in multi-page displays.
- NO_WAIT**
-NW Suppresses the *—More—* prompt and scrolls output continuously.

Examples

Displaying Your Line's Buffers: Simply issue the LAB command without any options to display information on your own line's buffers.

OK, LAB

Node: MATH.2

```

+-----+
|          |          |          Current Buffers          || Default/Initial Buffers  |
|          |          |-----+-----+-----+-----+
| Line | Status | Input | Output | DMQ || Input | Output | DMQ |
+-----+-----+-----+-----+-----+-----+-----+
|   66 | ACTIVE |   256 |   384 |  127 ||   256 |   384 |  127 |
+-----+-----+-----+-----+-----+-----+
    
```

Verifying Interactive Changes: Before issuing an interactive CAB command, use the LAB command to display the existing values. After issuing the CAB command, use the LAB command once again, as shown below, to verify that the changes are correct.

OK, LAB -LINE 5

[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]

Node: MATH.2

```

+-----+
|          |          |          Current Buffers          || Default/Initial Buffers  |
|          |          |-----+-----+-----+-----+
| Line | Status | Input | Output | DMQ || Input | Output | DMQ |
+-----+-----+-----+-----+-----+-----+
|    5 | ACTIVE |   128 |   128 |   31 ||   128 |   128 |   31 |
+-----+-----+-----+-----+-----+-----+
    
```

OK, CAB -LINE 5 -IBS 256 -OBS 384 -DMQS 127

[CAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]

OK, LAB -LINE 5

[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]

Node: MATH.2

```

+-----+
|          |          |          Current Buffers          || Default/Initial Buffers  |
|          |          |-----+-----+-----+-----+
| Line | Status | Input | Output | DMQ || Input | Output | DMQ |
+-----+-----+-----+-----+-----+-----+
|    5 | ACTIVE |   256 |   384 |  127 ||   128 |   128 |   31 |
+-----+-----+-----+-----+-----+-----+
    
```

Displaying Active Buffers For a Range Of Lines: The LAB command displays information on any lines currently in use within the range supplied. If you need information on all configured lines, use the -ALL option.

```
OK, LAB -LINE 0 -TO 10
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

Node: MATH.2

```

+-----+
|          |          Current Buffers          || Default/Initial Buffers          |
|          |-----+-----+-----+-----+-----+-----+-----+
| Line | Input | Output | DMQ || Input | Output | DMQ |
+-----+-----+-----+-----+-----+-----+-----+
| 0 | 256 | 384 | 127 || 256 | 384 | 127 |
| 3 | 256 | 384 | 127 || 256 | 384 | 127 |
| 5 | 256 | 384 | 127 || 256 | 384 | 127 |
| 6 | 256 | 384 | 127 || 256 | 384 | 127 |
| 7 | 256 | 384 | 127 || 256 | 384 | 127 |
| 8 | 256 | 384 | 127 || 256 | 384 | 127 |
+-----+-----+-----+-----+-----+-----+-----+

```

OK

Displaying All Buffers For a Range Of Lines: You can obtain a comprehensive listing for both active and inactive lines with the -ALL option. The following command line displays buffer sizes for all lines within the range supplied.

```
OK, LAB -LINE 0 -TO 10 -ALL
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

Node: MATH.2

```

+-----+
|          |          Current Buffers          || Default/Initial Buffers          |
|          |-----+-----+-----+-----+-----+-----+-----+
| Line | Status | Input | Output | DMQ || Input | Output | DMQ |
+-----+-----+-----+-----+-----+-----+-----+
| 0 | ACTIVE | 256 | 384 | 127 || 256 | 384 | 127 |
| 1 |         | 128 | 128 | 31  || 256 | 384 | 127 |
| 2 |         | 128 | 128 | 31  || 256 | 384 | 127 |
| 3 | ACTIVE | 256 | 384 | 127 || 256 | 384 | 127 |
| 4 |         | 128 | 128 | 31  || 256 | 384 | 127 |
| 5 | ACTIVE | 256 | 384 | 127 || 256 | 384 | 127 |
| 6 | ACTIVE | 256 | 384 | 127 || 256 | 384 | 127 |
| 7 | ACTIVE | 256 | 384 | 127 || 256 | 384 | 127 |
| 8 | ACTIVE | 256 | 384 | 127 || 256 | 384 | 127 |
| 9 |         | 128 | 128 | 31  || 256 | 384 | 127 |
| 10 |        | 0   | 0   | **** || 256 | 384 | 127 |
+-----+-----+-----+-----+-----+-----+-----+

```

OK,

Excluding Display Lines: It is possible to exclude lines from the display by using the -EXCEPT option as shown below.

```
OK, LAB -LINE 0 -TO 10 -EXCEPT 4 6 8
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

```
Node: MATH.2
```

```

+-----+
|          | Current Buffers          || Default/Initial Buffers |
|          |-----+-----+-----+
| Line    | Input | Output | DMQ  || Input | Output | DMQ  |
+-----+-----+-----+-----+
| 0      | 256  | 384  | 127  || 256  | 384  | 127  |
| 3      | 256  | 384  | 127  || 256  | 384  | 127  |
| 5      | 256  | 384  | 127  || 256  | 384  | 127  |
| 7      | 256  | 384  | 127  || 256  | 384  | 127  |
+-----+-----+-----+-----+

```

```
OK,
```

Displaying Buffers For Remote and NTS Lines: The following three command lines provide information on PRIMENET remote login line buffers, NTS login line buffers, and NTS assignable line buffers.

```
OK, LAB -REMBUF
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

```
Node: MATH.2
```

```

+-----+
|          | Initial Buffers          |
|          |-----+-----+
|          | Input | Output |
+-----+-----+
| REMBUF | 260  | 258  |
+-----+-----+

```

```
OK, LAB -NTSBUF
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

```
Node: MATH.2
```

```

+-----+
|          | Initial Buffers          |
|          |-----+-----+
|          | Input | Output |
+-----+-----+
| NTSBUF | 256  | 384  |
+-----+-----+

```

```
OK, LAB -NTSABF
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

```
Node: MATH.2
```

```

+-----+
|          | Initial Buffers          |
|          |-----+-----+
|          | Input | Output |
+-----+-----+
| NTSABF | 256  | 384  |
+-----+-----+

```

```
OK
```

Listing Buffers With DSM: Users with access to the DSM function LIST_ASYNC_BUFFERS\$ can issue the LAB command from any terminal. Your DSM Administrator must specifically give you access to the DSM function in your system's DSM configuration file. Your access rights are verified whenever you use the -ON *node* option. If the node name is omitted, the LAB command is executed on the local system. If the -ON option is omitted, the display is limited to buffer information on your terminal line.

```
OK, LAB -ACTIVE -ON DESIGN -NW
[LAB Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
```

```
Node: DESIGN
```

```

+-----+
|          |          Current Buffers          || Default/Initial Buffers          | | | | |
|          |-----+-----+-----+||-----+-----+-----+|
| Line    | Input | Output | DMQ || Input | Output | DMQ |
+-----+-----+-----+-----+||-----+-----+-----+|
| 0       | 256   | 384   | 127 || 256   | 384   | 127 |
| 5       | 256   | 384   | 127 || 256   | 384   | 127 |
| 6       | 256   | 384   | 127 || 256   | 384   | 127 |
| 7       | 256   | 384   | 127 || 256   | 384   | 127 |
| 8       | 256   | 384   | 127 || 256   | 384   | 127 |
| 12      | 256   | 384   | 127 || 256   | 384   | 127 |
| 13      | 256   | 384   | 127 || 256   | 384   | 127 |
| 16      | 256   | 384   | 127 || 256   | 384   | 127 |
| 17      | 256   | 384   | 127 || 256   | 384   | 127 |
| 20      | 256   | 384   | 127 || 256   | 384   | 127 |
| 23      | 256   | 384   | 127 || 256   | 384   | 127 |
| 25      | 256   | 384   | 127 || 256   | 384   | 127 |
| 26      | 256   | 384   | 127 || 256   | 384   | 127 |
| 27      | 256   | 384   | 127 || 256   | 384   | 127 |
| 28      | 256   | 384   | 127 || 256   | 384   | 127 |
| 33      | 256   | 384   | 127 || 256   | 384   | 127 |
| 34      | 256   | 384   | 127 || 256   | 384   | 127 |
| 36      | 256   | 384   | 127 || 256   | 384   | 127 |
| 37      | 256   | 384   | 127 || 256   | 384   | 127 |
| 39      | 256   | 384   | 127 || 256   | 384   | 127 |
| 44      | 256   | 384   | 127 || 256   | 384   | 127 |
| 45      | 256   | 384   | 127 || 256   | 384   | 127 |
| 46      | 256   | 384   | 127 || 256   | 384   | 127 |
| 56      | 256   | 384   | 127 || 256   | 384   | 127 |
| 59      | 256   | 384   | 127 || 256   | 384   | 127 |
| 63      | 256   | 384   | 63  || 256   | 384   | 63  |
| 64      | 256   | 384   | 127 || 256   | 384   | 127 |
| 66      | 256   | 384   | 127 || 256   | 384   | 127 |
| 70      | 256   | 384   | 127 || 256   | 384   | 127 |
| REM    | 260   | 258   | **** || 260   | 258   | **** |
+-----+-----+-----+-----+||-----+-----+-----+|

```

```
OK
```

LAB Error Messages

When the LAB command detects a syntax error, no action is taken on the command line. The appropriate error message is displayed, and you are returned to the command level. If there is an unexpected system error, the LAB display is terminated. When a LAB command fails to obtain and display all or part of the information requested, a warning is issued.

-ACTIVE may not be specified with the -ALL option. (LAB)

You cannot request information on all active lines and all configured lines in the same command line.

-ACTIVE may not be specified with the -LINE option. (LAB)

You cannot request information for a specific line and for all active lines in the same command line.

Bad line name for -LINE option. (LAB)

The line number *n* specified in the -LINE option is not configured on this system.

Bad line name for -TO option. (LAB)

The line number *m* specified in the -TO option must be a valid line number configured on the system greater than *n*.

Duplicate -EXCEPT values are NOT permitted. (LAB)

You can exclude as many as 10 separate lines from a display. Do not specify the same line twice.

-EXCEPT value(s) not within the specified range. (LAB)

You can exclude only those lines greater than *n* and less than *m* from a display.

Invalid options specified with the -NTSABF option. (LAB)

You cannot specify the -LINE, -TO, or -EXCEPT options with the -NTSABF option.

Invalid options specified with the -NTSBUF option. (LAB)

You cannot specify the -LINE, -TO, or -EXCEPT options with the -NTSBUF option.

Invalid options specified with the -REMBUF option. (LAB)

You cannot specify the -LINE, -TO, or -EXCEPT options with the -REMBUF option.

Lines <*n*> thru <*n+m*> are not present on the system. (LAB)

The range of lines specified in the command line is not configured on the system.

Line name for -TO must exceed that for the -LINE option. (LAB)

The value specified for the end of a range, *m*, must be larger than the value specified for the beginning, *n* in the LAB command line.

Must specify a line name when using the -LINE option. (LAB)

The line number, *n*, is required.

Must specify a line name when using the -TO option. (LAB)

The line number, *m*, is required.

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No ACTIVE lines available for supplied lines. (LAB)

The lines specified in the command line are not active at this time.

No lines in specified range are owned by current process. (LAB)

An unauthorized user attempted to display information for a range of lines belonging to other users.

No values were supplied with the -EXCEPT option. (LAB)

The value *y* was omitted from the command line. You can specify as many as 10 values with the -EXCEPT option.

Number of -EXCEPT values cannot equal number of lines. (LAB)

The total number of lines excluded from the display must be less than the total number of lines.

Option -LINE must be specified to use the -TO option. (LAB)

You must supply the beginning of a range *n* with the -LINE option before you can specify the end of the range, *m* with the -TO option.

Option -TO must be specified to use the -EXCEPT option. (LAB)

You can only exclude lines from the display of a range of consecutive lines.

You are not an authorized user. (LAB)

An unauthorized user attempted to display information for lines on a remote system with the -ON option.

You do not own this line. (LAB)

An unauthorized user attempted to display information for a line belonging to another user.

THE CONVERT_BUFFER_DIRECTIVES UTILITY

The CONVERT_BUFFER_DIRECTIVES utility translates any obsolete AMLBUF, NTSABF, NTSBUF, and REMBUF configuration directives in your configuration file to CAB commands. See Appendix A, Obsolete and Seldom Used Commands, for more information on the AMLBUF, NTSABF, NTSBUF, and REMBUF directives.

You can use this utility interactively, or in full file mode. You must, however, use SET_ASYNC commands to configure your asynchronous communication lines before you can use the CONVERT_BUFFER_DIRECTIVES utility.

Upgrade Procedure

Follow these basic instructions for upgrading your current AMLBUF, NTSBUF, NTSABF, and REMBUF directives to CAB commands.

1. Make a copy of your current configuration file for later reference.
2. Use the LAB -ALL command to list the actual values being set by your existing configuration directives.
3. Use the CONVERT_BUFFER_DIRECTIVES utility to create CAB commands that correspond to the existing directives.
4. If any of the buffer sizes listed by the LAB command are not the values that you expected, correct the CAB command for that line.

WARNING

At Rev. 19.4.7 the method for assigning DMQ buffer indices changed. Do not use the CONVERT_BUFFER_DIRECTIVES utility on AMLBUF directives created before Rev. 19.4.7.

To invoke full file mode, type the command line and press carriage return. You will be queried to enter four pathnames:

1. The input command file pathname that contains the SET_ASYNC commands (PRIMOS.COMI default)
2. The input configuration directive pathname that contains the buffer directives (CONFIG default)
3. The new output command file pathname to store the new CAB commands (PRIMOS.COMI.NEW default)
4. The new output configuration directive pathname without the buffer directives (CONFIG.NEW default)

To accept the defaults, simply press carriage return.

When you invoke the utility, it scans your input command file for obsolete AMLC commands. If AMLC commands are found, processing stops and an error message requests that you convert any AMLC commands to SET_ASYNC commands. Any SET_ASYNC commands specifically reassigning default buffer allocation with the -USER option are flagged.

Normal processing scans each line of the configuration file for obsolete buffer directives and translates them into separate CAB commands. Any other configuration directives are left untouched. If you specified LAG values for either NTSBUF or NTSABF, the directives will remain in your file.

At PRIMOS Rev. 22.0 the minimum input buffer size is 10 characters. When the CONVERT_BUFFER_DIRECTIVES utility translates directives with an input buffer size of 8 characters (4 16-bit halfwords) or less, it automatically increases the input buffer size to 10 characters.

Command Format

```
R TOOLS>CONVERT_BUFFER_DIRECTIVES { -HELP  
                                     -INTERACTIVE }
```

Options

- HELP** Displays a brief usage statement. All other options are ignored if **-HELP** is selected.
- H**
- INTERACTIVE** Queries you for an AMLBUF, NTSABF, NTSBUF, or REMBUF configuration directive, translates the directive, and displays the CAB equivalent on screen. Type Quit to exit from interactive mode and return to PRIMOS.
- INTER**

Note

CONVERT_BUFFER_DIRECTIVES generates a separate CAB command for each AMLBUF, NTSABF, NTSBUF, or REMBUF configuration directive it processes. This utility cannot recognize when consecutive lines have identical directives. You can manually combine these per-line CAB commands into a single CAB command with the **-TO** option if you wish.

Converting AMLBUF Directives

At Rev. 22.0, AMLBUF directives verify that the buffer size is within range and create an entry in the async data table for the line. Buffers are not allocated until the line becomes active.

Prior to Rev. 22.0, AMLBUF directives performed two separate tasks: they determined at cold start if the size requested was valid, and then hard-wired the requested amount of memory for the line.

The CONVERT_BUFFER_DIRECTIVES utility maintains each line's existing buffer sizes and assignments as defined by the existing AMLBUF directive and the **-USER** option of the line's SET_ASYNC command.

Prior to Rev. 22.0, AMLBUF directives referenced IRB and ORB buffers by user number and DMQ output buffers by line number. It is possible, therefore, for a single AMLBUF directive to set buffer sizes for two different lines. The CONVERT_BUFFER_DIRECTIVES utility can interpret these composite directives correctly.

WARNING

At Rev. 19.4.7 the method for assigning DMQ buffer indices changed. Do not use the CONVERT_BUFFER_DIRECTIVES utility on AMLBUF directives created before Rev. 19.4.7.

Examples

Full File Processing: The CONVERT_BUFFER_DIRECTIVES utility sets up a dialog with the user to obtain the pathnames for full file conversion. Simply press the carriage return at the prompt to accept the defaults shown below, or supply your own filenames. If an error is detected, you will receive an error message that includes the line number in the source file.

```
OK, R TOOLS>CONVERT_BUFFER_DIRECTIVES
[CONVERT_BUFFER_DIREC Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
Enter input pathname of SET_ASYNC commands
 [ CMDNCO>PRIMOS.COMI (default) ] :
Enter input pathname of configuration file
 [ CMDNCO>CONFIG (default) ] :
Enter output pathname for CAB commands
 [ *>PRIMOS.COMI.NEW (default) ] :
Enter output pathname for revised configuration file
 [ *>CONFIG.NEW (default) ] :

Conversion in progress... (CONVERT_BUFFER_DIRECTIVES)
Obsolete ring buffer directive size detected: line 51
  AMLBUF 5 1 62
The minimum input ring buffer size (10 characters) will be used.
CONVERT_BUFFER_DIRECTIVES)
*>PRIMOS.COMI.NEW *>CONFIG.NEW files have been created.
(CONVERT_BUFFER_DIRECTIVES)
OK,
```

Detecting Obsolete AMLC Commands: In the following example, the PRIMOS.COMI file contains obsolete AMLC commands. Upgrade your system startup and configuration files and remove any obsolete commands and directives.

```
OK, R TOOLS>CONVERT_BUFFER_DIRECTIVES

[CONVERT_BUFFER_DIREC Rev.22.0 Copyright (c) 1987, Prime Computer, Inc.]
Convert_AMLC_Commands has to be run prior to this command.
(CONVERT_BUFFER_DIRECTIVES)

OK,
```

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Using Interactive Mode: In the following example, the user supplies a configuration directive at the > prompt and the conversion utility displays the equivalent CAB command.

```
OK, R TOOLS>CONVERT_BUFFER_DIRECTIVES -INTER
[CONVERT_BUFFER_DIRECTIVES Rev.22.0 Copyright (c) 1987, Prime Computer, Inc.]
> AMLBUF 200 200 64
CAB -LINE 128 -IBS 256 -OBS 48 -DMQS 63

> AMLBUF 0 10 10 32
CAB -LINE 0 -IBS 16 -OBS 16 -DMQS 31

> NTSABF 200 200
CAB -NTSABF -IBS 256 -OBS 256

> NTSBUF 200 200 20 60
CAB -NTSBUF -IBS 256 -OBS 256

> NTSBUF 200 200
CAB -NTSBUF -IBS 256 -OBS 256

> REMBUF 200 200
CAB -REMBUF -IBS 256 -OBS 256

> AMLBUF 7 2 100 100
Minimum input ring buffer size (10 characters) will be
used. (CONVERT_BUFFER_DIRECTIVES)
CAB -LINE 7 -IBS 10 -OBS 128 -DMQS 63
```

CONVERT_BUFFER_DIRECTIVES Error Messages

The CONVERT_BUFFER_DIRECTIVES utility detects three kinds of input errors:

- Obsolete AMLC commands present in the PRIMOS.COMI file
- Configuration directives with incorrect or invalid arguments
- Input buffers less than 10 characters

This utility detects only those errors that prevent the translation of configuration directives to CAB commands and displays one of the error messages listed below. If any obsolete AMLC commands are found in your system startup file, processing stops, and you return to command level. If an individual buffer directive is incorrect, the directive is ignored and processing continues. The CAB command detects any logic errors when the commands are processed.

Buffer directives not found; No conversion required. (CONVERT_BUFFER_DIRECTIVES)

When the filename supplied in the command line does not contain any AMLBUF, NTSABF, NTSBUF, or REMBUF configuration directives, processing stops and you are returned to PRIMOS command level.

CONVERT_AMLC_COMMANDS has to be run prior to this command. (CONVERT_BUFFER_DIRECTIVES)

Your PRIMOS.COMI file contains obsolete AMLC commands. Either run the utility CONVERT_AMLC_COMMANDS or manually change all obsolete AMLC commands to SET_ASYNC commands. For more information, read Chapter 3, Configuring Asynchronous lines.

Allocating I/O Buffers

Directive in error; line <n>. Only octal numbers are accepted for numeric input. This line will be omitted. (CONVERT_BUFFER_DIRECTIVES)

A numeric error was detected in your original configuration file. Processing continued, but the directive specified in line *n* in the input file is omitted from the output file.

Directive in error; line <n>. Invalid parameter specified. This line will be omitted. (CONVERT_BUFFER_DIRECTIVES)

An invalid parameter was detected in your original configuration file. Processing continued, but the directive specified in line *n* in the input file is omitted from the output file.

Error in reading from terminal. (CONVERT_BUFFER_DIRECTIVES)

An error was detected in the keyboard input. Please check the directive and try again.

Obsolete input ring buffer size detected line <n>. Minimum input ring buffer size (10 Characters) will be used. (CONVERT_BUFFER_DIRECTIVES)

The directive at line *n* in your configuration file specifies an input buffer containing less than ten characters. The minimum input buffer size, 10 characters, was substituted.

Invalid parameter specified. (CONVERT_BUFFER_DIRECTIVES)

Too many parameters were specified in the directive being converted.

Only octal numbers are accepted for numeric input. (CONVERT_BUFFER_DIRECTIVES)

A buffer directive with an invalid numeric argument was detected.

Too many objects on command line. Error in parsing command line. (CONVERT_BUFFER_DIRECTIVES)

Extra characters were detected on the command line.

APPENDICES

OBSOLETE AND RARELY USED COMMANDS

This appendix describes the AMLC, ASSIGN AMLC, and UNASSIGN AMLC commands. These commands use octal bitstrings to configure, assign, and release asynchronous lines on AMLC, ICS, and LTS controllers. This appendix also contains information on the AMLBUF, NTSABF, NTSBUF, and REMBUF configuration directives for pre-Rev. 22.0 systems.

OBSOLETE COMMANDS

► AMLC

The AMLC command uses octal bitstrings to configure both terminal and assignable asynchronous lines. At Rev. 20.2, the AMLC command was replaced by the SET_ASYNC command, a more straightforward way of configuring your asynchronous lines. The AMLC command does not work on systems with more than 255 lines. The command defines the following:

- The protocol for the line
- The use of Auto Speed Detect (ASD) by the line
- The line speed, bit pattern, and parity for the line
- The initial terminal characteristics of the line

Caution

Use only octal numbers in the AMLC command.

Command Format

$\left. \begin{array}{l} \text{AMLC} \\ \text{AM} \end{array} \right\} [\textit{protocol}] \textit{line} [\textit{config_word} [\textit{lword}]]$

Arguments

protocol Defines the format and relative timing of data exchanged over the line, where *protocol* can be one of the following: ASD, TRAN, TTY, TT8BIT, TTYUPC, TTYNOP, TTY8, or TTY8HS. Do not use TTYNOP and ASD for NTS lines. Model number 5054 AMLC controller boards use TTYHS, TRANHS, or TTYHUP. Detailed definitions of each protocol are provided in the following section, Standard Protocols.

line Specifies the octal line number. The maximum value is 377₈ (255) for lines attached to AMLC and ICS controllers. Line numbers 376₈ and 377₈ cannot be used as login lines and must be configured as assignable lines. Valid NTS line numbers range from 2000₈ (1024) through 2377₈ (1279). If you have more than 255 lines configured on your system, you cannot use the AMLC command.

config_word An octal bitstring that defines the configuration parameters, such as data set control, baud rate, reverse flow control, and parity. The bit pattern definitions and a template can be found in the section, Constructing Octal Bitstrings, on page A-5. The four most commonly used *config_words* and the baud rates associated with them are as follows:

<i>config_word</i>	<i>Baud Rate</i>
2033	110 Baud (uses 2 stop bits)
2213	300 Baud
2313	1200 Baud (default)
2413	Programmable clock value (clock default is 9600 Baud)

lword An octal bitstring that specifies full-duplex or half-duplex mode, recognizes XON and XOFF, and enables data set sense. For login lines, the *lword* associates a pair of buffers with the user number, an index to the location of the buffers.

Note

When the AMLC command is used to configure NTS lines, certain restrictions apply. These constraints are highlighted in the section, Using the AMLC Command on NTS Lines, on page A-9.

Standard Protocols

The values for the *protocol* argument are TRAN, TTY (the default), TT8BIT, TTYUPC, TTYNOP, TTY8, TTY8HS, TRANHS, and ASD. The basis for selection of the protocol is discussed below. Protocols for older model AMLC boards (model 5054) are discussed separately.

TRAN: TRAN, the transparent protocol, is usually used by lines connected to peripheral devices or to other computers. With transparent protocol, input is not echoed, the input of a line feed or carriage return does not provoke a response, and carriage returns are not transformed to line feeds. CONTROL-P does not have a special meaning under this protocol and is passed through to the program. All characters pass as data unless XON/XOFF flow control is set in bit three of the lword.

TTY: TTY, the terminal protocol, is the protocol assigned at cold start to lines controlling interactive terminals. With the TTY protocol, all input from the terminal is echoed if the line is set for full-duplex; a carriage return and a line feed are echoed following a carriage return. The high-order bit (the *ASCII* parity bit) of each character input from the terminal is forced on. CONTROL-P and BREAK are interpreted as a QUIT command if the terminal is connected to the system as a user terminal.

If the terminal is connected to the PRIMOS operating system with an assignable line, CONTROL-P, BREAK, and line feed input from the terminal are ignored and discarded. A carriage return input from the terminal is transmitted as a new line (or line feed) to the program requesting input.

If you do not specify a protocol when using the AMLC command, TTY is assigned by the operating system.

TT8BIT: TT8BIT behaves in the same manner as the TTY protocol except that the high-order bit (ASCII parity bit) is not forced on for each character input from the terminal. All control characters are handled in the same manner as the TTY protocol.

Use this protocol only if you have an Arabic DM5E/PLUS terminal.

To use this protocol, you must set bit 13 of the line *config_word* to 0 to enable parity, and also set bit 14 to 0 to select odd parity, as shown in the example below:

```
AMLC TT8BIT 5 2403 /* Line 5: odd parity enabled, 9600 baud
```

TTYUPC: TTYUPC, the uppercase translating protocol, is used to avoid sending lowercase output to terminals or peripheral devices that cannot print lowercase characters. This is the only difference between TTY and TTYUPC protocols.

TTYNOP: TTYNOP configures the asynchronous DIM to ignore all traffic on the line. If you have a noisy line to which no device is connected, use this protocol to ensure that the CPU does not waste time trying to interpret any noise coming from this line as commands that it must process. Do not specify TTYNOP for an NTS line.

TTY8 and TTY8HS: TTY8 adapts the standard terminal protocol TTY for devices that use Prime ECS. If you have model 5052 or 5054 AMLC controller boards, use TTY8HS, a functional equivalent of TTY8 specifically designed for this hardware.

ASD: ASD (Auto Speed Detect) allows PRIMOS to detect automatically the transmission speed of a user terminal. Depending on how you configure the line, PRIMOS can detect baud rates of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200 bits per second. Do not specify ASD for an NTS line. If you enable ASD, you must explicitly set the line's baud rate to 9600.

Note

When the system enables ASD, it reconfigures the line for character length 7, odd parity, and 1 stop bit, to prepare for the next user. If it is necessary, use the SET_ASYNC command interactively to change these line characteristics after you establish the connection. Interactive changes to line characteristics are in effect for the current session only; when you log out, ASD is reenabled.

Protocols for Older Model AMLC Boards

If you have lines attached to an older model 5054 AMLC board (also known as the DMT AMLC board), use TTYHS, TRANHS, or TTYHUP as the value for the AMLC command's *protocol* argument. TTYHS, TRANHS, and TTYHUP are commonly referred to as high-speed protocols. When you specify TTYHS, TRANHS, or TTYHUP for an NTS line, the high-speed protocol automatically is converted to its equivalent standard protocol: TTY, TRAN, or TTYUP.

Do not use these protocols on the following lines:

- Lines attached to model 5154 AMLC boards (also known as QAMLC or DMQ AMLC boards) or to ICS controllers
- Lines that normally have their character-time-interrupt flag always set (for example, the last line on the last AMLC)

Depending on the baud rate and the number of lines in the group, lines using high-speed protocols can greatly increase the system overhead.

TTYHS and TRANHS: TTYHS and TRANHS are used by lines connected to peripheral devices that can run at greater than 1200 baud, which is the standard terminal speed. For example, lines using the high-speed protocols can run at 9600 baud. TTYHS and TRANHS are the same as the protocols TTY and TRAN, with one exception; these protocols have a burst-mode effect on the output device. When the output buffer contains more than 40 characters, the line's character time interrupt flag is set. This flag remains set until the output buffer contains fewer than 40 characters.

TTYHUP: TTYHUP, the high-speed translating protocol, is used to avoid sending lowercase output to terminals or peripheral devices that cannot print lowercase characters.

Constructing Octal Bitstrings

The *config_word* and *lword* arguments to the AMLC command are octal numbers that correspond to 16-bit halfwords. The procedure for constructing an octal bitstring is as follows:

1. Decide how you want to configure the line, the speed, the protocol, and so forth.
2. Select the appropriate values from the list for each parameter and fill in the blanks for each bit in the *config_word* template (Figure A-1).
3. Write the octal value for each block of zeros and ones in the template in the spaces provided. A conversion table is supplied in Figure A-1 for your convenience.
4. Read the bit pattern from left to right. Leading zeros can be ignored.
5. Repeat steps 1 to 4 for the *lword* template.

Using Data Set Sense

Bits 5 and 6 of the *lword* are used to support devices that toggle an RS-232-C pin to signal when they are busy/ready, rather than using XON/XOFF. The RS-232-C pin 8, Data Carrier Detect (DCD), is used for the signal.

Bit 5 of the *lword* indicates that pin 8 should be interrogated before performing an output operation. If pin 8 busy is detected, PRIMOS responds as if an XOFF was received for that line. When pin 8 goes to the ready state, it is flagged as if an XON was received, and output resumes. A device can signal busy by causing pin 8 to be raised or lowered.

Bit 6 is checked only if bit 5 is set. Bit 6 can be set to interrogate pin 8 either way. For example, if the device signals busy as pin 8 high (1), the *lword* bit setting is the following:

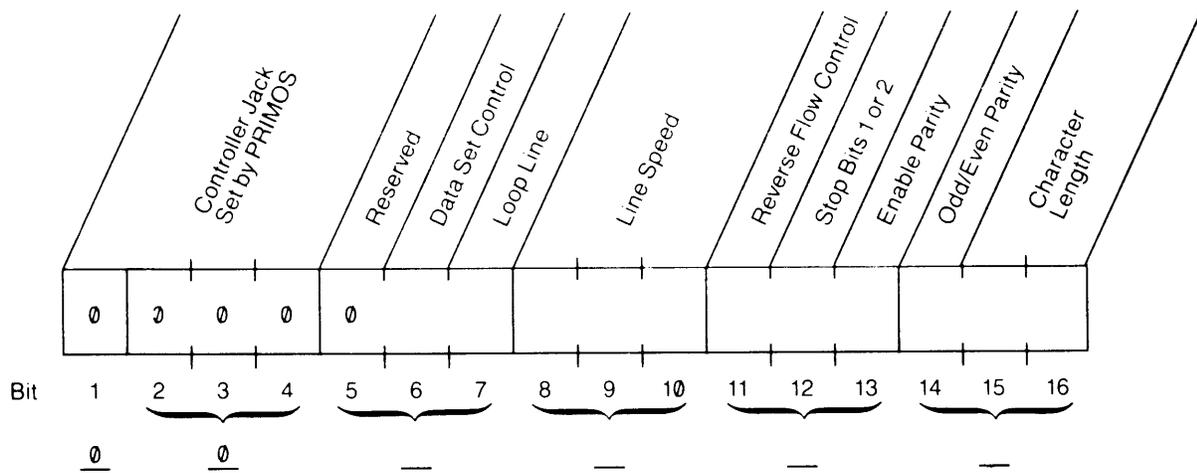
Bit 5 = 1 (Use data set sense.)

Bit 6 = 1 (If pin 8 is low, interpret as XOFF.
If pin 8 is high, interpret as XON.)

On some devices, pins other than pin 8 may be used. If this is the case, arrange the cabling so that the data set sense signal is wired into carrier detect for the controller.

Data set sense is also referred to as buffered protocol or reverse channel protocol.

Building the Configuration Word



Conversion Table

Binary	000	001	010	011	100	101	110	111
Octal	0	1	2	3	4	5	6	7

Building the Lword

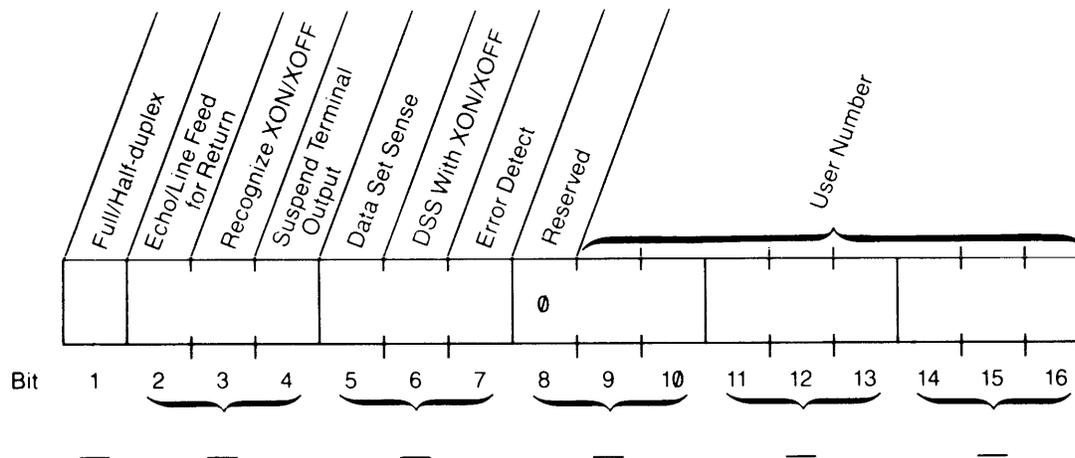


FIGURE A-1. AMLC Octal Bitstring Templates

Obsolete and Rarely Used Commands

The *config_word* is a composite of sixteen bits, each one having its own meaning as described below. Use the template in Figure A-1 to construct a *config_word* beginning at the left, with bit 1.

<i>Bit Number</i>	<i>config_word Meaning</i>
1,2,3,4	Line number on controller. Set by PRIMOS. Leave as 0.
5	Reserved. Set to 0.
6	0: Data set control off. 1: Data set control on, required for modems and port selectors, ignored by terminals. (Default)
7	0: Do not loop line. (Default) 1: Loop line (used only for testing purposes).
8,9,10	Asynchronous line speed (bits per second). 000 110 001 134.5 010 300 011 1200 (Default) 100 Programmable clock. (See AMLCLK directive.) 101 75 * 110 150 * 111 1800 *
11	0: Disable Reverse Flow Control. (Default) 1: Enable Reverse Flow Control.
12	0: 1 stop bit. (Default) 1: 2 stop bits.
13	0: Enable parity. 1: Disable parity. (Default)
14	0: Odd parity. (Default) 1: Even parity.
15,16	Character length: 00 5 bits 10 6 bits 01 7 bits 11 8 bits (Default)

The values marked with an asterisk are the defaults supplied by Prime. If you have assigned other baud rates with the ASYNC JUMPER directive or with hardware jumper cables, your values are different.

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The *lword*, like the *config_word*, is a composite of sixteen bits, each one having its own meaning as described below. Use the template in Figure A-1 to construct an *lword* beginning at the left, with bit 1.

<i>Bit Number</i>			<i>lword Meaning</i>
1	Reset	(0)	Full-duplex. (Default)
	Set	(1)	Half-duplex.
2	Reset	(0)	Echo <i>LINE FEED</i> for <i>RETURN</i> . (Default)
	Set	(1)	Do not echo <i>LINE FEED</i> for <i>RETURN</i> (meaningful only if bit 1 is set).
3	Reset	(0)	Do not recognize XOFF and XON.
	Set	(1)	Recognize XOFF (CONTROL-S, ASCII 223) and XON (CONTROL-Q, ASCII 221).
4	Reset	(0)	Terminal output not currently blocked.
	Set	(1)	Terminal output currently suspended (XOFF seen).
5	Set	(1)	Use data set sense.
6	Reset	(0)	Examined only if bit 5 is set. Toggles between XOFF when data set sense is on, and XON when data set sense is off.
	Set	(1)	Toggles between XOFF when data set sense is off, and XON when data set sense is on.
7	Set	(1)	Enable error detection, send NAK, ASCII 225 if parity error or an overflow is sensed.
8	—		Reserved. Set to 0.
9-16	—		User number (normally line number plus 2). 0 means the line is assignable. (The system's default formula for determining the user number is <i>usernumber = linenumber + 2</i> .) Do not attempt to remap line buffers at Rev. 22.0. Use the CAB command described in Chapter 6, Allocating I/O Buffers, to change buffer sizes.

Caution

If you do not follow the system's default formula for the user number on pre-Rev. 22.0 systems, two separate AMLBUF directives are required to set the size of the DMQ buffer and the input and output ring buffers for terminal users.

Using the AMLC Command on NTS Lines

NTS (Network Terminal Service) is a separately priced product that permits remote terminals and hosts to communicate with a Prime host over a LAN300, the Prime IEEE 802.3 local area network. NTS lines are usually configured with the SET_ASYNC command, but you can also use the AMLC command. For more information on the SET_ASYNC command, see Chapter 4, Configuring Asynchronous Lines.

When you use the AMLC command to configure NTS lines, certain restrictions apply.

- You must start NTS before you can configure NTS lines.
- NTS line numbers range from 2000₈ (1024) through 2377₈ (1279).
- NTS supports six standard protocols: TTY, TRAN, TT8BIT, TTYUPC, TTY8, and TTY8HS.
- NTS users are allowed twenty seconds to complete each ASSIGN or UNASSIGN command.
- The Network Administrator must map NTS lines with the NTS_ASSOCIATE command before they can be assigned.
- NTS ignores Data Set Control.
- NTS supports Reverse Flow Control. (Set RFC thresholds with either the NTSBUF or NTSABF configuration directives.)

NTS Protocols

NTS supports six standard protocols: TTY, TRAN, TT8BIT, TTYUPC, TTY8, and TTY8HS. For NTS login lines, the LTS sends the appropriate protocol to PRIMOS when the connection is established. The previous section, Standard Protocols, describes each protocol in detail.

The protocols TTYHS, TRANHS, or TTYHUP are intended for older model 5054 DMT AMLC controller boards. When you specify one of these protocols, NTS automatically converts the protocol to its equivalent: TTY, TRAN, or TTYUPC. An error message is not displayed.

Several protocols are not supported. If you specify TTYNOP or ASD for a line attached to an LTS, no action is taken and an error message is displayed on the screen.

► ASSIGN AMLC

The octal ASSIGN AMLC command was replaced by the decimal ASSIGN ASYNC command at PRIMOS Rev. 21.0. For more information on the new command format, see Chapter 5, Assignable Asynchronous Lines.

The ASSIGN AMLC command configures and assigns an asynchronous communication line. You also can assign a previously mapped path between devices.

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You can only assign a line if it was configured as an assignable line in your PRIMOS.COMI file and the line is not currently assigned to another user or process.

Before you can assign an NTS line, you must map it with the NTS_ASSOCIATE command. NTS allows a twenty-second time window for each connection request before terminating the ASSIGN command.

After the system is running, you can assign the line from your terminal by issuing the ASSIGN AMLC command.

Command Format

ASSIGN AMLC [*protocol*] line [*config_word*]

Arguments

protocol Defines the format and relative timing of data exchanged over the line, where *protocol* can be one of the following: ASD, TRAN, TTY, TT8BIT, TTYUPC, TTY8, TTY8HS, TTYHS, TRANHS, or TTYHUP. NTS lines support TTY, TRAN, TT8BIT, and TTYUPC

line Specifies the octal line number. The maximum values are 377₈ (255) for local lines and 2377₈ (1279) for NTS lines. If you have more than 255 lines configured on your system, you cannot use the ASSIGN AMLC command.

config_word An octal bitstring that defines the configuration parameters. For detailed information see the section, Constructing Octal Bitstrings, in this appendix. The four most commonly used *config_words* and the baud rates associated with them are as follows:

<i>config_word</i>	<i>Baud Rate</i>
2033	110 Baud (uses 2 stop bits)
2213	300 Baud
2313	1200 Baud (Default)
2413	Programmable clock value (clock default is 9600 Baud)

Note

The ASSIGN AMLC command cannot be issued twice in succession to perform an implicit UNASSIGN. To change a line from an assigned line to a login line, you must first issue the UNASSIGN AMLC command.

► **UNASSIGN AMLC**

The octal UNASSIGN AMLC command was replaced by the decimal UNASSIGN ASYNC command at PRIMOS Rev. 21.0. For more information on the new command format, see Chapter 5, Assignable Asynchronous Lines.

The UNASSIGN AMLC command releases an asynchronous communication line and makes it available for another user or process.

Use the UNASSIGN command to break a permanent connection over an NTS line. NTS allows a twenty second time window for each disconnect request before terminating an UNASSIGN command. After issuing the UNASSIGN command for an NTS line, issue the NTS_UNASSOCIATE command.

Command Format

UNASSIGN AMLC *line*

Argument

line Specifies the octal line number. The maximum values are 377₈ (255) for local lines and 2377₈ (1279) for NTS lines. If you have more than 255 lines configured on your system, you cannot use the UNASSIGN AMLC command.

Remember, you can unassign only those lines that you have assigned. If necessary, the operator or System Administrator has the rights to unassign any line or device from the supervisor terminal, regardless of who assigned it or from which terminal it was assigned.

AMLC Error Messages

The AMLC command checks for errors while parsing the command line. Missing, contradictory, or incorrect arguments generate an error message and no action is taken on the command. Error messages are reported to the process that invoked the AMLC command, usually the supervisor terminal. The AMLC error messages are listed alphabetically below.

Buffer number <buffer number> is already in use by line <n>. (AMLC)

An attempt was made to assign a single buffer *buffer number* to more than one line.

Buffer <buffer number> is a remote login buffer. (AMLC)

An attempt was made to use a remote buffer *buffer number* for a local line.

Buffer number <n> is out of range; the acceptable range for <line type> buffers is <x to y>. (AMLC)

The user number *n* specified in the lword is out of range for the given line. Where *line type* can be Local Terminal, Local Assigned, NTS Terminal, or NTS Assigned and *x* to *y* is the acceptable range of values for that line type.

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Cannot enable auto speed detect on an assignable line. (AMLC)

An attempt was made to specify the ASD protocol on an assignable line.

Cannot refer to an NTS line when NTS is not started. (AMLC)

An AMLC command was issued to configure an NTS line when NTS was not started.

Cannot swap terminal/assigned buffers while an NTS line is connected. (AMLC)

The user number specified in the lword attempted to substitute an NTS assigned line's buffer for an NTS terminal buffer while the line is connected, or vice versa.

Cannot use an assignable line buffer <buffer number> on a user login line. (AMLC)

An attempt was made to allocate a buffer *buffer number* from the pool reserved for assignable lines to a login line.

Device output queue full. (AMLC)

The line control output queue cannot accommodate the line configuration block generated by the AMLC command. This error message may indicate a temporary failure of PRIMOS to communicate with the LHC controller, or a problem with the LHC controller itself. No action is taken on the command attempt. However, if the command is reissued, it may succeed.

Invalid ASD sample speed specified <speed>. (AMLC)

The baud rate given in the *config_word* is not a valid ASD sample speed.

Line is already assigned to another user <user number>, must be unassigned first. (AMLC)

An attempt was made to convert a currently assigned line to a login line or assign a line that is already being used by another user.

Line <n> now supports user login, user number is <user number>. (AMLC)

This message is displayed after an assignable line *n* is reconfigured to be a login line with the given *user number*.

Line <n> now supports user <number>. The buffer sizes for line <n> remain the same. Please use the CAB command to change buffer sizes. (AMLC)

The System Administrator used the AMLC lword option to associate the buffers normally mapped to line *number* to line *n*. It is strongly recommended that you do not do this. Use a CAB command to change the size of the buffers logically associated with the line.

Line number is required. (AMLC)

A valid line number was not specified in the command line.

Line number <n> is out of range; acceptable range is 0 to 377₈. (AMLC)

The octal line number *n* supplied in the command line is not valid.

Line number <n> is out of range; acceptable range is 0 to 377₈ and 2000₈ to 2377₈. (AMLC)

The octal line number *n* supplied in the command line is not valid and NTS is running.

No XCB available for request. (AMLC)

This message usually indicates a software failure, either in PRIMOS or the LHC. Contact your Customer Support Center.

Number of configured async lines exceeds 256. Please use SET_ASYNC. (AMLC)

The AMLC command does not work on systems with more than 255 lines configured.

The <protocol name> protocol is not supported on NTS lines. (AMLC)

An unsupported protocol was supplied in the command line, where the invalid *protocol name* can be TTYNOP, or ASD.

System console command only. (AMLC)

An AMLC command was issued from a terminal other than the supervisor terminal (formerly referred to as the system console).

WARNING: Changing the speed of the AMLC Clock Line <n> to greater than 300 bps. (AMLC)

The line *n*, the last line of the last AMLC controller board, was configured for a speed greater than 300 bps. This can result in severe performance degradation.

WARNING: Line number <n> does not exist on this system. (AMLC)

An attempt was made to configure a line that does not physically exist.

► AMLBUF

Sets the size of I/O buffers for local login and assignable asynchronous lines. AMLBUF directives are necessary only for lines connected to devices that do not run efficiently with the default buffer sizes. AMLBUF directives are stored in your PRIMOS configuration file and set buffer sizes at cold start. All arguments to the AMLBUF directive are octal numbers.

Caution

The AMLBUF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your AMLBUF directives with CAB commands.

At Rev. 22.0 AMLBUF directives create an entry in the async data table for the line. Buffers are not hardwired at cold start; they are allocated when the line becomes active. CAB commands take precedence over AMLBUF directives. If you issue an interactive CAB command, it overwrites any previous values contained in the async data table.

WARNING

At Rev. 19.4.7 the method for assigning DMQ buffer indices changed. Do not use the CONVERT_BUFFER_DIRECTIVES utility on AMLBUF directives created before Rev. 19.4.7.

This directive has two distinct formats as shown below. Each login line requires a separate AMLBUF directive. Assignable lines may require two directives. If any of the size arguments to the AMLBUF directive are set to zero or omitted, the default size or, when there is an existing AMLBUF directive, the last value specified is used.

Command Format I

For login lines, only one AMLBUF directive is necessary:

AMLBUF *line-number* *IRB-size* *ORB-size* *DMQ-size*

Command Format II

Assignable lines may require two AMLBUF directives. The first AMLBUF directive sets only the DMQ size and the second sets the ring buffer sizes.

AMLBUF *line-number* *0* *0* *DMQ-size*

AMLBUF *index* *IRB-size* *ORB-size* *0*

Caution

Prior to Rev. 22.0, you could eliminate unused default buffers by changing the user number associated with the line. This is no longer necessary or possible at Rev. 22.0, because I/O buffers are now associated with the line, not with the user number.

Arguments

- line-number*** The physical line number required for setting the DMQ buffer.
- index*** The values used by PRIMOS to reference ring buffers for assignable lines. The values for *index* range from (NTUSR + NRUSR - 1) to (NTUSR + NRUSR + NAMLC - 2).
- IRB-size*** The size in halfwords (two characters per halfword) of the input ring buffer. The minimum value is 1 and the maximum is 7777₈ (4095). The default value is 200₈ (128).
- ORB-size*** The size in halfwords (two characters per halfword) of the output ring buffer. The minimum value is 62₈ (50) and the maximum is 7777₈ (4095). The default value is 300₈ (192).
- DMQ-size*** The size in halfwords (one character per halfword) of the direct memory queue buffers. The value must be a power of 2 ranging from 20₈ (16) through 2000₈ (1024), inclusive. If you specify a value less than 20₈ (16), the system sets the size to 20₈ (16). The default value is 40₈ (32).

When invalid or excessive values are supplied, these values are rejected and one of the following error messages is displayed at the supervisor terminal.

Obsolete and Rarely Used Commands

BAD LINE <line number> IN AMLBUF COMMAND. (AMLBUF)

This message is displayed when the octal *line number* supplied in the AMLBUF command is not a valid line number.

Warning: Input buffer size less than minimum of 10 (dec). Minimum size will be used. (AS\$DBA)

The input buffer size requested in the AMLBUF directive is less than 10 characters.

Warning: The AMLBUF directive is being phased out. Please use the CAB command instead.

This message alerts the operator at cold start that the PRIMOS.COMI file contains at least one obsolete AMLBUF directive.

You can add comments at the end of each AMLBUF directive to make your configuration file easier to read and modify.

The AMLBUF directives are included in your configuration file. The sample AMLBUF directives shown in Figure A-2 set the IRB, ORB, and DMQ buffer sizes for a system with 20 asynchronous lines.

```
/* Lines 0 to 3 are using the default buffer sizes.
/* Buffer assignments login lines 4, 5, 6, 7, and 8.
/* line number IRB-size ORB-size DMQ-size
AMLBUF 4 1 62 20 /* Unused login line
AMLBUF 5 200 2000 40 /* New Medusa PW 153
AMLBUF 6 1500 500 200 /* PT65 running OAS
AMLBUF 7 1000 1000 200 /* 9600 baud with DPTX
AMLBUF 10 1000 1000 200 /* 1200 baud with DPTX
/*
/* DMQ buffer assignments for assignable lines
/* line number IRB-size ORB-size DMQ-size
AMLBUF 21 0 0 20 /* LQ Printer
/*
/* Ring buffer assignments for assignable lines
/* Set all IRBs and ORBs to the maximum size
/* required by any individual device. 1024 ('2000)
/* index IRB-size ORB-size DMQ-size
AMLBUF 17 2000 2000 0 /* MEDUSA PW 95, or
AMLBUF 20 2000 2000 0 /* computer link, or
AMLBUF 21 2000 2000 0 /* serial printer.
```

FIGURE A-2. Sample AMLBUF Directives

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The sample system shown in Figure A-2 supports a supervisor terminal and 9 login lines. Therefore, NTUSR = 12₈ (10). There are 6 lines for PRIMENET remote login users and 3 assignable lines. The corresponding values for the NRUSR and NAMLC configuration directives are: NRUSR = 6₈ (6), and NAMLC = 3₈ (3).

Login line number 4₈ is unused. The IRB, ORB, and DMQ buffers are set to their minimum values to conserve memory; 1₈, 62₈, and 20₈ halfwords, respectively.

Login line 5₈ is connected to a PRIME MEDUSA workstation model number PW 153, which does require an assigned line. The default IRB and DMQ sizes are used and the ORB size is increased to 2000₈ (1024) halfwords.

Login line number 6₈ is connected to a PT65 terminal running OAS. The IRB and ORB sizes are increased to 1500₈ (832) halfwords and 500₈ (320) halfwords, respectively. The DMQ size is increased to 200₈ (128).

Login lines 7₈ and 10₈ (8) are configured for 9600 baud and 1200 baud, respectively. The DMQ buffer sizes for both lines are increased to 200₈ (128). These lines are used primarily for DPTX. Increasing the IRB and ORB values to 1000₈ (512) also increases throughput.

The remaining login lines are connected to devices that operate well with the default buffer sizes.

The three assignable lines are used for a bidirectional letter quality printer, a serial graphics line for PRIME MEDUSA PW 95 workstation, and an incoming only computer-to-computer link.

A bidirectional printer is connected to physical line number 21₈ (17). To prevent its small internal buffer from overflowing, use an AMLBUF directive to set the DMQ buffer to the minimum value, 20₈ (16).

Although the printer can use the default ring buffer sizes, the serial graphics line requires a large ORB and the computer-to-computer link requires a large IRB.

Using the second format given on page A-14, the ring buffer *index* for assignable lines ranges from 17₈ (15) through 21₈ (17). Use three AMLBUF directives to set each pair of IRBs and ORBs to 2000₈ (1024) for all possible values of *index*: 17₈ (15), 20₈ (16), and 21₈ (17).

► **NTSABF** *line IRB-size ORB-size XOFF-lag XON-lag*

Sets the size of I/O buffers and flow control thresholds for NTS assignable lines connected to the local system. If an argument is omitted, the default value is used, unless a previous NTSABF directive still exists; then the last value specified is used.

Caution

The NTSABF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your NTSABF directives with CAB commands.

Arguments

- | | |
|------------------------|---|
| <i>line</i> | The only legal value for Rev. 22.0 is 0. This reserves a standard set of I/O buffers for all NTS assignable lines. |
| <i>IRB-size</i> | The size in halfwords (two characters per halfword) of the input ring buffer. The minimum value is 1, the maximum is 7777 ₈ (4095), and the default value is 200 ₈ (128). |
| <i>ORB-size</i> | The size in halfwords (two characters per halfword) of the output ring buffer. The minimum value is 62 ₈ (50), the maximum is 7777 ₈ (4095), and the default value is 300 ₈ (192). |
| <i>XOFF-lag</i> | The threshold point in the IRB when an XOFF is sent to the line to stop the incoming stream of characters. XOFF-lag is measured in halfwords and must be less than the IRB-size. The default value is 60% of the IRB-size. |
| <i>XON-lag</i> | The threshold point in the IRB when an XON is sent to the line to restart the incoming stream of characters. XON-lag is measured in halfwords and must be less than the IRB-size. The default value is 20% of the IRB-size. |

When *line* is not 0, the specific line number is ignored and the following message is displayed:

Warning: NTS line number must be zero at this release. (NTSABF)

Warning: Input buffer size less than minimum of 10 (dec). Minimum size will be used. (ASSDBA)

The input buffer size requested in the NTSABF directive is less than 10 characters.

If the NTSABF directive is issued when NTSASL is 0, the following message is displayed:

Warning: NTSABF directive issued with no NTS assigned lines configured. (CINIT)

The first time an NTSABF directive is used at cold start, the following message notifies the operator that the directive is obsolete:

Warning: The NTSABF directive is being phased out. Please use the CAB command with the -NTSABF option instead.

► **NTSBUF *line* *IRB-size* *ORB-size* *XOFF-lag* *XON-lag***

Sets the size of I/O buffers and flow control thresholds for NTS terminal users connected to the local system. If an argument is omitted or set to zero, the default value, or, when there is an existing NTSBUF directive, the last value specified is used.

Caution

The NTSBUF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your NTSBUF directives with CAB commands.

Arguments

- line*** The only legal value for Rev. 22.0 is 0. This reserves sets of standard I/O buffers for all NTS terminal users.
- IRB-size*** The size in halfwords (two characters per halfword) of the input ring buffer. The minimum value is 1, the maximum is 7777₈ (4095), and the default value is 200₈ (128).
- ORB-size*** The size in halfwords (two characters per halfword) of the output ring buffer. The minimum value is 62₈ (50), the maximum is 7777₈ (4095), and the default value is 300₈ (192).
- XOFF-lag*** The threshold point in the IRB when an XOFF is sent to the line to stop the incoming stream of characters. XOFF-lag is measured in halfwords and must be less than the IRB-size. The default value is 60% of the IRB-size.
- XON-lag*** The threshold point in the IRB when an XON is sent to the line to restart the incoming stream of characters. XON-lag is measured in halfwords and must be less than the IRB-size. The default value is 20% of the IRB-size.

When *line* is not 0, the specific line number is ignored and the following message is displayed:

Warning: NTS line number must be zero at this release. (NTSBUF)

If the NTSBUF directive is issued when NTSUSR is 0, the following message is displayed:

Warning: NTSBUF directive issued with no NTS terminal users configured.
(CINIT)

Warning: Input buffer size less than minimum of 10 (dec). Minimum size will be used. (AS\$DBA)

The input buffer size requested in the NTSBUF directive is less than 10 characters.

The first time an NTSBUF directive is used at cold start, the following message notifies the operator that the directive is obsolete:

Warning: The NTSBUF directive is being phased out. Please use the CAB command with the -NTSBUF option instead.

► **REMBUF *IRB-size ORB-size***

Sets the sizes of the terminal input and output buffers for remote users.

Caution

The REMBUF directive is obsolete at Rev. 22.0. Use the CAB command, described in Chapter 6, Allocating I/O Buffers. Replace your REMBUF directives with CAB commands.

Arguments

IRB-size The terminal input buffer size in halfwords (two characters per halfword). The default and minimum value is 202₈ halfwords (260 bytes decimal). If 0 is specified, the buffer size remains at its previously set value (which is usually the default size).

ORB-size The terminal output buffer size in halfwords (two characters per halfword). The default and minimum value is 101₈ halfwords (130 bytes decimal). If 0 is specified, the buffer size remains at its previously set value (which is usually the default size).

On systems using block-mode terminals, you can improve throughput by increasing the size of the input buffer to 404₈ halfwords (520 bytes decimal). You can also improve throughput on systems where users are logging in remotely across a ring network by increasing the size of the output buffer to 402₈ halfwords (516 bytes decimal).

For remote login over Public Data Networks (PDNs), you must set *IRB-size* and *ORB-size* to the octal value of the packet size that you configured with CONFIG_NET. For example, a packet size of 200₈ (128) bytes requires that both *IRB-size* and *ORB-size* be set to 200₈.

Table A-1 lists the errors that can occur during cold start.

TABLE A-1. REMBUF Error Messages

<p>Warning: The REMBUF directive is being phased out. Please use the CAB command with the -REMBUF option instead.</p> <p>Warning: The REMBUF directive was issued with no remote terminal users configured. The directive is ignored.</p> <p>Warning: A REMBUF input buffer size less than zero was specified. The default size of 260 will be used.</p> <p>Warning: A REMBUF input buffer size greater than the maximum allowable size of 4096 was specified. The maximum size will be used.</p> <p>Warning: A REMBUF input buffer size less than the minimum allowable size of 260 was specified. The minimum size will be used.</p> <p>Warning: A REMBUF output buffer size less than zero was specified. The default size of 258 will be used.</p> <p>Warning: A REMBUF output buffer size greater than the maximum allowable size of 4096 was specified. The maximum size will be used.</p> <p>Warning: A REMBUF output buffer size less than the minimum allowable size of 258 was specified. The minimum size will be used.</p> <p>Warning: Input buffer size less than minimum of 10 (dec). Minimum size will be used. (AS\$DBA)</p>
--

DETERMINING PHYSICAL LINE NUMBERS

This appendix describes the procedure for tracing your asynchronous communication lines back to the controller. It explains how to calculate a physical line number from the controller's device address, offset, and jack number. For more information on line number allocation, see Chapter 1. Use the following procedure to find the line number for a particular asynchronous line:

1. Use the STATUS COMM command to determine the device addresses for all the AMLC and ICS controller boards in the system.
2. Trace the target line to the controller into which it is plugged. The line is connected to a cable assembly, which consists of four cables. The four cables terminate at one end in a single connector, marked C1. Each of the other ends has a 9-pin connector labeled J1 to J4. The cable assembly, in turn, is plugged into one of one, two, or four ports on the target controller.
3. Determine the type of the target controller (AMLC, ICS1, ICS2, or ICS3).
4. Find out the device address of the target controller. Examples are 10_8 , 11_8 , 36_8 , and 54_8 .
5. Determine into which port the C1 cable connector is plugged.
6. Find out the jack number into which the target line is plugged. The four cables on a given cable assembly are labeled J1, J2, J3, and J4. The labels are located near the point at which the target line connects to the cable.
7. Use one of the following two procedures to determine the target line number. For ICS controllers, see the section, Lines Attached to ICS Controllers, later in this appendix. For AMLC controllers, see the section entitled Lines Attached to AMLC Controllers.

Lines Attached to ICS Controllers

To determine the line number for a line connected to an ICS controller, use the following procedure:

1. Determine the offset of the first ICS controller on the system.
2. Determine the offset of the target controller.
3. Determine the offset of the line on the target controller.
4. Add the three numbers obtained from steps 1 through 3. The line number is the sum of these three numbers.

This procedure is explained in the following paragraphs. For more information on ICS controllers, see the *ICS User's Guide*.

Finding the Offset of the First ICS Controller: AMLC controllers are always configured before ICS controllers. Therefore, the offset of the first ICS controller depends on whether the system has AMLC controllers.

- If the system has no AMLC boards, the offset of the first ICS controller is zero.
- If the system has AMLC controllers, the offset of the first ICS controller is the highest available AMLC line number rounded up to the next modulus-16 boundary. The offset is always represented in octal, is always evenly divisible by 16 (20_8), and always ends in 0. For example, offsets can be 0, 20_8 , 40_8 , 60_8 , and 100_8 .

Finding the Offset of the Target Controller: The offset of the target ICS controller depends on the configuration of the lines and controllers. However, the offset for AMLC controllers depends entirely on the device address.

1. Use the STATUS COMM command to find the device addresses of all the ICS controllers. The address priority for all ICS controllers is 10_8 , 11_8 , 36_8 , and 37_8 . ICS2 and ICS3 controllers are usually assigned a device address of 10_8 or 11_8 by the manufacturer. When you have ICS2 or ICS3 controllers as well as an ICS1, the ICS1 controller has a lower priority and is assigned a device address of 36_8 or 37_8 . If you have only ICS1 controllers, all device addresses (36_8 , 37_8 , 10_8 , or 11_8) are valid.
2. Check off the device addresses of the ICS controllers on the list in Table B-1. Do not, however, check off AMLC device addresses on the list.
3. The ICS controller indicated by the first check in the list has a target offset of 0. The target offset of an additional ICS controller depends on the number of lines configured for those above it on the list.

Number of Lines Per Controller: The number of lines on an ICS controller depends on the model; an ICS1 controller is always configured for eight asynchronous lines. ICS2 and ICS3 controllers support four asynchronous lines for every Line Adapter Card (LAC) in the card cage. Use the following procedure to determine how many lines are present.

Determining Physical Line Numbers

1. Determine how many asynchronous LACs are in the controller's card cage.
2. If the number from step 1 is odd, add 1 to it.
3. Multiply the result by 4. Write this number in the *Number of Lines* column of the controller checklist in Table B-1.
4. Add the number of lines configured for the first ICS to its offset (zero). The result gives the offset of the second ICS. If the system has a third ICS, its offset is the sum of the number of lines configured for the second ICS and the offset of the second ICS, and so on.

TABLE B-1. ICS Controller Checklist

<i>Present</i>	<i>Address</i>	<i>Offset</i>	<i>Number of Lines</i>
[]	10 ₈	[]	[]
[]	11 ₈	[]	[]
[]	36 ₈	[]	[]
[]	37 ₈	[]	[]
[]	56 ₈	[]	[]
[]	51 ₈	[]	[]
[]	50 ₈	[]	[]
[]	32 ₈	[]	[]
[]	17 ₈	[]	[]
[]	16 ₈	[]	[]
[]	15 ₈	[]	[]
[]	35 ₈	[]	[]
[]	52 ₈	[]	[]
[]	53 ₈	[]	[]
[]	54 ₈	[]	[]

Finding the Line Number on the Target Controller: The line number is determined differently for each model of ICS controller.

For an ICS1 controller, the line number depends on:

- The port to which the line is connected on the ICS1 controller
- The cable connector into which the line is plugged

An ICS1 controller has three ports. The leftmost port is for synchronous communication only, so it is not discussed here. The center and rightmost ports are the asynchronous ports. The rightmost port contains controller line numbers 0 to 3, and the middle port has board line numbers 4 to 7. (Note that this is the reverse of the AMLC board.)

Use the following list to determine the ICS1 board line number.

<i>Port</i>	<i>J1</i>	<i>J2</i>	<i>J3</i>	<i>J4</i>
Rightmost	0	1	2	3
Middle	4	5	6	7

For ICS2 and ICS3 controllers, the board line number depends on

- The LAC to which the line is connected on the ICS2 or ICS3
- The jack number of that particular line on the LAC

ICS2 and ICS3 controllers support up to 16 LACs. Figure B-1 shows the jacks and cable connections for ICS2 and ICS3 asynchronous LACs. The LACs are numbered from right to left as viewed from the back of the ICS2. The rightmost cable leads to a buffer card. The number of other cables depends on how many LACs are on the controller. Each of the next eight cables leads to a LAC. If the system has more than eight LACs, the next cable leads to a buffer card, and the following cables lead to LACs.

Determine how many LACs are to the right of the LAC to which the line is connected, and to which of the four jacks the line is connected. Now multiply the number of LACs by 4, add the jack number, and subtract 1. The result is the board line number.

Calculating Line Numbers: To calculate the line number, add the ICS line offset, the target offset, and the board line number. This value is the line number in octal. You can convert this number to a decimal number with the following PRIMOS command for octal-to-decimal conversions:

```
TYPE [OCTAL octal-number]
```

Determining Physical Line Numbers

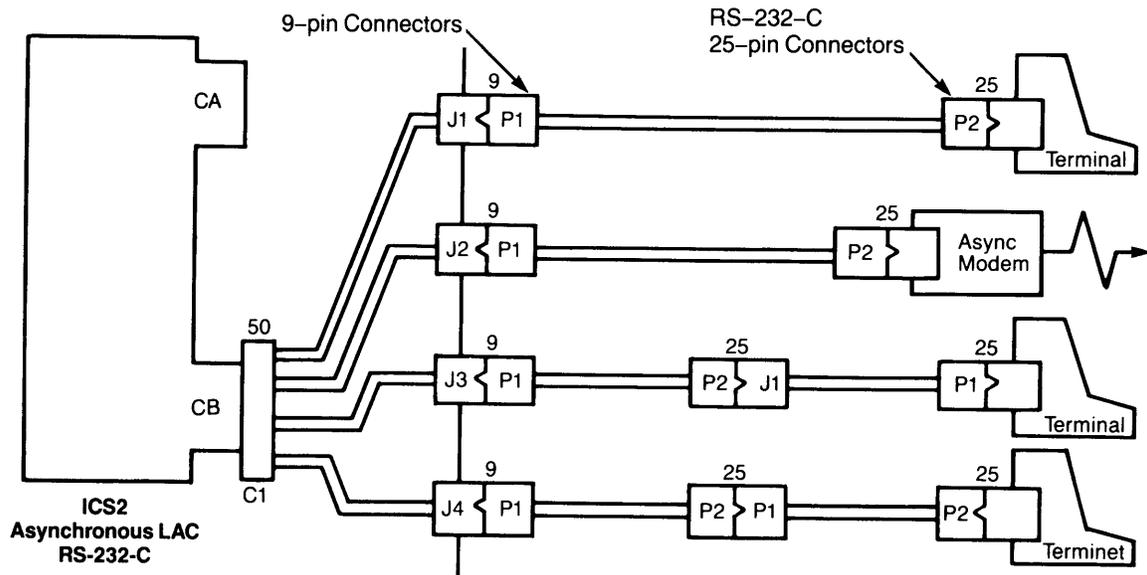
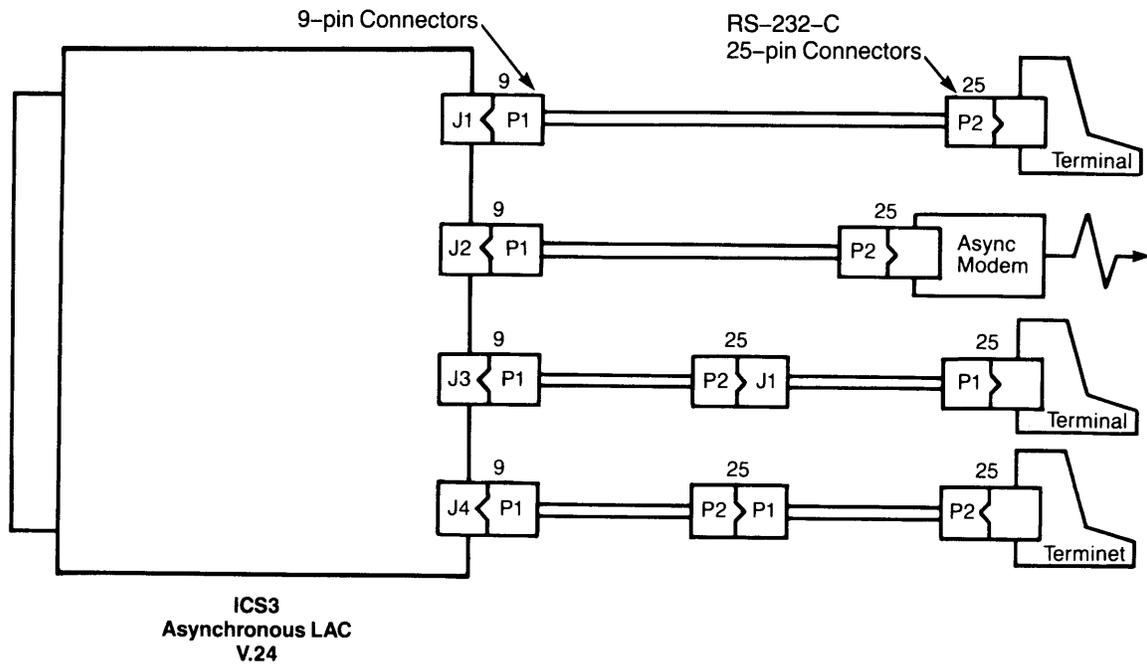


FIGURE B-1. Cable Connections for ICS2 and ICS3 Asynchronous LACs

Lines Attached to AMLC Controllers

A system can have a maximum of eight AMLC boards. Each board has a maximum of four ports (C, D, E, F), proceeding from left to right as viewed from the rear of the CPU. Line numbers can be calculated with the formula given in Table B-2. Table B-3 lists the line assignments for four AMLC controllers.

TABLE B-2. Determining AMLC Line Numbers

<i>AMLC Board</i>	<i>Value of x =</i>	<i>Device Address</i>
1	0	54 ₈
2	1	53 ₈
3	2	52 ₈
4	3	35 ₈
5	4	15 ₈
6	5	16 ₈
7	6	17 ₈
8	7	32 ₈

<i>AMLC Port</i>	<i>Value of y =</i>	<i>Jack Number</i>	<i>Value of z =</i>
C	0	J1	1
D	1	J2	2
E	2	J3	3
F	3	J4	4

To determine:

- 1) Physical line number
- 2) SET_ASYNC command *line* argument

Use the default formula:

$$16(x) + 4(y) + (z-1) = n$$

Convert the physical line number *n* calculated above to decimal with the PRIMOS command TYPE [OCTAL *n*]

Determining Physical Line Numbers

TABLE B-3. AMLC Line Number Assignment

First AMLC Board — Device Address 54₈

<i>Port</i>	<i>Jack</i>	<i>Line #</i>	<i>User #</i>
C	A1-J1	0	2
C	A1-J2	1	3
C	A1-J3	2	4
C	A1-J4	3	5
D	A2-J1	4	6
D	A2-J2	5	7
D	A2-J3	6	8
D	A2-J4	7*	9
E	A3-J1	8	10
E	A3-J2	9	11
E	A3-J3	10	12
E	A3-J4	11	13
F	A4-J1	12	14
F	A4-J2	13	15
F	A4-J3	14	16
F	A4-J4	15*	17

Second AMLC Board — Device Address 53₈

<i>Port</i>	<i>Jack</i>	<i>Line #</i>	<i>User #</i>
C	A1-J1	16	18
C	A1-J2	17	19
C	A1-J3	18	20
C	A1-J4	19	21
D	A2-J1	20	22
D	A2-J2	21	23
D	A2-J3	22	24
D	A2-J4	23*	25
E	A7-J1	24	26
E	A7-J2	25	27
E	A7-J3	26	28
E	A7-J4	27	29
F	A8-J1	28	30
F	A8-J2	29	31
F	A8-J3	30	32
F	A8-J4	31*	33

*If this is the last available AMLC line, it establishes the AMLC I/O interrupt rate. Set the speed of this line to 110 or 300 baud.

Table B-3. AMLC Line Number Assignment (Continued)

Third AMLC Board -- Device Address 52₈

<i>Port</i>	<i>Jack</i>	<i>Line #</i>	<i>User #</i>
C	A9-J1	32	34
C	J103	33	35
C	J102	34	36
C	J101	35	37
D	J100	36	38
D	J99	37	39
D	J98	38	40
D	J97	39*	41
E	J96	40	42
E	J95	41	43
E	J94	42	44
E	J105	43	45
F	J115	44	46
F	J114	45	47
F	J113	46	48
F	J112	47*	49

Fourth AMLC Board -- Device Address 35₈

<i>Port</i>	<i>Jack</i>	<i>Line #</i>	<i>User #</i>
C	J111	48	50
C	J110	49	51
C	J109	50	52
C	J108	51	53
D	J107	52	54
D	J106	53	55
D	J116	54	56
D	J117	55*	57
E	J125	56	58
E	J124	57	59
E	J123	58	60
E	J122	59	61
F	J121	60	62
F	J120	61	63
F	J119	62	64
F	J118	63*	65

*If this is the last available AMLC line, it establishes the AMLC I/O interrupt rate. Set the speed of this line to 110 or 300 baud.

Example of Line Number Calculation

Suppose a system has the following controllers:

- One AMLC controller
- One ICS2 controller, at device address 10_8 , containing seven Line Adapter Cards
- Two ICS1 controllers, at device addresses 11_8 and 36_8

To determine the number of the line connected to cable connector J3 on the middle port of the ICS1 at device address 36_8 , proceed as follows:

1. Find the offset of the first ICS controller. Because the system has only one AMLC, this offset is 20_8 .
2. Use the STATUS COMM command to check the device addresses of the ICS controllers, and check these off on the ICS Controller Checklist. (See the sample under step 5 below.)
3. Determine the number of lines that are allocated for the ICS2. Because there are seven LACs, add 1 and multiply by 4. The result is 32 in decimal. Converted to octal, the answer is 40_8 .
4. Find the offset of the ICS1 at device address 11_8 . Compute this by adding the offset of the first ICS (0) to the number of lines, 40_8 .
5. Find the offset of the ICS1 at device address 36_8 . This is the sum of the offset of the second ICS (40_8) and the number of asynchronous lines (10_8). (An ICS1 is always configured for 10_8 lines.) Fill in the appropriate information on your checklist as shown in the following example.

<i>Present</i>	<i>Address</i>	<i>Offset</i>	<i>Number of Lines</i>
[x]	10_8	[0_8]	[40_8]
[x]	11_8	[40_8]	[10_8]
[x]	36_8	[50_8]	[10_8]

Completed Sample of ICS Controller Checklist

6. Find the board line number. In the preceding list of ICS1 board line numbers, the line connected to J3 on the middle port is line number 6.
7. Add the ICS line offset from step 1 (20_8), the offset of the target ICS1 from step 4 (50_8), and the board line number from step 6 (6_8). The result is 76_8 .
8. Use the PRIMOS command TYPE [OCTAL 76] to convert the answer to decimal and display it on the screen. The result is 62. The line number is therefore 62.

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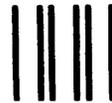
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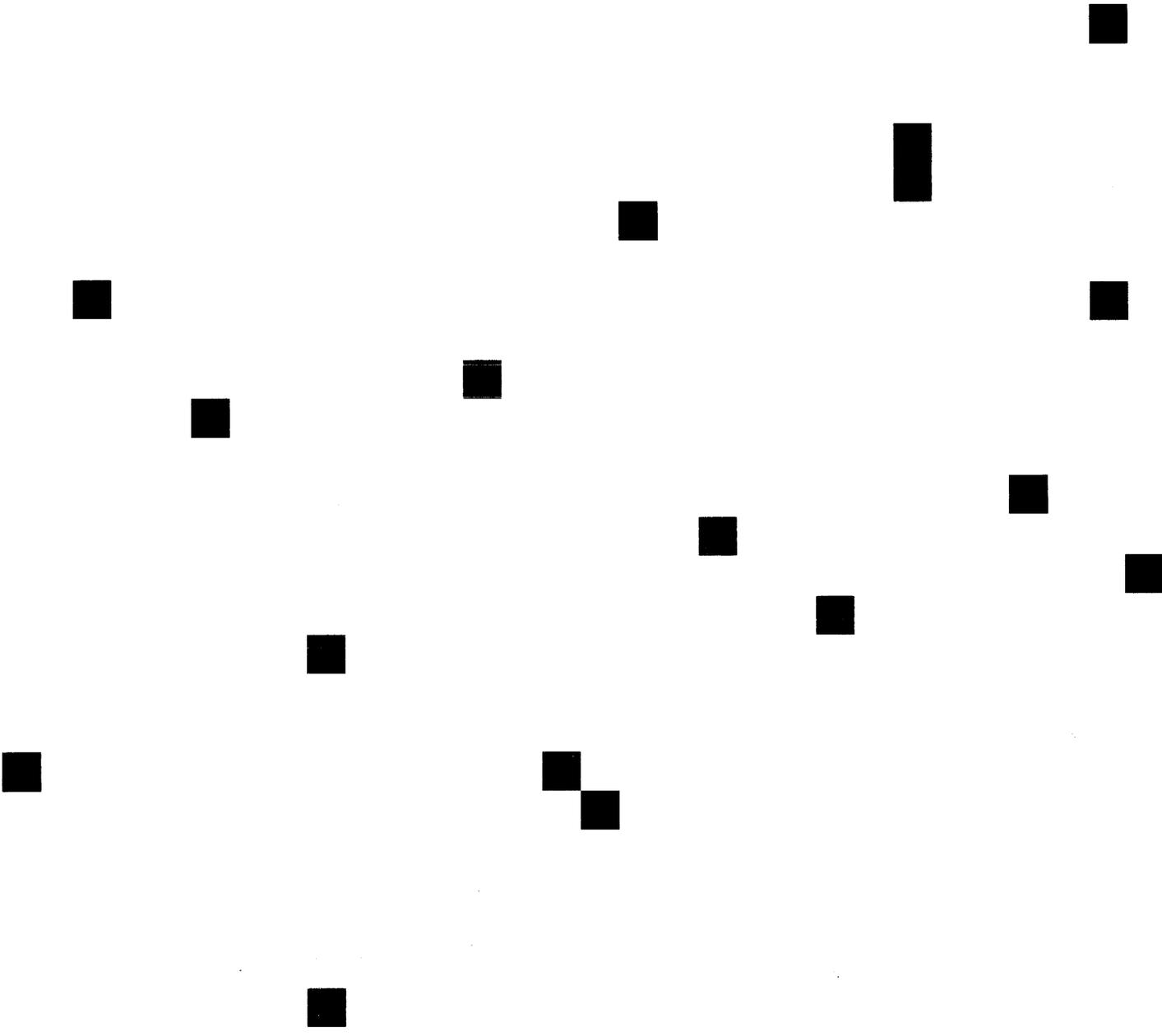
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