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Component Product Specification  
P O S E I D O N   T E R M I N A L   S E R V E R  
S O F T W A R E

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## PREFACE

This is a Component Software Product Specification. It is the definitive description in measurable terms of the proposed goals, capabilities and external characteristics of the POSEIDON Terminal Server. It is the commitment of WHAT IS TO BE BUILT as agreed by the product team.

No changes are to be made to the product as described here, unless approved and documented as an amendment to this specification.

### Associated Documents

1. POSEIDON Software Development Plan - Richard Bailey  
Version 3.0 17-Oct-83
2. POSEIDON System Specification - Ray Gruda  
Revision 1 21-Sep-83
3. Customer Services Plan and Service Cost Analysis, Phase 1  
for POSEIDON - Don Gatton  
Version 1.1 16-Sep-83
4. Serviceability Requirements Document - Carroll Wright  
Version 1.0 23-Sep-83
5. POSEIDON Product Requirements for Phase 0 - Marilyn Kessler
6. Local Area Transport Architecture - Bruce Mann  
Rev 1.1 25-Aug-83
7. NI Node Product Architecture Specification - Tony Lauck  
Version 1.0 24-Mar-82
8. The Ethernet, a Local Area Network, Data Link and Physical  
Layer Specifications - DEC-INTEL-XERCX  
Version 2.0 November 1982
9. DEC Standard 052 - Operational Requirements for Serial Terminals  
and Serial System Interfaces Operating as DTEs Connected to EIA  
RS-232-C or CCITT V.28 Point-To-Point Modems.  
Rev B 29-Sep-82
10. Diagnostic Engineering 68000 Online Debugging Tool Specification  
Cheryl Galvin/Rick Shea Version 1.1

### Change History

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Component Software Product Specification

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## 1.0 PRODUCT SUMMARY

POSEIDON is a high-performance, low-cost terminal server for use on NI-based (Ethernet) Local Area Networks. It allows a terminal user connected via the NI to access any of a set of host systems on that NI, and experience throughput and apparent response time similar to a directly connected terminal. In addition, a POSEIDON implementation can offer less host CPU loading to traditional asynchronous terminal interfaces.

POSEIDON supports up to eight asynchronous terminals, and is offered in two distinct configurations: One with Modem Control, and the other without. The Modem Control version will conform to DEC Standard 052 and allow remote terminal access through both US and foreign switched networks.

The POSEIDON terminal server implements the Local Area Transport (LAT) architecture, and the operational server software consists of four modules:

- o LAT Protocol Module.
- o Terminal Port Module.
- o NI Port Module.
- o User Interface Module.

The operational server software is downline loaded from a Phase-IV DECnet host system using the standard maintenance operations protocol (MOP). Microcode within the POSEIDON will control the downline load process and handle low-level Ethernet maintenance requests.

In addition, an implementation of the LAT architecture is required on the host side of the Ethernet. This may be provided as a host-resident driver either bundled with or layered upon the host operating system, or as a free-standing LAT host server which communicates with existing interfaces on the host system. Host-resident drivers are currently planned for VAX/VMS, RSX-11M/M-PLUS and TOPS-20 systems, and a LAT host server ("Reverse Poseidon") is planned for support on other host systems.

This document describes, in detail, the POSEIDON software features and operation including microcode functions, and provides a summary of the LAT architecture used to communicate with hosts.

## 2.0 ENVIRONMENT

### 2.1 Users

The POSEIDON software may be utilized by any Terminal User requiring access to a host computer. Much of the software functionality is transparent to the user: the main task of transporting terminal data back and forth between a host system and a user terminal requires no additional user interface. The user, therefore, requires only the knowledge of the host processor command language (or other interface), and the ability to connect to the host processor.

There is a limited "Local Mode" command set provided by POSEIDON which allows a user to connect to and disconnect from a host system, set and show terminal parameters and display host information. A HELP command is provided, allowing full use of the terminal without written documentation. The level of complexity of connecting to a host system is about the same as that using traditional switching devices.

The capability of automatically connecting to a pre-defined host system is provided, avoiding the Local Mode command interface entirely. An Automatic feature is also provided, eliminating the need for manual speed specification.

During normal server operations, one of the local terminals may be enabled as "Privileged" for use by a "Terminal Manager". This password-protected interface allows the specification of server parameters and the initiation of maintenance processes, and is the only network management interface provided with POSEIDON. This interface is also used to specify user accessibility to host systems.

The Terminal manager would typically be responsible for the day-to-day operation of one or more POSEIDON units and associated terminals, and would be expected to manipulate all non-network-related parameters without assistance. Supervision of the Ethernet network, containing Poseidons and host systems, would be the responsibility of Network (and/or System) Managers. These individuals would be responsible for defining network (LAT) parameters for the POSEIDONS and hosts, and for relaying this information to the individual terminal managers. Of course, in certain installations, the Network and Terminal managers may be the same people.

### 2.2 Hardware

This release of the LAT server software is designed to run on the POSEIDON hardware exclusively. The hardware configuration consists of the following elements:

- o 68000 microprocessor (10 MHz, running at 7.35 MHz)
- o 16 KB ROM (6 KB for load/maintenance microcode, 10 KB for diagnostics)



- o 128 KB RAM
- o A PROM containing the Ethernet address, checksum and test pattern
- o 512 bytes of Non-volatile RAM, for storage of "Permanent" parameters
- o 4 2681 DUARTS with RS-232C/CCITT V.24 interface (8 lines)
- o AML/MOSTEK LANCE and SIA Ethernet Chips

A memory layout is shown in Appendix E.

POSEIDON supports most asynchronous ASCII terminals up to speeds of 19200 bits per second (bps) in Line Mode, and up to 9600 bps in Block Mode. DIGITAL terminals specifically supported by POSEIDON include:

- o LA12, LA50, LA100
- o LA120, LA180
- o LA34, LA36, LA38
- o VT50, VT52, V15x as VT52, VT6x as V152
- o VT100, VT101, VT102, VT125, VT131
- o VT220, VT240
- o GIGI as VT100, VT180 as VT100
- o RAINBOW 100, DECmate II and PRC/325/350 as VT100

POSEIDON will support terminals that generate both 7 and 8-bit characters. The Modem Control version of POSEIDON will support full-duplex modems conforming to the RS-232-C and CCITT V.24 standards, including CCITT V.23 modems. Modems explicitly supported are:

- o BELL 1030
- o BELL 212A
- o DF01/DF02/DF03

### 2.3 Software

The operational software runs on the POSEIDON hardware as a stand-alone system: no other software is required, nor may any other software be layered upon the server software. This software is downline loaded from a Phase IV DECnet host supporting the standard maintenance operations protocol (MOP). Therefore, ONE active Phase IV DECnet host system on the local Ethernet is a minimum requirement for POSEIDON support.

LAT support is also required on the host side of the Ethernet, and this can be in the form of a host-based LAT driver, or a LAT host server utilizing existing host interfaces. It is planned to ship a host-based LAT driver as a layered product supported by VAX/VMS V4.0. This product is described in the "VAX-11 LAT" engineering plan (TBS). Future support is also planned for the RSX-11M/M-PLUS and TOPS-20 operating systems.

## 2.4 Services

The POSEIDON product is engineered to be fully customer installable. The POSEIDON software will be shipped (as required) with the hardware on the appropriate media for the load host(s). A separate Software Installation Guide will also be shipped. Upon receipt of the POSEIDON product, it is expected that the software media and installation documentation be given to the system manager(s) of the appropriate load host(s) for installation. The POSEIDON hardware would then be installed by the customer or optionally by a Field Service representative.

The POSEIDON software is fully supported by DIGITAL for 90 days, after which support services may be purchased. Planned services include Software Maintenance Service and BASIC Support using the Telephone Support Center (TSC). Details on software support strategy may be obtained in Reference 4, Serviceability Requirements Document.

## 3.0 SOFTWARE CAPABILITIES

### 3.1 GENERAL DESCRIPTION

A typical local area network configuration might consist of a number of terminals connected to one or more POSEIDON terminal servers, which are in turn connected to the NI. Also on the NI may be a number of host systems with LAT host software support.

A terminal user may, using a Local Mode command, display a list of hosts to which he/she is authorized to access. This authorization is specified by the Terminal Manager using the Privileged Local Mode interface, and is co-ordinated with the System Manager(s) of the host systems.

A user may then CONNECT to and communicate with any one of the authorized hosts and experience functionality, apparent response time and throughput similar to a directly connected terminal. There may be any number of POSEIDON servers and supported hosts residing on a single NI, within Ethernet limitations.

Once a terminal is logically connected to a host, most applications that would normally be supported by the host operating system are supported by POSEIDON. This includes "interactive" terminal mode applications at speeds up to 19200 bps and flow-controlled block-mode applications at speeds up to 9600 bps. Operation of "passall" block-mode applications (REGIS/PRO-350 file transfer etc), and interprocessor communication are supported, provided that a higher level protocol (eg: DDCMP) is in operation to detect and correct any data overrun conditions.

Remote terminal operation is possible with the Modem Control version of POSEIDON. This modem control supports both US and foreign switched networks.

The server software is logically broken down into four elements, to

facilitate the possible use of LAT on other server products. These elements are now described:

- o The LAT Protocol Module - This module is responsible for implementing the server side of the LAT protocol, and can be considered the "Base" of the server software. The Protocol Module is responsible for:
  - Initializing POSEIDON hardware, LAT data structures and buffers.
  - Implementing the various timer functions.
  - Controlling the server Circuit States and Slot States.
  - Accepting terminal input buffers from the Terminal Port Module, and passing them as transmit buffers to the NI Port Module.
  - Accepting NI receive buffers from the NI Port Module, and passing them as output buffers to the Terminal Port Module.
  - Maintaining a data base of accessible host systems.
  - Handling all Connect and Disconnect requests, including Autocconnect, and issuing connection status messages.
  - Servicing all maintenance requests from host and user.
  - Writing to the NV RAM.
- o The Terminal Port Module - This module interfaces between the Protocol Module and the terminals themselves via the 2681 DUARTS. It is responsible for:
  - Automatically detecting terminal speed.
  - Accepting input characters from the terminals and placing them in the LAT buffers in main memory.
  - Detection and handling of flow control characters, the Local Switch Character and BREAK.
  - Handling Local Mode input, echo, processing of control characters and passing entire commands to the User Interface module.
  - Handling local output, including flow control, status messages and notification upon output completion.
  - Accepting LAT output buffers from main memory, and outputting characters to the terminals.
  - Handling of modem control.

- o The NI Port Module - This module interfaces between the Protocol Module and the NI controller, as is responsible for:
  - Accepting LAT transmit buffers, formatting them into NI frames and transmitting them to the connected hosts over the NI.
  - Receiving NI Frames, filtering unwanted frames, and notifying the Protocol Module upon completion.
  - Maintaining Ethernet counters and providing mechanisms to read and zero them.
- o The User Interface Module - This module handles both the Non-privileged and Privileged Local Mode interfaces with the user, and formats status messages. It is responsible for:
  - Parsing and processing all user commands entered while a terminal is in Local Mode.
  - Notifying the Protocol Module if a CONNECT, DISCONNECT, INITIALIZE or LCCP Command is entered.
  - Co-ordinating the updating of dynamic and permanent parameters, depending on the current server, connection and privilege states.
  - Conducting terminal tests.
  - Formatting and initiating output of status messages.

During normal operations, a POSEIDON terminal server is not considered a DECnet node, nor does it interface with DECnet. LAT hosts need not support DECnet, but if they do common DECnet and LAT parameters (eg: Host Name) should be compatible. Certain network management functions provided with DECnet software may be utilized with POSEIDON. Section 3.1.17 describes POSEIDON support in this area.

The following sections describe the external software functionality provided by POSEIDON.

### 3.1.1 Local Mode Operation -

LOCAL MODE is a means of communication between the terminal user and the POSEIDON unit, and is available to all interactive terminals except those defined to have a DEDICATED HOST system (see section 3.1.8).

Local Mode may be operated in a PRIVILEGED or NON-PRIVILEGED state: the non-privileged state is utilized to connect and disconnect the user's terminal to or from a host system, set and show terminal parameters and display a list of authorized hosts. This interface is available to all users.

The privileged state is password-protected, and is utilized to connect and disconnect any POSEIDON terminal, set and show any terminal's parameters, set and show server parameters, perform server initialization and maintenance functions. Only ONE terminal may be privileged at a time. The privilege may be "stolen" from one terminal to another if a terminal port becomes disabled for some reason.

For terminals with a DEDICATED HOST defined, no Local Mode operation is possible. For these terminals, user operation is identical to that of a terminal connected directly to a host system. Also, if a "terminal" type is designated as "OTHER" (see section 3.1.12), or if it is defined as "WRITE\_ONLY" or "READ\_ONLY", no Local Mode operation is available. For these terminals, connection to a host is achieved using AUTOCCONNECT, or the CONNECT TERMINAL command in privileged local mode. Local Mode is discussed in detail in Section 3.3.

### 3.1.2 Host Mode Operation -

Host Mode enables a terminal user to communicate with a host system, and is the mode that will be utilized for most of the time. All functions supported by the host system that would have been available using a direct local interface are available to the POSEIDON user.

Host Mode is initiated in one of the following ways:

- o Following a CONNECT command from Local Mode, and a connection was successfully established.
- o Following POSEIDON initialization when AUTOCCONNECT is enabled for the terminal, a default host is defined, and a connection was successfully established.
- o Following a host initialization when AUTOCCONNECT is enabled for the terminal, and a connection was successfully established.
- o Following a Local Mode RESUME command, when a connection was established prior to entering Local Mode.

In Host Mode, all characters typed are sent to the host and character echo (if any) is performed by the host. All control characters and escape sequences are passed to the host without interpretation EXCEPT the following:

- o The XOFF and XON characters - If output flow control is enabled, these characters cause immediate flow control actions on the terminal, and are passed along to the host as well. Flow control can be enabled and disabled by the user as desired. In addition, the host system may dynamically disable and enable flow control to permit certain interactions such as file transfers without user intervention.

- o The Designated Local Switch character (or the Break key) - This causes an XOFF to be sent to the host, and Local Mode to be immediately entered on the terminal.

Characters such as Control/O, Control/Y etc are host-specific implementations, and are processed exclusively by the host.

When a terminal is in Host Mode, local (POSEIDON-originated) status messages MAY appear in the following circumstances:

- o If the host disconnects the terminal for some reason.
- o If a privileged POSEIDON user terminates the session (DISCONNECT TERMINAL or INITIALIZE).
- o If a communications timeout or fatal protocol error occurs with the host.

Status messages are delivered ONLY to the same terminals that allow Local Mode. (IE: DEDICATED HOST, "OTHER", "READ\_ONLY" and "WRITE\_ONLY" terminals do not receive local status messages).

### 3.1.3 Autobaud Capability -

Autobaud is a means by which the POSEIDON unit can determine the input (and by assumption output) terminal speed of a particular terminal, and adjust the current terminal parameters to that speed. If input and output speeds of the terminal are different, autobaud will not function correctly.

The autobaud feature is implemented by posting a read to a terminal with autobaud enabled when POSEIDON is initialized, or after a LOGOFF command. When the user types a carriage return <CR>, the bit pattern of the <CR> will be matched to one in a set of possible values, each matching a different terminal speed. If a table entry matches, the input and output terminal speeds are adjusted, and either AUTOCONNECT begins or Local Mode is enabled on the terminal. If the bit pattern does not match any in the tables, another read is posted and the user should enter another carriage return.

This feature is particularly useful for modem-controlled terminal lines. Autobaud is enabled by default, and, when enabled, overrides any previously-defined terminal speed.

The autobaud capability available to POSEIDON may be restricted because of certain characteristics of the UARTS. Since these characteristics are unspecified, the extent of the autobaud capability may be determined only after implementation.

#### 3.1.3.99.1 Extent of Autobaud Functionality to be defined after implementation

### 3.1.4 Local Switch Character -

Since there are two user modes available at the user's terminal (Local and Host modes), a way to initiate each mode is required. Entering Host Mode is discussed in section 3.1.2.

To enter Local Mode while in Host mode, the "Local Switch Character" may be typed in. Any ASCII character OR the break key may be defined as the local switch character in a SET TERMINAL command. The default is the BREAK key.

Upon entering this character, an XOFF character is sent to the host, the Host Mode session is suspended, and Local Mode is enabled on the terminal.

### 3.1.5 Host Access Control -

The typical Ethernet environment may contain literally "hundreds" of host systems and terminal servers (in addition to other servers). These servers and hosts may cross many different organizational components of customer sites, each of which may need to access only a small subset of the services.

A facility is provided to assign ACCESS CODES to both hosts and individual terminal users. On both the POSEIDON and affected host(s), access codes may be entered only by a privileged user. Access codes provide both protection and a more efficient directory service (see section 3.1.7). One or more access codes are assigned to each terminal, and one or more access codes are assigned to each host. If any ONE access code is assigned both for the terminal and host, then the terminal is authorized to access that host (and CONNECT requests are honored). Up to 128 access codes may be specified, numbered 0 - 127.

In addition, only the hosts for which a particular terminal is authorized to access are shown in the SHOW HOSTS display.

As a further method of access control, hosts may reject connection requests on a per-server or per-terminal basis, based on other attributes passed to the host at connect time, or for any reason at all. The overall philosophy of access control allows the local POSEIDON Terminal Manager to define the environment for the terminals for which he is responsible, and allow the host system to accept or reject this environment at connect time.

### 3.1.6 Host Names -

Every host that supports the LAT architecture must be assigned at least ONE name, and this first name must be unique within the local network and not change while the host is accessible. Names may be from 1-16 characters in length, and contain the following characters: A-Z, a-z, 0-9, \$ (dollar) and \_ (underscore). An example of a valid name is "LAT\$HOST\_1". Lowercase names are logically equivalent to uppercase names.

Host names are utilized in CONNECT commands, and are displayed in the SHOW HOSTS command, and are the only means of referencing a particular host system.

To support VAX clusters, the capability exists to assign up to seven additional group names to a host system, and allow different systems to share names. Together with each host name, a host RATING from 0-255 is also assigned. When a CONNECT request is issued, the host with the highest rating FOR THAT NAME will be selected for connection. Specific hosts may be referenced by their unique name under all circumstances.

For example, a host may be assigned a unique name (SMAUG), and have two group names (COMPUTER and VAX) that are shared among hosts. The hosts will conspire amongst themselves as to which has the highest rating for the names COMPUTER and VAX, so that the user requiring access to any COMPUTER may simply say CONNECT HOST COMPUTER and will be connected to the COMPUTER with the highest rating. For those more demanding users who require access to a specific host, CONNECT HOST SMAUG may be entered.

It is expected that hosts sharing names will regularly adjust ratings in such a way as to evenly distribute the processing load.

If a group name is specified in a CONNECT command, or is defined as a Preferred or Dedicated host, the POSEIDON software will make every attempt to connect to, and maintain a connection with, one of the hosts in the group. If, for example, the highest-rated system in the group does not respond, or terminates a connection, the POSEIDON software will automatically attempt to connect to the next highest-rated system within the group. This will continue indefinitely until a connection is established, or a DISCONNECT command is entered in local mode. This feature is called Autoconnect (see section 3.1.6) and may be enabled or disabled on a per-terminal basis.

If an existing connection was broken, and communications subsequently established with a different host in the group, a NEW connection is established, and no continuation of any system activity from the old connection is transferred to the new. If and when the host operating system supports session recovery, the POSEIDON software will be updated (if necessary) to also support it.



### 3.1.7 Host Directory Service -

At any given time, a terminal user may wish to know what host systems are currently available to him. The SHOW HOSTS command lists all the hosts that the user is authorized to access, and they are displayed by name. For any name that is a group name, a list of hosts in that group will be displayed.

The display will also consist of host identification and status. The status may be one of REACHABLE, UNREACHABLE, OVERDUE or DELETED. Only those hosts designated REACHABLE or OVERDUE may be accessed by a CONNECT command.

The host directory service is maintained as a result of host systems informing servers of their presence at regular intervals of 10 seconds - 3 minutes. If these messages are received regularly, and no connections time out or terminate abnormally, the host status is marked as 'REACHABLE'. If POSEIDON has not heard from a host for 6-8 minutes, the host's status is changed from REACHABLE to OVERDUE, alerting the user that the host may be down. CONNECT requests are honored if the host is either in REACHABLE or OVERDUE status.

If no information is received for 30 minutes, or a connection was terminated abnormally, the status is changed to UNREACHABLE and may no longer be accessed. If no information is received for 24 hours, (or the host data base becomes full) the host is deleted from the data base entirely, and no information about it is retained.

More detailed information about a specific host may be displayed using the "SHOW HOST host\_name" command. Host counters will also be included in this display.

The privileged terminal user may SHOW ALL HOSTS, and receive a list of the hosts that ALL of the terminals on the POSEIDON may access. If none of the terminals on a POSEIDON may access a particular host system, no data about that host is retained, and hence it cannot be displayed.

POSEIDON reserves 30 KB of memory for storage of host systems and names. This amount will support the storage of over 200 host systems, and 50 group names. If an Ethernet contains more than 200 hosts, the terminal/system managers should assign access codes appropriately, so that individual POSEIDON units will not require access to more than 200 hosts.

### 3.1.8 Autocconnect Capability -

AUTOCCONNECT is a function that automatically connects a user terminal to a host system when connection failures occur, or upon POSEIDON initialization.

If AUTOCCONNECT is enabled, but no DEDICATED or PREFERRED host is defined,

then Autoconnect operates only upon abnormal termination of a connection, or upon failure to establish a connection. (An abnormal termination is any disconnection that is NOT because of a DISCONNECT, INITIALIZE command or host LOGOUT.) Upon such termination, the POSEIDON will attempt to reconnect to the same host. Attempts to reconnect will be made at 30 second intervals, and continue indefinitely unless local mode is entered by the user.

If the terminal had been connected to a GROUP host, Autoconnect functions slightly differently upon abnormal termination. Instead of trying to connect to the same host system, attempts will be made to connect to another host within the group, and so on through all the hosts in the group until either a connection is established, or local mode is entered by the user.

In addition, A DEDICATED HOST or PREFERRED HOST may be specified with Autoconnect. When either of these are specified, Autoconnect will attempt to connect to that host upon POSEIDON initialization, or when a CONNECT command (with no host name) is entered, as well as upon abnormal termination.

If a Dedicated Host is specified, autoconnect will attempt to connect to that host "for ever", until the connection is successfully established. This configuration is designed to simulate a local terminal interface exactly, and hence there is no Local Mode or POSEIDON-initiated status messages. If the host goes down, the user will only notice a lack of response, just like a local system. However, autoconnect will still attempt to re-connect to the host (or another host in the group). Autoconnect is always enabled when a Dedicated host is specified.

If a Preferred Host is specified, autoconnect will also attempt to connect to the host "for ever", unless Local Mode is entered. When Local Mode is entered, the autoconnect procedure is suspended and the user may then SHOW HOSTS or CONNECT to another host as desired. If a connect to another host is not performed, Autoconnect may be restarted by entering a RESUME command. Status messages may be issued to terminals with a Preferred Host specified.

If Autoconnect is disabled, all connection failures result in an error message being displayed, and Local Mode being entered on the terminal.

The LOGOUT command may be used to disconnect from the host and also exit out of Local mode. Upon entering this command, the Autoconnect procedure halts and is not restarted until a LOGIN occurs.

### 3.1.9 Flow Control -

Flow Control is a means by which a receiving station (Host, POSEIDON or terminal) may inhibit transmits to that station until the station is adequately buffered to receive the data. With flow control, the possibility of data overruns is minimized (or eliminated). POSEIDON

possesses an extremely flexible and effective flow control mechanism.

Flow control between the POSEIDON and the host system is managed at the LAT protocol level by a credit scheme. Receiving stations, when they are prepared to receive data, pass a credit to the transmitting station. Credits are maintained on a per-terminal basis and are passed in slot headers (see section 3.2.2). Transmit and receive credit counts are maintained by both stations. Transmits may only occur when transmit credits are available. This flow control is bi-directional and is always enabled.

Flow control between the POSEIDON and the terminal is achieved using special characters termed "XOFF" and "XON". When a station (POSEIDON or TERMINAL) receives an XOFF from another station, it must inhibit all transmits to that station until an XON is received. There is usually a small "grace" period for the station to comply: POSEIDON will allow up to 10 extra characters to be received from the XOFF'd station before data overrun occurs.

Since this form of flow control utilizes special characters, its use may not always be desired, especially if "binary" data is being exchanged. POSEIDON allows the terminal user to specifically enable or disable input (from terminal) or output (to terminal) flow control.

Certain situations require that flow control be dynamically enabled and disabled. Instead of requiring the user to repeatedly enter commands to achieve this, the capability exists to allow the host to dynamically enable or disable flow control. Since both the Terminal User and host system can enable or disable flow control, the following priorities are in place:

<u>State set by User</u>	<u>Action</u>	<u>Final State</u>
Disabled	User Disable	Disabled
Disabled	User Enable	Enabled
Disabled	Host Disable	Disabled
Disabled	Host Enable	Disabled
Enabled	User Disable	Disabled
Enabled	User Enable	Enabled
Enabled	Host Disable	Disabled
Enabled	Host Enable	Enabled

The user command will always operate and override any state set up by the host.

Flow control is enabled by default. The XOFF and XON characters are DC3 (hex 13) and DC1 (hex 11) respectively.

In addition to flow control, LOSS NOTIFICATION may be enabled on a per-terminal basis. If enabled, the LL character will be output for each character lost because of insufficient buffer space. This alerts the user that the character must be re-entered. To effectively utilize flow control, the following set-up is recommended:

Line mode terminals

Output Flow Control Enabled  
Input Flow Control Disabled  
Loss Notification Enabled

Block mode terminals

Output Flow Control Enabled  
Input Flow Control Enabled  
Loss Notification Disabled

3.1.10 Modem Control -

The Modem Control version of POSEIDON conforms to DEC Standard 052, and supports the following 3 forms of Modem Control:

- o Two-way simultaneous, Symmetrical (Full-Duplex)
- o Two-way simultaneous, Asymmetrical using Special Cable
- o Data Leads only Mode.

This conforms to the EIA RS-232C and the CCITT V.24 standards for full-duplex modems, including CCITT V.23 modems using the secondary channel. Half-duplex modem control is NOT supported.

All calls are originated from the terminal into the POSEIDON; dial-out and modem speed select are not supported.

The supported modem signals are:

<u>Name</u>	<u>Pin</u>	<u>Description</u>
AA	1	Protective Ground
BA	2	Transmitted Data
BB	3	Received Data
CA	4	Request to Send
CB	5	Clear to Send
CC	6	Dataset Ready
AB	7	Signal Ground
CF	8	Received Line Signal Detector
CD	20	Data Terminal Ready

Modems specifically supported are BELL 1030, BELL 212A, DF01/2/3.

3.1.11 Terminal Support -

Since POSEIDON performs no interpretation of data characters, all asynchronous ASCII terminal devices supported by the host terminal class driver (up to a speed of 19200 bps) are supported by POSEIDON in Host Mode. See section 2.2 for a list of terminals explicitly supported.

Block mode terminals at speeds up to 9600 bps are also supported,

provided that they honor input flow control or utilize a higher-level protocol to detect and correct any data overrun errors.

POSEIDON supports both 7-bit and 8-bit character sets in host mode. To support a 7-bit character set (ASCII), the terminal and the POSEIDON may be set up to exchange either 7 or 8 bit characters (terminal and Poseidon must be set up the same way). If set up to exchange 8-bit characters, bit 7 will be a zero. The parity bit (if enabled) is NOT sent to the host in bit 7, and the host must NOT output a parity bit in bit 7.

If an 8-bit character set is used, both terminal and POSEIDON must be set up to exchange 8 bits (either with or without parity). All eight bits are sent to the host, and all 8-bits received from the host will be output to the terminal.

The Local Mode interface functions only with the 7-bit ASCII character set. Bit 7 in all local mode input is ignored, and is zero on all local mode output. Note that this places a restriction on host names, identification etc, which must utilize only 7-bit ASCII.

The specification of terminal parameters such as terminal speed, number of stop bits etc must be done from local mode using the SET TERMINAL or DEFINE TERMINAL commands. No host-based specification of parameters is supported.

### 3.1.12 Terminal Parameters -

Several options that may be set on a per-terminal basis have been described in the preceding sections. Other parameters which may be set on a per-terminal basis are as follows:

- o Input Terminal Speed: The Input (Terminal to POSEIDON) terminal speed may be specified. Legal values are 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200 bits/second (bps). The default is 9600.
- o Output Terminal Speed: The Output (POSEIDON to Terminal) terminal speed may be specified. Legal values are 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200 bps. The default is 9600.

Although 9600 is a default for terminal speed, autobaud is also enabled by default. The 9600 default only becomes effective if autobaud is disabled.

For a character size of eight bits, no parity bit, one start bit and one stop bit, the character throughput in bytes/second is one tenth of the terminal speed.

- o Character Size: This may be 7 or 8 bits. The default is 8 bits

which can be utilized on most terminals. Support of 5 or 6 bit codes is not provided.

- o Parity: Parity may be enabled or disabled, and if enabled may be even or odd. The default is parity disabled.
- o Number of Stop bits. The default value is two. Legal values are 1 and 2.
- o Type: Terminal Type may be defined as HARDCOPY, SOFTCOPY, ANSI and OTHER. If HARDCOPY is specified, all Local Mode output will be compatible with hardcopy terminals, and the delete key will echo the deleted character between slashes.

If SOFTCOPY is specified, the delete key (in Local Mode) will erase the deleted character from the screen, and backspace the cursor. This applies also to ANSI.

If ANSI is specified, the VT100 ANSI escape sequence support will be assumed on Local Mode output (Note: VT52-compatible terminals are not ANSI type).

If OTHER is specified, it is assumed that the device is not a terminal at all, and Local Mode and status messages will not be enabled on the device. Connections must be performed via Autoconnect, or from the Privileged Local Mode interface.

Read and/or write access may also be specified as a TYPE parameter, and may be "READ\_WRITE", "READ\_ONLY" or "WRITE\_ONLY". The default is "READ\_WRITE". This parameter is specified by a privileged command. Local Mode and status messages are enabled only for "READ\_WRITE" terminals. In addition, output is disabled for "READ\_ONLY" devices, and input is disabled from "WRITE\_ONLY" devices.

- o Access Codes: Access Codes authorize the terminal user to access hosts containing at least one of the same codes. This parameter is specified by a privileged command. The default is access code zero enabled (all others disabled), which will allow access to all hosts which also default to access code zero.
- o Name: A name of up to 10 characters may be specified for each terminal. The name is specified in a privileged SET TERMINAL command by the Terminal Manager, and may be used for any purpose. Normally, the name would identify the terminal user, or location if shared by users.

In the case of printers and other non-terminal devices, the name may be utilized to identify the device to host systems. The name is passed up to the host in the connection procedure, and the host may utilize it (in conjunction with other information) as a logical name which may be allocated to processes in the system. In this way, it is possible that devices connected via POSEIDON may be used by host systems in any way that a directly-connected device may be used, for

example as a spooled output device.

Such uses of the device name, however, are functions of the host-based LAT product, and are not explicitly-defined features of the POSEIDON Terminal Server.

Other terminal parameters have been previously discussed. See section 3.3.2 for the command syntax for entering terminal parameters. Discussion of server parameters is provided in section 3.2.5.

### 3.1.13 Application Support -

All interactive mode terminal applications supported by the host terminal class driver are supported by POSEIDON.

Special terminal modes, escape sequence recognition and the like are performed by the host terminal class driver and the terminal itself. POSEIDON performs no special functions.

LAT handles single-character, read-with-no-echo functions, as exhibited in such utilities as EIT and EDT, but response time may be slightly slower than on a directly connected terminal. Section 8.1 gives details.

### 3.1.14 Security -

In order to provide security from unauthorized users, access to the POSEIDON functions (including Local Mode) may be password-protected on a per-line basis. The Terminal Manager may specify a LOGON PASSWORD for the POSEIDON in privileged mode, and then specify which ports require the password to be entered. If enabled, the password must be entered at the following times:

- o Upon INITIALIZATION of the POSEIDON.
- o Following a LOGOFF command in Local Mode.

When the terminal is logged off, the user should enter one or more carriage returns to notify the POSEIDON that service is required. If LOGON is enabled a 'Bel' character is output to the terminal, and the user has a specified number of attempts (1 - NCLIMIT) to enter the password. If the password is entered incorrectly for the specified number of consecutive attempts, the terminal port is disabled. It may be re-enabled only upon a privileged command, or upon POSEIDON initialization.

### 3.1.15 Server Initialization -

The POSEIDON server, and LAT software, may be initialized in two ways: either by electrical power-up or by a software INITIALIZE command in Privileged Local Mode. The following processes occur upon initialization:

- 1 Warning messages are sent to the users at one minute intervals indicating that the server is about to re-initialize. (Initialize Only)
- 2 All active terminals and virtual circuits are disconnected. (Initialize Only). At this point, the software status, uptime and dump host fields are initialized.
- 3 Control is passed to the Self-test diagnostic which then executes. Upon successful self-test the front light is illuminated, and control is passed to step 4. If self-test detects a fatal error the unit will halt and should be referred for service. Upon detection of a soft error, the diagnostics will blink the front light, then pass the error status to the microcode, and continue with step 4.
- 4 The POSEIDON microcode optionally outputs hardware/load status messages, then commences to downline load the operational LAT software. This operation will typically take about 10-15 seconds. (Details of the loading process are given in section 3.4.2 and Appendix I).
- 5 If AUTOBAUD is disabled, go to step 6. If AUTOBAUD is enabled for a terminal, input is enabled. When the user enters a carriage return (probably much later) and the terminal speed is successfully determined, the terminal initialization logically continues at step 6.
- 6 For all terminals with LOGON enabled, a BEL character will be output to the terminal. This is a prompt to enter the LOGON password. Once the password is correctly entered, control passes to step 7. If LOGON is disabled, control continues at step 7.
- 7 All terminals with a specified Dedicated or Preferred Host are connected to that host. If this fails, the autoconnect procedure will continue to retry this event until Local Mode is entered by the user. If the specified host is a group name, a connect attempt will be made to all hosts in the group (in priority order) until a connection is successful.
- 8 All terminals with no default host are put into Local Mode, and the 'LOCAL>' prompt is displayed.



### 3.1.16 Software Support Tools -

Support services in the form of an SPR service and telephone hotline will be made available to the user for reporting suspected software errors. Maintenance will be performed by a Software Engineering Maintenance Group and shipped to users in autopatch releases (as with other layered products).

Tools will be provided to diagnose and correct POSEIDON software problems. A diagnostic online debugging tool (ODT) will be provided, which may be used to obtain detailed information about software crashes. The information provided can then be relayed to the Maintenance Group via SPR's or telephone hotline. The ODT interface is described in the "POSEIDON Online Debugging Tool Specification".

There are several bugchecks within the POSEIDON software, which are activated upon any illogical or "impossible" condition that may occur within the software system, or a fatal hardware error. They are NOT activated on any user error, or illegal message received over the Ethernet. If a bugcheck is activated, a system crash occurs. The POSEIDON may be configured to Upline Dump its memory image to a host system for later analysis upon system crash. Appendix J gives details on the upline dump operation.

The RSX/VMS EDT utility may be used to update the POSEIDON software on the host. The image file contains a small header, followed by printable ASCII text. Software specialists or customers may utilize updates provided in Software Dispatches or by telephone, when the need exists to update the software prior to the shipment of autopatch. The image file contains a checksum which must be correctly updated, otherwise the software will not be runnable on the POSEIDON. The EDT utility is described in the RSX/VMS documentation sets.

The maintenance strategy for correcting errors in the ROM-based microcode is a release of a new ROM. No patching facility is provided for the ROM-based code.

### 3.1.17 Maintenance Functions -

The POSEIDON Terminal Server is a fully supported DIGITAL node on the NI. Maintenance functions are implemented so that the server operation may be controlled and monitored by the Privileged Local Mode interface, without active assistance by any host processor.

The following Ethernet maintenance functions (as described in the Maintenance Operations Protocol specification) are provided, and their particular implementation is outlined:

- o Loop Server - The LAT server implements the Ethernet Loop Server functions as follows:

- Enable Server: This function is implicitly defined as part of the POSEIDON initialization procedure. The loop server is enabled following a successful initialization and remains enabled at all times that the server is in normal operation.
  - Disable Server: This function is implicitly defined as part of the POSEIDON initialization procedure, and is in effect from the start of the diagnostic self-test function until successful initialization completion.
  - Enable Assistance/Disable Assistance: These functions are not implemented. The loop server never responds to the loopback assistance multicast address.
  - Read Status: This function is implemented as part of the SHOW SYSTEM command. The loop server state and assistance state are displayed.
- o Loop Requester: Since POSEIDON is designed to be controlled from its own interface, the following Loop Requester functions are supplied:
- LoopDirect: The Terminal Manager may test a link between the POSEIDON and any other specific station, or the loop assistance multicast address, by issuing a "LOOP station" command in Privileged Local Mode. A response is provided within 5 seconds, indicating whether the test was successful.
  - LoopAssisted: The Terminal Manager may test a link between the POSEIDON and a specific station, using the assistance of a third station by issuing a "LOOP station WITH function ASSIST station" command in Privileged Local Mode. A response is provided within 5 seconds, indicating whether the test was successful.
  - LoopPoll: This function is implicitly defined as part of the LOOP procedure. No user interface is supplied.
  - LoopAbort: This function is implicitly defined as part of the LOOP procedure. If a response to a LOOP command is not forthcoming within 5 seconds, the loop function is internally aborted, and a failure status is returned to the user.
- o Console Server Functions - Because POSEIDON does not support remote console carrier functions, this minimum subset of console server functions is defined:
- Identify-Self function - A system-ID message is sent to the console server multicast address at intervals of 10 minutes plus or minus a random interval up to 2 minutes, 11 seconds. The system-id message contains all fields required by the NI Node architecture specification, and also the following:
    - 101 Communication Device Related - Diagnostic Status
    - 102 Communication Device Related - ROM Version Number
    - 103 Communication Device Related - Software Version Number

- 104 Communication Device Related - Server Number
  - 105 Communication Device Related - Server Name
  - 106 Communication Device Related - Server Location
- 
- Read-Identity function - A system-ID message is sent to a requester node that issues a Read-Identity function to the LAT server node.
  - Read-counters function - A Counters message is sent to a requester node that issues a Read-Counters function to the LAT server node.

In addition to Ethernet maintenance functions, a TEST TERMINAL function is provided for users to determine whether the UART/cable/terminal sub-system is functioning correctly. There are three variations of TEST TERMINAL as follows:

- o TEST TERMINAL - This non-privileged command outputs a rotational display of all printable ASCII characters on the requesting terminal. The display may be visually examined for errors. The test is stopped by typing any character during the test.
- o TEST TERMINAL n - This privileged function outputs the ASCII display to a specified terminal (where n is 1-8). The display is visually examined for errors. The function is stopped by entering the privileged STOP TEST TERMINAL n command.
- o TEST TERMINAL n LOOPBACK - This privileged function requires that the terminal loopback connector is inserted into the specified terminal port prior to issuing the command. The rotational ASCII pattern is written to the specified terminal, read back and compared for errors. The test is stopped by the STOP TEST TERMINAL n command, after which a message containing the number of errors and bytes transferred is displayed on the privileged terminal.

The privileged TEST functions may not be applied to the requesting terminal.

### 3.1.18 Software Reset -

Since terminal and server parameters may be "permanently" modified and stored in non-volatile memory, a method to reset the unit to its factory (default) settings is required. This is especially useful if the Privileged Mode password is forgotten, terminal parameters are set up to "bad" settings, and when individual POSEIDON units are transferred into a different environment or returned from service.

This feature is provided by a SOFTWARE RESET button located on the POSEIDON box itself, and is activated by depressing the RESET button while simultaneously removing and inserting the power cord. When the Terminal Manager activates this control, an immediate initialize occurs, and all permanent and dynamic parameters are reset to their default

values. This control should ONLY be activated when absolutely required, and not as a matter of course. Normal powerfail and INITIALIZE will not cause the unit to reset to factory settings.

The RESET function is implemented in the diagnostic self-test code.

## 3.2 LAT ARCHITECTURE OVERVIEW

This section presents an overview of the LAT architecture sufficient to illustrate the meaning of various LAT server parameters. The architecture definition is provided in Reference 6. Appendices C, D and E outline the circuit state processing, slot state processing and message formats used in POSEIDON.

### 3.2.1 Virtual Circuits -

Communication between POSEIDON and a host system utilizes a synchronous, packet-oriented protocol, following the establishment of a VIRTUAL CIRCUIT. A Virtual Circuit associates a POSEIDON with a Host system, and all terminals connected to that host will utilize a single circuit.

When a user requests to CONNECT a terminal to a host, and no other terminals on the POSEIDON are communicating with that host, a Virtual Circuit is initiated between POSEIDON and the host. The POSEIDON sends a START MESSAGE, containing server parameters and other information, to the host. During this process, the POSEIDON circuit is in the START STATE.

The host examines the Start Message and decides whether to accept or reject the Circuit Connection. If the host accepts the Circuit Connection, it sends a Start Message back to the POSEIDON, and the circuit becomes established. Slot connection (section 3.2.2) is then performed.

POSEIDON then transmits RUN MESSAGES, containing input terminal data, control information and acknowledgements, to the host at regular intervals determined by the CIRCUIT TIMER (section 3.2.3). The host responds to each message by also sending a Run Message containing output terminal data, control information and acknowledgements. The POSEIDON circuit performs these activities in the RUN state.

If no data is waiting for transmission for any terminals on the circuit, POSEIDON transmits RUN MESSAGES at much longer intervals determined by the KEEP\_ALIVE timer (section 3.2.4), and the circuit enters the WAIT state. If data then becomes available, the RUN state is re-entered.

This continues until one of the stations (host or POSEIDON) decides to terminate the circuit. Normally, this occurs when the last terminal on the circuit disconnects, but may be initiated for a variety of other

reasons. The station then sends a STOP MESSAGE to the partner, upon which both stations will terminate the circuit. The circuit will enter the HALT state.

Appendix C summarizes the processing involved when various EVENTS occur while a circuit is in one of the above circuit states.

### 3.2.2 Slots -

The Virtual Circuit protocol handles the data transport between a POSEIDON and a host. Management of individual TERMINAL DATA is performed using SLOTS. Run Messages consist of a circuit header, plus zero or more slots, each slot corresponding to one of the connected terminals.

When a user CONNECTS to a host, and following the establishment of a virtual circuit, slot connection takes place. POSEIDON sends a START SLOT, including terminal parameters and other information, to the host. During this process, the slot is in the START STATE.

The host examines the Start Slot and decides whether to accept or reject the Slot Connection. If the host accepts the Slot Connection, it sends a Start Slot back to the POSEIDON, and the slot becomes established. The slot then enters the RUN STATE.

Terminal input and output, which occurs directly to and from slot buffers, is actually transported by the virtual circuit protocol, with no slot state transitions.

This continues until one of the stations (host or POSEIDON) decides to terminate the terminal connection. Normally, this occurs upon a user DISCONNECT command, but may be initiated for a variety of other reasons. The station then sends a STOP SLOT to the partner, upon which both stations will terminate the slot. The Slot will then enter the HALT state.

Appendix D summarizes the processing involved when various EVENTS occur while a slot is in one of the above slot states.

### 3.2.3 Circuit Timer -

The Circuit Timer defines the interval between messages sent from the POSEIDON to a host system. The circuit timer may range from 30 - 200 milliseconds, and applies to all circuits on the POSEIDON.

Under no circumstances will messages be sent more often than that defined by the circuit timer, even if more than one message is required to transmit all waiting slots; slots not transmitted in a given message will be sent AFTER the circuit timer interval in the next message. A

round-robin slot selection process will ensure fair service to all slots.

Selection of the circuit timer value should be co-ordinated between the needs of the terminal users on the POSEIDON, and the capabilities of the host systems which they will access. A short circuit timer interval will potentially minimize response time to the user, but maximize host loading. A long circuit timer minimizes host loading, but extends user response time.

The default circuit timer value of 80 ms is recommended for interactive terminal use on timesharing systems. Host system managers are urged to define the minimum circuit timer value to be 80 ms. This value provides fast response (40-50 ms average) to terminal users, while at the same time offloading host interrupt processing compared to such local interfaces such as the DZ11.

The circuit timer value may be reduced for use on stand-alone, or underused, host systems to minimize response time. For systems that are very heavily used, a longer circuit timer will increase CPU capacity for compute-intensive applications.

A short Circuit Timer value will increase overhead traffic on the Ethernet, since more messages with less data per message will be transmitted. Data throughput is constrained by terminal speed, and is generally not affected by different Circuit Timer values.

#### 3.2.4 Keep\_Alive Timer -

The KEEP\_ALIVE TIMER defines the interval between messages on circuits where no data is being transported. This parameter is much less critical on overall performance than the Circuit Timer, but may have an impact on a heavily-loaded Ethernet. The default value of 30 seconds is recommended for timely status information to users in most environments.

A value of 10 seconds provides fast status information, but will increase Ethernet traffic, especially if many POSEIDONS are in operation. For Ethernets that are near or at maximum capacity, the maximum value of 180 seconds should be used.

#### 3.2.5 Server Parameters -

The Privileged Local mode interface allows the specification of various server parameters, which may be used for POSEIDON identification or protocol variables. Parameters affecting the LAT protocol were discussed in the previous sections. Other specifiable parameters include:

- o Server Number - This is a value from 0-65535 that may be used in any way to identify the POSEIDON unit. It is suggested that a different

number be used for each POSEIDON on the local network. This number is passed to hosts in Start Messages, and is included in the System Identification message sent upon request from a host system. The default value is zero.

- o Server Name - This 0-16 character ASCII field is used to identify a POSEIDON unit by name, or may be used (at the option of the Terminal Manager) to identify type, ownership, usage or any other relevant meaning. This field is passed to hosts in Start Messages, and System Identification messages. The default value is the name and option number of the POSEIDON.
- o Location - This 0-16 character ASCII field is used to identify a POSEIDON location, or may be used (at the option of the Terminal Manager) for any other meaning. This field is passed to hosts in Start Messages, and System Identification messages. The default value is spaces.
- o Privileged Mode Password - This 1-6 character ASCII field is used to gain access to the Privileged Local Mode command set. This value should be unique for each POSEIDON or group of POSEIDONS managed by a single Terminal Manager, and should not be obvious. Only necessary and knowledgeable users should have access to this password, otherwise the performance of the entire network may be compromised.

The Terminal Manager should remember the password. If a password is forgotten, the POSEIDON unit may be re-initialized to its factory settings using the reset button. The default password of "SYSTEM" will then take effect. The use of the reset button will also initialize all terminal and server parameters to their default settings.

- o Logon Password - This 1-6 character ASCII field is used to gain access to POSEIDON functions if LOGON is enabled for a terminal. The password must be entered after POSEIDON initialization or a LOGOFF command following output of a "prompting" Bel character. The default LOGON password is "ACCESS", but should be changed prior to normal use. LOGON is enabled by default, and is seen to be especially useful for modem lines.
- o The SOFTWARE\_ID parameter specifies the name of the POSEIDON software load image file residing on the host. The following filenames are defined, one of which is stored in the ROM area of the POSEIDON unit at factory ship (depending on the version of POSEIDON ordered):

- PS0801ENG.SYS - POSEIDON/8, no modem control, English
- PS0802ENG.SYS - POSEIDON/P, modem control, English
- PS0803ENG.SYS - Reverse POSEIDON/8, English

If the Terminal manager wishes to load an alternate software image into the unit, the file descriptor should be specified prior to initialization using the DEFINE SERVER SOFTWARE\_ID command. The

file descriptor is limited to 16 characters, and the following defaults apply:

- For VAX/VMS systems:           SYS\$SYSTEM:filename.SYS
- For RSX systems:                LB:[1,54]filename.SYS

- o Console - One of the eight POSEIDON terminals may be designated as a CONSOLE terminal, which may be utilized by ODT and upon system crash. If a console terminal is specified, a system crash will output a two-line crash message to the console terminal, and display the Ethernet address of the upline dump host (if dump is enabled). The console terminal will also be used as the ODT interface (if ODT is enabled).

Only ONE terminal may be designated as the console terminal. The default is that terminal port 1 is the Console terminal.

- o Dump - If the POSEIDON software detects a fatal logic error, it may crash. The Terminal Manager may request that an Upline Dump be performed upon crash. This command enables the dump process. The default is Dump Disabled.

- o ODT - The diagnostic microcode contains an Online Debugging tool - This may be enabled using the ODT ENABLED command. A CONSOLE terminal must be defined prior to enabling ODT. Once enabled, ODT will prompt at the CONSOLE terminal upon each of the following conditions:

- Upon system crash (after upline dump)
- Upon a pre-set ODT breakpoint being hit
- Upon a ODT command being entered from privileged mode
- Upon initialization (after downline load)

- o Heartbeat - All Ethernet transceivers conforming to the Ethernet V2.0 spec must enable the "Heartbeat" collision detect circuitry, but this is NOT a requirement for Ethernet V1.0. By default, if absence of heartbeat is detected, the LAT software (but NOT microcode) will get a transmit error on all transmits, and hence will not function. The HEARTBEAT DISABLED command is provided to allow POSEIDON usage with transceivers which do not have the heartbeat circuitry. If heartbeat is disabled, heartbeat errors are ignored and not counted.

### 3.3 USER INTERFACE

This section describes the Local Mode interface provided with POSEIDON, including all commands, options and status messages. This command set is compatible with the LAT implementation supplied by other DIGITAL Terminal Servers.

If a terminal is specified to be password-protected by the Terminal



Manager, a password must be correctly entered to access POSEIDON functions (either host or local modes). The password must be entered upon POSEIDON initialization or following a Local Mode LOGOFF command. A "Bel" character (Beep) will be output to the terminal after which the user has a specified number of attempts to enter the password. The password may be from 0-16 characters, and consist of any valid local mode character (see below). The password is not echoed on the terminal.

Local Mode may be initiated as the default mode upon POSEIDON initialization, or in one of the following ways:

- o The Local Switch character (or break key) is entered by the user
- o If Autobaud is enabled, the user may type carriage return, and Local Mode will be entered.
- o Upon circuit or terminal disconnection for any reason and Autoconnect is disabled.

In Local Mode, POSEIDON reads, echoes and processes all input entered at the terminal. To facilitate usage, (and for compatibility with other DIGITAL interfaces) the following functions are provided in Local Mode:

- o DELETE Key - Deletes Last Character Typed. Deleted character echoed between slashes on a hardcopy terminal, erased on a SOFTCOPY or ANSI terminal.
- o CONTROL/U - Deletes current input line. Echoes as "^U".
- o CONTROL/R - Re-echoes entire input line. Echoes as "^R".

In addition, output flow control (XON/XOFF) is fully supported, and a function is enabled to terminate terminal tests.

Command lines up to 132 characters may be entered. All commands should be terminated by a carriage return: other common line terminators (escape/line feed etc) are not supported as line terminators in Local Mode.

Commands may be entered in upper or lower case, and are converted internally to upper case. All local mode exchanges utilize the 7-bit ASCII character set, and valid command characters include:

A-Z, a-z, 0-9, \$ (dollar) and \_ (underscore)

Local Mode commands may be typed ONLY when a prompt is outstanding. Local type-ahead is not supported if the prompt has not yet been issued. The prompts are as follows:

```
LOCAL>          Non-privileged State
PRIV_LOCAL>     Privileged State
```

All keywords may be abbreviated to 3 or more characters, and optional keywords may be omitted. For example, the "DEFINE SERVER CIRCUIT TIMER

100" command may be abbreviated to as little as "DEF CIR 100". The entire keywords "SERVER" and "TIMER" are optional.

Certain commands allow the modification of terminal or server parameters. Temporary modifications should be issued using the SET command. These changes are stored in dynamic memory, take effect immediately and remain in effect until changed or until a POSEIDON initialization occurs.

If a parameter is to be changed permanently, the DEFINE command should be issued. The DEFINE command should be issued ONLY for permanent changes, and not as a regular procedure. DEFINE commands update only the permanent memory (NVRAM) in the POSEIDON, and do not affect the current state of the server.

Local Mode is always entered in the Non-privileged state. To enable the Privileged state, the following command should be issued:

```
LOCAL> SET PRIVILEGED  
Password>
```

The password is not echoed. If another terminal is already privileged, the following error message is displayed and privilege is not given:

```
LOCAL -nn- Terminal n is already privileged
```

It is possible to "Steal" the privilege from the other terminal by entering the following command:

```
LOCAL> SET PRIVILEGED OVERRIDE
```

This command should only be entered if the currently privileged terminal is out of order. Only one terminal may be privileged at any time.

For each command described in the next two sections, a description of the command is given, together with the meanings of any options. Examples are given for non-trivial commands.

The COMMAND RESPONSE is the normal response that would be output upon successful completion. If NONE is given, the output of the "LOCAL>" prompt serves as the command response.

The ERROR RESPONSE(S) document the possible error messages that may occur. Any error response results in the non-execution of the entire command: the state of the system after the command is the same as that before.

Certain error responses may occur on any command, and are not individually documented. These are as follows:

```
LOCAL -nn- Command syntax error
```

```
LOCAL -nn- Privileged command or option
```

```
LOCAL -nn- Keyword "XXXXX" not known
```

LOCAL -nn- Value invalid or out of range, "value"

### 3.3.1 Command Set Summary -

The NON-PRIVILEGED commands available in Local Mode are summarized below:

```
CONNECT [HOST] [host-name]
(DEFINE|SET) TERMINAL characteristics
DISCONNECT
LOGOFF
HELP [(CONNECT|DEFINE|DISCONNECT|LOGOFF|RESUME|SET|SHOW|TEST)]
RESUME
SET HOST host_name
SHOW CONNECTS
SHOW HOSTS
SHOW TERMINAL
TEST TERMINAL [WIDTH nn] [COUNT nn]
```

The PRIVILEGED commands are summarized below:

```
CONNECT TERMINAL (1|2|...|8) [HOST host_name]
(DEFINE|SET) (LOGDN|PRIVILEGED) PASSWORD
(DEFINE|SET) SERVER characteristics
(DEFINE|SET) TERMINAL (1|2|...|8) characteristics
DISCONNECT TERMINAL (1|2|...|8)
HELP [(DEFINE|INITIALIZE|LOOP|SET|STOP|ZERO)]
INITIALIZE [ABORT]
           [DELAY minutes]
           [DISABLE]
           [TEST options]
LOOP STATION station1_id
           [WITH (TRANSMIT|RECEIVE|FULL) ASSIST STATION station2_id]
ODT
SHOW ALL CONNECTS
SHOW COUNTERS
SHOW ALL HOSTS
SHOW SERVER
SHOW TERMINAL n
STOP TEST TERMINAL (1|2|...|8|ALL)
TEST TERMINAL [(1|2|...|8|ALL)] [WIDTH nn] [COUNT nn] [LOOPBACK]
ZERO COUNTERS
```

### 3.3.2 Non-privileged Commands -

- o **CONNECT** [HOST] [host\_name]  
**SET HOST** [host\_name]

The **CONNECT** command logically connects a terminal to the specified host system. The host name is the 1-16 character name of the host system, optionally followed by a double-colon. **SET HOST** is provided for DECnet/VAX compatibility.

If no host name is specified, an attempt to connect to the Preferred Host (if any) is made.

Examples:

```
LOCAL> CONNECT  
LOCAL> SET HOST BERGIL::
```

Command Response:

```
LOCAL -nn- Connection to host XXXXXX established
```

Error Responses:

```
LOCAL -nn- Host XXXXXX not known
```

```
LOCAL -nn- Host XXXXXX not available (code xx)
```

```
LOCAL -nn- Connection already established
```

```
LOCAL -nn- Connection to host XXXXXX not established  
Host rejects connection (code xx)
```

```
LOCAL -nn- Connection to host XXXXXX not established  
Host does not respond to connect request
```

```
LOCAL -nn- Continuing attempts to connect to host XXXXXX
```

```
LOCAL -nn- Preferred host not defined
```

- o **DISCONNECT**

The **DISCONNECT** command logically disconnects the terminal from the connected host system, or cancels connect attempts initiated by autoconnect. Following the disconnection, Local Mode is entered and the 'LOCAL>' prompt is issued.

Command Response:

```
LOCAL -nn- Disconnected from host XXXXXX
```

Error response:

LOCAL -nn- No connection established or requested

o **HELP [CONNECT|DEFINE|DISCONNECT|LOGOFF|RESUME|SET|SHOW|TEST]]**

The HELP command displays a list of commands available in Local Mode. If a keyword is supplied, the command provides help on the command specified.

Example:

LOCAL> HELP CONNECT

Command Response:

A Help display as shown in Appendix G

Error Response:

LOCAL -nn- Keyword "XXXXX" not known

followed by the HELP display shown in Appendix G.1

o **LOGOFF**

This command effectively terminates the user's entire terminal session. If a host is connected, a DISCONNECT is activated. The LOCAL> prompt is NOT re-issued, and any modem connection is terminated. To re-use the port, the LOGON PASSWORD (if enabled) must be entered. If LOGON is not enabled, local mode may be regained by entering a carriage return. Following a successful LOGON, dynamic terminal parameters are reset to the permanent values stored in NV\_RAM.

Command Response:

LOCAL -nn- Logged off terminal n

o **RESUME**

This command is effective after Local Mode has been entered during a terminal/host session by means of the Local Switch character (or Break key), and is used to exit Local Mode and resume Host Mode. RESUME also restarts autoconnect if a requested connection was not successfully established prior to entering Local Mode.

Command Response:

LOCAL -nn- Connection to host XXXXXX resumed - OR -  
LOCAL -nn- Continuing attempts to connect to host XXXXXX

Error Response:

LOCAL -nn- No connection established or requested

- o SET TERMINAL characteristics  
DEFINE TERMINAL characteristics

The SET TERMINAL command enables a terminal user to modify dynamic terminal parameters. The DEFINE TERMINAL command enables a user to modify permanent terminal parameters. Terminal parameters are discussed in section 3.1.12. One or more parameters may be entered per command, separated by a space, comma or both.

The characteristics may consist of one of the following:

AUTOCONNECT (ENABLED|DISABLED)  
CHARACTER SIZE (7|8)  
PREFERRED HOST (host\_name|NONE)  
INPUT FLOW CONTROL (ENABLED|DISABLED)  
INPUT SPEED bits\_per\_second  
LOCAL [SWITCH] CHARACTER (char|BREAK)  
LOSS [NOTIFICATION] (ENABLED|DISABLED)  
OUTPUT FLOW CONTROL (ENABLED|DISABLED)  
OUTPUT SPEED bits\_per\_second  
PARITY (ODD|EVEN|NONE)  
SPEED bits-per-second  
STOP BITS (1|2)  
TYPE (HARDCOPY|SOFTCOPY|ANSI)

Example:

LOCAL> SET TERMINAL AUTOCONNECT ENABLED, PREFERRED HOST SMAUG

Command Response:

None

- o SHOW CONNECTS

The SHOW CONNECTS command displays information about the current connection status of the terminal.

Command Response:

The display as shown in Appendix F.1 is output.

o **SHOW HOSTS** [host\_name]

The **SHOW HOSTS** command displays information about host systems accessible to the terminal user. The command comes in two flavors:

- If **'SHOW HOSTS'** is typed, a one-line-per-host display of all hosts accessible to the user is output. The information contains host name, status and abbreviated ID message.
- If **'SHOW HOST host\_name'** is typed, more detailed information about the specified host, including counters, will be displayed.

Command Response:

SHOW HOSTS display examples are shown in Appendix F.2 and F.3.

Error Response:

LOCAL -nn- Host XXXXXX not known

o **SHOW TERMINAL**

The **SHOW TERMINAL** command displays the dynamic and permanent terminal parameters and current connection status for the user's terminal.

Example:

LOCAL> SHOW TERMINAL

Command Response:

A **SHOW TERMINAL** display example is shown in Appendix F.4

o **TEST TERMINAL** [WIDTH nn] [COUNT nn]

This command instructs POSEIDON to test the user's terminal. A rotating ASCII pattern, containing lines of the specified **WIDTH**, are output to the terminal. Width may vary from 1 to 255 characters. If no width is given, a default of 70 is used.

The **COUNT** parameter defines how many lines are output. If not specified, the count will be indefinite, and the test may be terminated by entering any character (or **BREAK**) on the terminal, or

entering a STOP TEST TERMINAL command from the Privileged Local Mode.

Example:

```
LOCAL> TEST TERMINAL WIDTH 20 CCOUNT 48
```

Command Response:

```
!"#$%^()*+,-./0123
!"#$%^()*+,-./01234
!"#$%^()*+,-./012345
!"#$%^()*+,-./0123456          (user types on terminal)
```

### 3.3.3 Privileged Commands -

#### c CONNECT TERMINAL (1|2|...|8) [HOST host\_name]

This command implements the same function as the non-privileged CONNECT command, except that a specific user terminal is specified. This command is provided in order to connect devices which do not have a keyboard (such as an output-only printer), and NOT to override the user's connection at the terminal. Hence, the specified terminal must be of the type "OTHER", or have a DEDICATED HOST specified, and not support Local Mode.

If the HOST name is not supplied, the specified terminal is connected to its dedicated or preferred host (if any).

Example:

```
PRIV_LOCAL> CONNECT TERMINAL 2 HOST BERGIL::
```

Command Response:

```
LOCAL -nn- Connection to host XXXXXX established
```

Error Responses:

```
LOCAL -nn- Host XXXXXX not known
```

```
LOCAL -nn- Host XXXXXX not available (code xx)
```

```
LOCAL -nn- Connection already established
```

```
LOCAL -nn- Connection to host XXXXXX not established
```



Host rejects connection (code xx)

LOCAL -nn- Specified terminal supports local mode

LOCAL -nn- Preferred host not defined

o **DEFINE (LOGON|PRIVILEGED) PASSWORD**  
**SET (LOGON|PRIVILEGED) PASSWORD**

This command changes the LOGON or PRIVILEGED password for access to the relevant POSEIDON functions. SET PASSWORD changes the dynamic password; DEFINE PASSWORD modifies the permanent password.

When either command is entered, two password prompts are issued. The same 1-6 character alphanumeric password should be typed in response to each prompt. Since the password is not echoed on the terminal, the dual entry minimizes the probability of a spelling error in the password. Example:

```
PRIV_LOCAL> DEFINE LOGON PASSWORD
Password> ; Type password
Password> ; Repeat password
```

Command response:

None

It is important that any permanent change to the PRIVILEGED password be remembered.

o **DEFINE SERVER characteristics**  
**SET SERVER characteristics**

The DEFINE SERVER characteristics updates permanent server parameters. The SET SERVER characteristics updates dynamic server parameters. DEFINE SERVER commands may be entered at any time, and take effect upon the next initialization. SET SERVER commands may be entered only when no circuits are active, preferably with user terminals disabled. One or more parameters may be entered per command. Section 3.2.5 provides a description of server parameters. The list of settable parameters are:

```
CIRCUIT TIME# milliseconds
CONSOLE (n|NONE)
DUMP (ENABLED|DISABLED)
HEARTBEAT (ENABLED|DISABLED)
KEEPALIVE TIMER seconds
LOCATION "location_text"
NAME "name_text"
```

NUMBER integer  
ODT {ENABLED|DISABLED}  
SOFTWARE\_ID filename

Command Response:

None

Error Response:

LOCAL -nn- Parameter cannot be modified, connection established

LOCAL -nn- Parameter cannot be dynamically modified

LOCAL -nn- Console terminal not defined

Note that the keyword SERVER may be omitted from any SET SERVER or DEFINE SERVER command.

- o DEFINE TERMINAL {1|2|...|8} characteristics
- SET TERMINAL {1|2|...|8} characteristics

This command allows the privileged user to define or set any terminal's parameters. The terminal must be idle and not connected to a host when this command is given. The characteristics are the same as for the non-privileged DEFINE/SET TERMINAL, except that the following additional characteristics may be set:

AUTOBAUD {ENABLED|DISABLED}  
DEDICATED\_HOST {host\_name|NONE}  
ACCESS {ENABLED|DISABLED} CODES {0|1|...|127|ALL}  
LOGON {ENABLED|DISABLED} [(LIMIT nn|NOLIMIT)]  
MODEM {ABSENT|PRESENT}  
NAME "name\_text"  
TYPE {HARDCOPY|SOFTCOPY|ANSI|OTHER}  
{READ\_WRITE|READ\_ONLY|WRITE\_ONLY}

See the non-privileged DEFINE/SET TERMINAL command for more information.

Example:

PRIV\_LOCAL> SET TERMINAL 1 LOGON ENABLED LIMIT 10

Command Response:

None

Error Response:

LOCAL -nn- Parameter cannot be dynamically modified

o DISCONNECT TERMINAL {1|2|...|8}

This command disconnects a specified terminal from the host system that it is currently connected to. It is functionally similar to the non-privileged DISCONNECT command. The command may only be issued to a terminal of type "OTHER", or one with a DEDICATED HOST specified.

Example:

```
PRIV_LOCAL> DISCONNECT TERMINAL 4
```

Command Response:

```
None
```

Error Response:

```
LOCAL -nn- No connection established
```

```
LOCAL -nn- Specified terminal supports local mode
```

o HELP {DEFINE|INITIALIZE|LOOP|SET|STOP|ZERO}}

This command is functionally similar to the non-privileged HELP command, except that information about privileged commands is available, as well as the non-privileged commands. See Appendix G for details.

o INITIALIZE [DELAY minutes] [DISABLE] [TEST options] [ABORT]

The INITIALIZE command instructs POSEIDON to perform an orderly shutdown of normal operations, execute the diagnostic self-test, and re-initialize. Section 3.1.15 describes initialization.

If the "DELAY minutes" option is given, the initialization will take place in the specified number of minutes. At one minute intervals prior to initialization, warning messages are printed to all terminals alerting the users that the local system will be re-initializing. The delay variable may vary between 0 and 255 minutes, and the default is 5 minutes if no "DELAY" option is given. To get an immediate initialization, "DELAY 0" should be entered.

If the "TEST options" keyword is given, non-standard diagnostic tests will be performed. The options will be defined at a later date. The default is the standard self-test diagnostic.

3.3.3.99.1 Define Test Options for Initialize command.

If the DISABLE keyword is given, the newly-initialized POSEIDON will not allow autoconnect or any Local Mode command except 'SET PRIVILEGED'. Once a terminal is privileged, all commands are honored. To re-enable the server for normal operations, another INITIALIZE command, excluding the DISABLE keyword, must be entered. This option allows for maintenance functions to be carried out on the POSEIDON without interference from other users.

The ABORT qualifier has the effect of aborting a previously-requested initialization, which has not yet taken effect. Remaining warning messages will be cancelled, and the server will continue to operate normally.

Examples:

```
PRIV_LOCAL> INITIALIZE DELAY 10
```

```
PRIV_LOCAL> INITIALIZE DELAY 0 DISABLE
```

Command Response (all terminals):

```
LOCAL -nn- WARNING -- Local area service ending in nnn minute(s)  
LOCAL -nn- WARNING -- Local area service ending in nnn minute(s)  
:      :      :      :      :      :      :      :  
:      :      :      :      :      :      :      :  
LOCAL -nn- WARNING -- Local area service ending in 1 minute(s)  
LOCAL -nn- Local area service end
```

o LOOP STATION station\_id

This command instructs the POSEIDON to attempt to communicate with the specified Ethernet station using the Ethernet maintenance protocol Reply function. This command tests the physical connectivity between stations, and the station need not be a LAT host system. A message indicates if the test is successful or not.

Example:

```
PRIV_LOCAL> LOOP STATION 10-1F-23-43-1A-00
```

Command Response:

```
LOCAL -nn- Loop test successful
```

Error Response:

```
LOCAL -nn- Loop test failure
```

- o LOOP STATION station1-id WITH {TRANSMIT|RECEIVE|FULL} ASSIST STATION station2-id

This command instructs the server to attempt to communicate with the specified station1 using the Ethernet Maintenance protocol Forward Message and Reply functions, with assistance from station2. The message paths are as follows:

```
Transmit Assist: POSEIDON-station2-station1-POSEIDON
Receive Assist: POSEIDON-station1-station2-POSEIDON
Full Assist: POSEIDON-station2-station1-station2-POSEIDON
```

This command tests the physical connectivity between stations, and the stations need not be LAT host systems.

example:

```
PRIV_LOCAL> LOOP STATION 10-1F-23-43-1A-00 WITH FULL
ASSIST STATION 10-23-19-00-13-00
```

Command Response:

```
LOCAL -nn- Loop test successful
```

Error Response:

```
LOCAL -nn- Loop test failure
```

- o ODT

The ODT command is utilized to break into ODT during operations. For this to be effective both a CONSOLE terminal must be defined, and ODT previously enabled using SET/DEFINE server commands. Upon entering the ODT command, all operations will immediately cease, and the ODT prompt will be issued at the console terminal. Any terminal or Ethernet traffic arriving during the ODT session may be lost.

Command Response:

```
None (at the requesting terminal, if not the console)
* (at the console terminal)
```

Error Responses

```
LOCAL -nn- ODT not enabled
```

o **SHOW ALL CONNECTS**

This command is similar to the non-privileged **SHOW CONNECTS** command, except that the connection status for all terminals is displayed. An example is shown in Appendix F.5.

o **SHOW COUNTERS**

The **SHOW COUNTERS** command displays Ethernet counters and Server (LAT) counters.

Example:

```
PRIV_LOCAL> SHOW COUNTERS
```

Command Response:

Appendix F.6 provides an example of the **SHOW COUNTERS** display.

o **SHOW ALL HOSTS**

The **SHOW ALL HOSTS** command enables the privileged user to view all host systems that are stored in the host data base, instead of only those hosts which are accessible from the terminal. The display is similar to the non-privileged **SHOW HOSTS** display.

o **SHOW SERVER**

The **SHOW SERVER** command displays server parameters and hardware status.

Example:

```
PRIV_LOCAL> SHOW SERVER
```

Command Response:

Appendix F.8 provides an example of the **SHOW SERVER** display.

o **SHOW TERMINAL n**

This command displays terminal characteristics of any terminal 'n' (1-8) in the same format as the non-privileged **SHOW TERMINAL** command.

o STOP TEST TERMINAL (1|2|...|8)

This command terminates any test activity generated by the TEST TERMINAL n command. If the test involved the LOOPBACK function, the results of the test is printed out on the privileged terminal.

Example:

```
PRIV_LOCAL> STOP TEST TERMINAL 2
```

Command Response:

```
LOCAL -nn- Test complete, xxxxxx bytes written, xx error(s) detected
```

Error Response:

```
LOCAL -nn- Terminal n not under test
```

o TEST TERMINAL (1|2|...|8) [WIDTH nn] [COUNT nn] [LOOPBACK]

This command conducts the same terminal test as the non-privileged TEST TERMINAL command, except that any terminal may be tested. The terminal must be in Local Mode for this function to work.

If the LOOPBACK keyword is given, the external terminal loopback connector must be inserted into the specified terminal port. In this case, the test pattern is written to the terminal port, then read back and the data compared for correctness. When the test is terminated, a message indicating the number of errors, and number of bytes transferred, is displayed on the privileged terminal.

To terminate the test the STOP TEST TERMINAL command should be used.

Example:

```
PRIV_LOCAL> TEST TERMINAL 5 WIDTH 132 LOOPBACK
```

Command Response:

```
None
```

o ZERO COUNTERS

This command zeros all dynamic Ethernet and server counters contained within POSEIDON. The seconds-since-zeroed counter is also reset. This command does NOT zero the uptime or software status fields displayed in SHOW SERVER. These are zeroed by an INITIALIZE command instead.

Command Response:

None

### 3.3.4 Status And Error Messages -

The following is a full list of status and error messages, which should be self-explanatory based on previous descriptions and examples. For those messages where "(code xx)" is output, the codes are explained.

All messages have an associated MESSAGE CODE, to facilitate use in non-English speaking countries together with native-language documentation. At this time the error codes have not been defined, but are shown as "nn" in the message.

#### 3.3.4.99.1 Status Message Codes to be defined.

**Initialization Messages (with #e1):**

LOCAL -nn- Local area service start, POSEIDON Vx.y (caa.bbb)

where:

x = External Major version number

y = External Minor version number

c = internal Version Status Code as follows:

    'V' Release version

    'Z' Field test version

    'Y' Base Level version

    'X' Development version

aa = Internal software major version number (1-2 digits)

bbb = Internal software revision level (1-3 digits)

An example would be POSEIDON V1.0 (V04-000)

LOCAL -nn- Internal memory error in server parameters -  
System defaults in effect

LOCAL -nn- Internal memory error in terminal parameters -  
System defaults in effect

LOCAL -nn- This terminal may not function correctly -  
Continuing operations



**Logon Messages:**

LOCAL -nn- Local area service disabled

LOCAL -nn- Entering Local Mode on terminal n

**Connection Status Messages**

LOCAL -nn- Connection to host XXXXXX established

LOCAL -nn- Disconnected from host XXXXXX

LOCAL -nn- Connection to host XXXXXX not established  
Host rejects connection (code xx)

Code 01 - User requested disconnection  
Code 02 - Invalid Message Format Received  
Code 03 - Invalid Local Circuit Identification  
Code 04 - Invalid Remote Circuit Identification  
Code 05 - Privileged disconnect or POSEIDON initialize  
Code 09 - No host resources  
Code 10 - POSEIDON Circuit Timer too short  
Code 11 - User requested shutdown  
Code 12 - Host system shutdown in progress  
Code 13 - Fatal Communications Error (Invalid Slot)  
Code 14 - Illegal Service Class

LOCAL -nn- Connection to host XXXXXX not established  
Host does not respond to connect request

LOCAL -nn- Connection to host XXXXXX not established  
Communication error with host

LOCAL -nn- Connection to host XXXXXX terminated  
Host disconnects circuit (code xx)

Code 01 - User requested disconnection  
Code 02 - Invalid Message Format Received  
Code 03 - Invalid Local Circuit Identification  
Code 04 - Invalid Remote Circuit Identification  
Code 05 - Privileged disconnect or POSEIDON initialize  
Code 07 - Time limit expired (from host)  
Code 08 - Retransmit limit reached (from host)  
Code 09 - No host resources

Code 10 - POSEIDON Circuit Timer too short  
Code 11 - User requested shutdown  
Code 12 - Host system shutdown in progress  
Code 13 - Fatal Communications Error (Invalid Slot)  
Code 14 - Illegal Service Class  
Code 15 - Terminal not authorized to access host

LOCAL -nn- Connection to host XXXXXX terminated  
Communication error with host

LOCAL -nn- Specified terminal supports local mode

LOCAL -nn- Connection already established

LOCAL -nn- Continuing attempts to connect to host XXXXXX

Connection Status Messages (no action taken):

LOCAL -nn- Communications with host XXXXXX lost  
Continuing attempts to re-establish communication

LOCAL -nn- Communications with host XXXXXX re-established

LOCAL -nn- Logged off terminal n

User Error Messages (Command is not processed):

LOCAL -nn- Command syntax error

LOCAL -nn- Privileged command or option

LOCAL -nn- Keyword "XXXX" not known

LOCAL -nn- Value invalid or out of range, "value"

LOCAL -nn- Host XXXXXX not known

LOCAL -nn- No connection established or requested

LOCAL -nn- Terminal n is already privileged

LOCAL -nn- Terminal n not under test

LOCAL -nn- Host is not available (code xx)

Code 00 - Host status unknown

Code 03 - Host is unavailable

Code 06 - Host is unavailable (marked for delete)

LOCAL -nn- Preferred host not defined

LOCAL -nn- Parameter cannot be modified, connection established

LOCAL -nn- Parameter cannot be dynamically modified

LOCAL -nn- GDT not enabled

**Test Related Messages:**

LOCAL -nn- Test complete xxxxx bytes written, xx error(s) detected

LOCAL -nn- Loop test successful

LOCAL -nn- Loop test failure

**Pre-initialization Messages (with BEL):**

LOCAL -nn- WARNING -- Local area service ending in NNN minutes

LOCAL -nn- Local area service end

### 3.4 MICROCODE DESCRIPTION

The POSEIDON capabilities described in the previous sections utilize software that is downline-loaded following successful initialization. This section describes the ROM-based microcode which handles the downline-load operation and required low-level Ethernet maintenance services.

#### 3.4.1 Status Reporting Functions -

Upon each POSEIDON initialization, power-fail or fatal error, the ROM-based diagnostic self-test executes to verify the Poseidon hardware. There are three basic results of the self-test, which are reflected in the state of the POSEIDON front light as follows:

- o Unit is fully operational (light constantly on)
- o Unit is partially operational (light blinking)
- o Unit is not operational (light off)

The diagnostic status is reflected in the light approximately ten seconds following the initialization. If the light remains off, the unit requires service and will not function in any way.

The POSEIDON microcode provides a mechanism for reporting non-fatal errors and downline load status to the user following initialization. This is done by entering one or two carriage returns on one of the terminals connected to the unit, and observing the message(s) displayed.

The first message identifies the POSEIDON and its Ethernet address:

```
LOCAL -nn- Initializing POSEIDON "Ethernet_address"
```

If the front POSEIDON light is blinking, the following message will appear:

```
LOCAL -nn- WARNING -- Non-fatal hardware error detected  
Server status xxxx, terminal status nnn nnn nnn nnn nnn nnn nnn
```

where

xxxx is a bitmap code indicating a non-fatal error condition which affects the server as a whole. Each "x" may be a zero or one, a one meaning that the condition is true. From left to right the codes are:

- o Checksum error in server parameters, using system defaults
- o NI Port hardware error, external loopback test failed

- o NI Port hardware error, no heartbeat detected
- o Checksum error in diagnostics parameters

nnn is a bitmap code indicating a non-fatal error condition which affects a particular terminal. Each 'n' may be a zero or one, a one meaning that the condition is true. Each group of 'nnn' represents the status for terminals 1 to 8 from left to right. Within each group, the codes are (from left to right):

- o Checksum error in terminal parameters, using system defaults
- o hard error on terminal port, port disabled
- o Dynamic error on terminal port, port enabled

The microcode will similarly provide status information as to the progress of the downline load procedure. The following sequence of messages will appear in a normal load procedure:

```
LOCAL -nn- Waiting for image load  
LOCAL -nn- Loading from host "Ethernet_address"
```

Following a successful load, the operational LAT software gains control and starts terminal server operation. If an error occurs in the load procedure the following message occurs:

```
LOCAL -nn- Load failure, protocol error          -OR-  
LOCAL -nn- Load failure, timeout  
LOCAL -nn- Waiting for image load
```

If no host volunteers to load the unit, the 'waiting for image load' message will be repeated at intervals of 30 seconds, and the unit will attempt to load indefinitely. Reloads are also attempted if downline load fails.

At any time following self-test execution, and prior to the completion of downline loading, a user may request re-initialization of the unit by typing in a specific control code (control/P hex 10). However, re-initialization takes effect ONLY upon downline load failure. This prevents unauthorized users from re-initializing the unit during the normal downline load procedure. If control/P is typed, and downline load is successful, re-initialization will not occur, but may thereafter be requested using the Privileged Local Mode interface.

The Control/P must be typed after the initial carriage return for correct interpretation. This function is provided as a means to re-initialize the unit in the absence of software without removing the power cord.

### 3.4.2 Downline Load Function -

The POSEIDON microcode contains a tertiary loader program to load the entire operational software image into memory. The load procedure utilizes the standard Maintenance Operations protocol and requires that there be at least ONE active Phase IV DECnet node on the Ethernet.

The POSEIDON requests a specific load image file from the host, its name being stored in permanent memory. This image filename defaults to PS0801ENG.SYS, but may be changed by the terminal manager using the 'DEFINE SERVER SOFTWARE\_ID' command in Privileged local mode. This feature facilitates the implementation of foreign language support. Details of the downline-load function are provided in Appendix I.

If the diagnostic status reports an external loopback error condition, the downline load will not be attempted. The following message will appear instead:

```
LOCAL -nn- Image load not attempted, network communication failure
```

This message indicates that the POSEIDON has no Ethernet access, and may be caused by cabling or transceiver problems. Following this message, control/P may be entered to re-initialize the unit, and cause a subsequent downline load.

### 3.4.3 Upline Dump Function -

The POSEIDON may be requested to upline dump its memory to a host system upon a system crash. This may be specified using the SET SERVER DUMP ENABLED command in privileged mode. When enabled, and a system crash occurs (except one caused by the Watchdog timer), the POSEIDON memory will be dumped to a dump volunteer host. The following messages will be printed out on the designated CONSOLE terminal (if any):

```
LOCAL -nn- Fatal Bugcheck at xxxxxx, SP=xxxxxx, SR=xxxx, TP=xxx  
LOCAL -nn- Waiting for image dump  
LOCAL -nn- Dumping to host "Ethernet address"
```

The Fatal Bugcheck message displays the address of the instruction causing the crash, the stack pointer (SP) and Status register (SR) at that time, and the crash type (TP). The crash types are defined within the listings of the code.

#### 3.4.4 Maintenance Functions -

The POSEIDON microcode will support the following low-level maintenance functions, which are initiated from a host system:

- o Forward Message
- o Reply
- o Identify-self function
- o Read-identity function

These functions satisfy the minimum network management requirements for a DIGITAL node on the Ethernet, and are described in section 3.1.17. Note that the POSEIDON-initiated Loop requester and Read-counter functions are not supported by the microcode, but are supported by the downline-loaded operational software.

#### 3.4.5 Online Debugging Tool (ODT) -

An online debugging tool will be supplied by Diagnostic Engineering to help diagnose any system problems that may occur during POSEIDON operation. This tool is a functional subset of the IAS/RSX-11M ODT, and is described in the "POSEIDON Diagnostics Online Debugging Tool" specification. The ODT is designed to be used by Software Services, Field Service or other specialists with knowledge of the software residing in the POSEIDON.

It is NOT expected that ODT will be utilized by customers, and its operation (and the privileged mode commands that invoke it) is not described in the normal POSEIDON documentation set. It is, however, described in the POSEIDON technical manual.

Furthermore, it is expected that the ODT function will only be used when tracking down problems, and will not be enabled in the normal mode of operations. The specialist must enter the following commands from privileged local mode before ODT can be utilized:

```
PRIV_LOCAL> SET SERVER CONSOLE n  
PRIV_LOCAL> SET SERVER ODT ENABLED
```

where:

n is a POSEIDON terminal port number (1-8) that is to be used for the ODT console.

The specified terminal must be configured according to its permanent terminal parameters stored in NV RAM. When ODT is enabled, it may be activated in one of three ways:

- o Upon entering a privileged ODT command.
- o Upon a system crash (following optional Upline Dump, but prior to

self-test).

- o Upon re-initialization (following Downline Load, but prior to start of normal operations). Note: ODT will NOT be enabled after a Power-up, but after a software initialize only.

When ODT is entered, any ODT command may be given (see ODT Specification). If the 'GO' command is given with no PC, execution continues at the following places, depending on why ODT was activated:

- o Upon ODT command, or ODT breakpoint - At the next instruction
- o Upon system crash - At the ROM-based Self-test
- o Upon software initialize - At the start of normal operations

The ODT operation, SET SERVER CONSOLE and ODT commands will not be described in the normal POSEIDON documentation set. Information regarding ODT operation will be provided to Software services and Field service, and to certain customers as the need arises.

#### 4.0 PUBLICATIONS

The software publications supplied with POSEIDON are targeted for two main audiences: the Terminal User and the Terminal Manager (see Section 2.1). It is expected that these two groups of people will be located generally in the vicinity of the POSEIDON unit, and that the documentation will reside there also.

For each terminal user, a POSEIDON USER'S CARD is supplied. This card contains a summary of local mode operations and commands, and is expected to cover over 95% of the features that a non-technical terminal user would ever need.

One POSEIDON OPERATIONS GUIDE is provided, which explains all terminal server features and more detailed operations. It is expected that this document is located with the Terminal manager, also in the vicinity of the POSEIDON unit. If a terminal user has a problem (or needs more detailed information concerning operations), he/she may refer to this manual, or call the terminal manager for assistance.

One POSEIDON SOFTWARE INSTALLATION GUIDE is provided, which explains the software installation process for each type of host system on which the software is expected to reside. This manual is expected to be located in the possession of the local host system manager, and NOT be located in the area of the POSEIDON unit.

The contents of each manual is as follows:

- o POSEIDON USER'S CARD (8 supplied per POSEIDON):



- Local Mode Operation Overview
- Non-privileged Command Summary
- Status and Error Message Summary
  
- o POSEIDON OPERATIONS GUIDE (1 per POSEIDON):
  - Description of all Terminal Server features
  - Local Mode Description
  - Non-privileged command descriptions, including responses
  - Privileged command descriptions, including responses
  - Maintenance Operations
  - Basic Troubleshooting procedures
  - Status and Error Messages Description
  
- o POSEIDON SOFTWARE INSTALLATION GUIDE (1 per optional software kit)
  - Software Installation Procedures
  - Installation Verification
  - Software Update (Autopatch) Installation

Information of interest to an overall network manager, including a description of the LAT architecture, message formats and network troubleshooting procedures, is supplied in the documentation set for the LAT host support, and is not packaged with POSEIDON.

## 5.0 PACKAGING

The POSEIDON software resides on a LOAD host system, and is downline loaded via the Ethernet upon every POSEIDON initialization. When POSEIDON units are ordered, the customer/salesman should determine the number and type(s) of load host systems. With small Ethernet configurations, one or two load hosts may suffice. With larger implementations, more load hosts would speed the downline load process. A rule of thumb might be that ONE load host is required for every 10 POSEIDON units installed, plus ONE spare. A load host must be configured with Phase IV DECnet, and have a DECnet license.

When ordering POSEIDON hardware units, the appropriate POSEIDON software needs to be specified. It is also important that the LAT host software

(in the form of a host-resident driver or LAT host server) be considered at this time. For licensing purposes, the following applies:

- o ONE POSEIDON software license is supplied for each POSEIDON unit ordered, and is included in the basic cost. This license allows the execution of POSEIDON server software on the hardware unit, and comes with a 90-day warranty. The following documentation is also provided for each unit:
  - 1 POSEIDON Site Preparation and Installation Guide
  - 1 POSEIDON Operations Guide
  - 8 POSEIDON Users' Cards
- o A POSEIDON software kit may be purchased, which includes "binaries" supplied on an appropriate disk, and all software-related documentation including a SOFTWARE INSTALLATION GUIDE. This kit may be loaded onto any number of DECnet load host systems.
- o ONE LAT host software license must be purchased for each host that intends to support the POSEIDON terminal server. Right-to-copy licenses are available for this software. LAT host software and documentation must be ordered as a separate line item, and may be shipped with the POSEIDON, or ordered separately from the SDC.

## 6.0 INSTALLABILITY

The POSEIDON software is designed to be customer installable, and fully automated. The installation procedure will be initiated by one or two commands entered at the load host system console, and will be described in a separate Software Installation Guide.

All standard installation procedures for layered products (if any) will be applied.

Updates for both POSEIDON software will be supplied in Autopatch kits in the same manner as are updates for other layered products. Installation instructions are provided in the kits.

## 7.0 EASE-OF-USE

The Local Mode user interface has been designed for simplicity, and for compatibility with other DIGITAL local area terminal servers (such as Voyager). All commands are in an English-like format, without switches and other unusual punctuation. Host access is by name (rather than Ethernet-id). A two-level HELP facility is supplied, which shows all available commands, and all options for each command.

The capability exists for a Terminal Manager to define a PREFERRED or

DEDICATED HOST for each terminal, and to set up permanent terminal characteristics. In this way, a user may access a terminal without any knowledge of a Local mode interface, since the terminal will be permanently connected to a host system.

For the Local Mode user requiring more flexibility, commands exist to display a list of available hosts, set and show dynamic terminal parameters, and to connect to and disconnect from a specific host system. It is also possible to run a terminal test from a local terminal.

The Privileged Local Mode interface has been designed for simplicity, and is specialized for the POSEIDON/LAT environment. A HELP capability also exists for Privileged commands.

## 8.0 PERFORMANCE

### 8.1 Response Time

POSEIDON has been engineered as a high-performance terminal server product, able to provide NI-based terminals with the throughput and response time expected of a locally connected terminal, even under worst case conditions.

Character-echo response time is a critical performance attribute, and in the case of POSEIDON, is highly dependent on the value of the CIRCUIT TIMER. For normal interactive functions, in which the host terminal class driver echoes all input characters, the character-echo response time will average 0.5 times the circuit timer, plus a small propagation delay.

With the circuit timer set at the recommend 80 ms value, this response time is between 40 and 50 ms. Although this is numerically much slower than a direct connection (such as a D211), a 50 ms (1/20 sec) delay is not noticeable to a human operator. In effect, the "apparent" response time is the same as that of a local connection.

This response time will NOT degrade upon maximum throughput through the server. It may degrade (as would a local connection) if a host system is overloaded.

For application programs using the read-with-no-echo functions, the character echo response time will average at least 1.5 times the circuit timer, plus propagation delays plus application program delays. With the recommended circuit timer of 80 ms, this time will average at least 120 ms. For certain applications, such as EDT, which issue multiple write I/O's for each character typed, the response time may be longer.

When a character is typed on a block-mode terminal, the typed "echo" is a local echo. No host processing is involved. The response for a whole block of data sent is dependent on the application processing time and the host-POSEIDON throughput.

## 8.2 Server Throughput

Server throughput is the number of bytes that the server can process in a given amount of time, and may be expressed in terms of bytes/second. It is the GOAL of POSEIDON to be able to drive full-duplex output and input at 9600 bps (approx 960 bytes/second) on all terminals.

This performance is HIGHLY critical on various code paths within the POSEIDON software, and actual performance characteristics will be defined upon completion of this code. Current analysis suggests that this goal will be met.

POSEIDON will accept line speeds of up to 19200 bps, but will NOT support sustained input at this line speed. Terminals must not transmit more than 960 characters per second at 19200 bps, otherwise the server may saturate and data overruns may occur. In addition, even moderate bursts of 19200 bps input may adversely affect terminal output. It is therefore HIGHLY recommended that a line speed of 19200 bps be used ONLY in a human-speed input environment. Sustained output at 19200 bps is supported.

## 8.3 Ethernet Utilization

Ethernet (NI) Utilization is an important consideration for determining how many POSEIDONS, and other processors, can be supported on one Ethernet.

The nature of the LAT protocol is such that NI utilization is lowest when the number of connected hosts is small compared to the number of connected terminals, and highest when the number of connected hosts equals the number of terminals. The NI utilization is highly dependent on terminal speeds, and also somewhat dependent on the Circuit Timer value.

The following table indicates the worst-case scenario of 9600 bps full-duplex simultaneous input and output (or 19200 bps output only) with various numbers of terminals and hosts.

The "RAW DATA" utilization is simply the percentage NI usage that would be required to transfer 1920 characters/second/terminal across the Ethernet with no protocol overhead. The POSEIDON utilization includes the LAT protocol overhead, with two Circuit Timers values of 80 ms and 30ms.

The percentages represent the actual utilization divided by the theoretical maximum for the Ethernet of 1.25 Mbytes/seconds (10Mbps).

Number of Terminals	Number of Hosts	NI Utilization RAW DATA	NI Utilization 80ms	POSEIDON 30ms
1	1	0.15%	0.22%	0.32%
4	1	0.61%	0.72%	0.86%
4	4	0.61%	0.88%	1.27%
8	1	1.23%	1.40%	1.57%
8	4	1.23%	1.55%	1.99%
8	8	1.23%	1.76%	2.53%

These are the worst-case utilization requirements that may occur with one POSEIDON. In normal usage, terminal traffic will probably be intermittent, terminal speeds may be lower, and other factors combine to make the actual NI utilization much lower than indicated above.

#### 8.4 host Performance

A POSEIDON implementation has the potential of utilizing less host CPU processing than traditional asynchronous interfaces such as the DZ11. This is because in one host interrupt, an entire LAT buffer, possibly containing data for many terminals, may be serviced. The DZ11, by contrast, requires a separate interrupt for each character processed.

The actual amount of host processing depends on factors such as Circuit Timer value and I/O length. Also critical is the amount of processing per single interrupt (which is many times more than that of a DZ11 interrupt).

With these factors in mind, the minimum expected performance goal of POSEIDON (with respect to host processing) with recommended parameters is to match that of the DZ11. It is expected that under most circumstances, host CPU utilization will be less with POSEIDON than with the DZ11, especially when large amounts of terminal traffic is involved, resulting in more host compute power available for application processing. These expectations are based on an existing LAT prototype system.

Actual performance measurements will be made after implementation, so that performance characteristics may be accurately defined, and user expectations accurately set.

All performance estimates are made on the assumption that the error rate over the Ethernet is low, and that the Ethernet (and hosts) have light to moderate loads. On heavily-loaded hosts and networks, the overall response-time and throughput performance (as perceived by the user) will be worse than stated above. However, a similar performance degradation would be observed on any terminal/host system under the same circumstances.

## 9.0 RELIABILITY

Reliability is of primary importance in a product with such high visibility. An extensive internal and field test program will be undertaken prior to shipment in order to eliminate all fatal software errors, and protocol violations. Shipment will not take place if any fatal conditions or protocol violations occur without resolution. (Category 1 errors).

Category 2 errors are defined as major errors which do not cause a crash, but result in the non-functioning of major elements of the software, or cause serious performance problems. Shipment will not take place if any category 2 errors are known.

Category 3 errors are defined as minor errors, resulting in the non-functioning (or partial functioning) of minor elements of the software or errors causing minor performance degradation. Shipment will not take place with any more than two (2) such known errors.

Category 4 errors are defined as totally cosmetic errors, with no impact on functionality and performance. Shipment will not take place with more than five (5) such known errors.

Category 5 errors are suggestions and documentation errors. There may be any number of suggestions submitted, but shipment will not take place with more than five (5) known documentation errors.

Since POSEIDON contains a stand-alone software system, the following broad categories of detectable errors, and POSEIDON responses, are defined:

- o Fatal Hardware Error, determined by diagnostic self-test. The POSEIDON unit will not function, and the hardware status light will remain off. A unit replacement is required for recovery.
- o Non-fatal Hardware Error. The hardware status light on the POSEIDON will flash, and an appropriate value will be placed in the hardware status indicator. Hardware status may be displayed using the privileged "SHOW SERVER" command. The unit will attempt to function normally with a non-fatal hardware error.
- o Fatal Software Error, caused by a fatal software bug or hardware error in server. A crash routine will place a value in the software status indicator, optionally upline dump the POSEIDON memory, then initialize the server. This value may be displayed using the privileged "SHOW SERVER" command. If the software error was caused by a fatal hardware error, the initialization will be unsuccessful, and the POSEIDON unit will not function.
- o LAL Protocol Error, caused by a software bug in server or host. An error message will be displayed on all affected terminals, the virtual circuit will be placed into the halt state, and all terminals will be disconnected. If Autoconnect is enabled, attempts to reconnect to the same (or a different group) host will be made,

otherwise Local Mode will be entered.

- o LAT Timeout Error, caused by a problem in a host system. After 10 unsuccessful retries, an error message will be displayed to all affected terminals.

If AUTOCONNECT is disabled, a message is displayed indicating that communication with the host is lost. However, POSEIDON will attempt to re-establish communications, unless and until a DISCONNECT command is given.

If AUTOCONNECT is enabled, the connection is taken down, and a new connect request is issued. If the specified host name is a GROUP name, connection to another host in the group is attempted. If the specified host name is a unique name, connection to the same host is attempted. The autoconnect mechanism may be stopped by entering local mode.

- o User Input Error, caused by a user entering invalid input in either Local or Console mode. An error message is printed out, and the entire command ignored.
- o Data Overflow Error, caused by more characters being input than can be accommodated in a LAT buffer. This error can only occur if input flow control is disabled, or if the terminal has ignored the XOFF character sent to it when the buffer was full. The character is discarded, and optionally a BEL (beep) code is output to the terminal.

## 10.0 MAINTAINABILITY

Maintainability of the POSEIDON software will be enhanced by the following provisions:

- o The POSEIDON Software Installation Guide will describe how to install updates of the software via the Autopatch mechanism. It will also briefly reference the VMS/RSX EDT utility (described in the operating system documentation), which may be used for updating of the POSEIDON software image by Software Services or the customer. Patches may be supplied by telephone, or through publications such as the Small Buffer.
- o Updates will be supplied in standard Autopatch kits for layered products. The release of the Autopatch kit will be controlled by the operating system. The entire poseidon load image will be replaced by Autopatch. This will almost certainly involve just one file.
- o The Server Software will be modularized, with clearly defined interfaces. Modules will have clearly defined areas of interest, and will not perform tasks outside of those areas of interest. All

- modules and routines will have their functions defined in block comments prior to the actual code.
- o Microcode ODT will be available, and this may be enabled from the privileged terminal. On-site personnel may utilize this ODT capability, or it may be utilized remotely over the telephone (for the modem control version of Poseidon). The ODT capability will allow examination/ modification of memory and setting of breakpoints.
  - o An Upline Dump capability will be provided, and may be enabled from the privileged terminal. The dump will occur upon any POSEIDON system crash, except that caused by the hardware watchdog sanity timer. This dump may then be later examined to determine the cause of the crash. A dump formatter program is being considered for release at some time following the initial POSEIDON release, and will be implemented on a time-available basis.
  - o Non-fatal error conditions will be counted, and displayable using privileged local mode commands.
  - o The Server Software will be completely commented, to current software standards, and all documentation conventions will be followed. Following implementation, a maintenance guide will be written explaining Data structures, logic flow, error handling etc. This will be compiled from existing design specifications, comments in the code, and new descriptions.

## 11.0 MAINTENANCE (PRELIMINARY)

### 11.0.99.1 Maintenance: Final strategy to be defined following Phase 1.

Software maintenance for POSEIDON will be performed by the Distributed Systems software maintenance group. Customers may report problems via SPR service or through a telephone hotline. Customers and/or Software Services may utilize the ODT interface to more specifically diagnose problems. Use of this tool will be co-ordinated by the development/maintenance team in Software Engineering. It is NOT a goal for Software Services or the customer to independently utilize ODT beyond obtaining a register printout or memory dump following a system crash. Neither software services nor the customer will normally have access to the source code. The software maintenance team may utilize the ODT interface directly through a modem line for the modem control version of Poseidon.

It is expected that the maintenance effort for POSEIDON will require 0.5 persons for the first full year from FCS for POSEIDON software.

The maintenance group will publish patches as necessary in the following publications:



- o Small Buffer (for VMS and RSX load host systems)
- o Large Buffer (for TOPS-20 load host systems)

Maintenance releases will be made, if needed, at quarterly intervals for the first year following FCS. Patches will be published in weekly/monthly articles for more immediate application. The utility 'EDT' may be used to apply patches.

Patches applied to POSEIDON will have to be co-ordinated with patches for the LAT host support. It is therefore planned to ship matching patches for both sides of the protocol.

Major enhancements for the POSEIDON product have not been defined, but it is expected that enhancements will occur over the life of the product.

## 12.0 COMPATIBILITY

POSEIDON, and the software which executes upon it, is a new product. Its function is to act as a terminal server on an Ethernet local area network.

The PLUTO-based 'Voyager' product is a 32-terminal, DECnet-compatible terminal server on an Ethernet local area network. To facilitate the possible use of both servers in the same environment, the non-privileged POSEIDON Local Mode interface and Voyager are compatible.

The POSEIDON privileged mode interface, being heavily involved with the LAT architecture and having its own maintenance functions, has its own interface. This interface is patterned after the DECnet Network Control Program (NCP), although by necessity there are many differences. LAT-related privileged commands are compatible with other LAT-based terminal servers.

POSEIDON software adheres to the Local Area Transport (LAT) architecture specification, and is designed to operate with any system that supports the host implementation of LAT, with the Interactive Terminal service class enabled.

POSEIDON adheres to all requirements of the Ethernet version 2.0 specification, and implements the REPLY and FORWARD MESSAGE network management functions defined therein. The Ethernet physical link and data link layers are performed exclusively by POSEIDON hardware.

POSEIDON adheres to all requirements of the DIGITAL NI node architecture, and supports the LOOP SERVER, IDENTIFY-SELF, READ-IDENTITY and READ COUNTERS functions. POSEIDON also implements the optional LOOP REQUESTOR functions, since network management is locally initiated.

Except for the downline load/upline dump functions, POSEIDON does not interface with DECnet (or any other network protocol), but may function in both DECnet and non-DECnet host environments. POSEIDON is compatible

with DECnet-supplied host names, and DECnet-modified Ethernet addresses. The LAT software in the host system is responsible for reading the DECnet host name and Ethernet address, and responsible for sharing the NI port driver with DECnet.

### 13.0 EVOLVABILITY

The current plans are to ship POSEIDON software as an English language product. Software engineering does not intend to implement foreign language support, but has provided the hooks to make this possible. In particular, all hard-coded English-text has been consolidated in one section of the program, with a conditional assembly parameter. Space has been reserved for an increase in code size that might be experienced when a language conversion takes place. In addition, the capability exists to define an alternate load image file name and the format of the existing name takes into account the language used.

If a language which requires an 8-bit character set (in local mode) is to be implemented, certain sections of the Terminal Port module will require modification. These sections have also be identified by (another) conditional assembly parameter.

The modem control version of Poseidon has already been designed to be used with most european modems, as per DEC standard 052.

The POSEIDON code was modularized for possible implementation on future products. The Protocol and User Interface module were made (virtually) independent of the hardware environment, except for the CPU type. The terminal port module and NI port module are hardware dependent, but their interfaces with other modules are not.

### 14.0 COSTS

POSEIDON Transfer costs are based upon the cost of hardware and manufacturing. The cost of producing software documentation is included, but the software development costs are not. Software media is an optional item, which is ordered as a line item (at media cost).

Excluding the software media cost, the POSEIDON will transfer at a price of about \$500 for the non-modem version. The modem control version will transfer at about \$600.

## 15.0 TIMELINESS, CONSTRAINTS AND TRADE-OFFS

The POSEIDON product must be ready to ship in Q1 1985. The software development schedule, risks, dependencies and requirements associated with the development effort are defined in the POSEIDON Software Development plan.

This section defines constraints and trade-offs that may affect implementation of features/performance that have been described in this document.

The main constraints affecting functionality concern memory utilization and execution speed of the POSEIDON software.

Preliminary analysis has been performed on execution time based on an 7.35 MHz MCG8000 processor, which indicates that the performance goal of 9600 bps full-duplex will be met, if an appropriate Circuit Timer (80 ms) value is specified. Use of shorter circuit timers, exceptionally heavily Ethernet traffic and other considerations may affect this throughput goal. Performance will be measured following implementation, and supplied with the final documentation. No dropping of functionality is planned to enhance performance.

The read-only memory available for the POSEIDON initialization microcode has been limited to 6 KB, and the current estimate is 6 KB. The 6 KB limit must not be exceeded. The following is a list of trade-offs for the POSEIDON microcode, if the memory allocation is not sufficient:

- o Diagnostic Status reporting mechanism will be abbreviated. (Message codes instead of English text).
- o Control/P re-initialize function will be eliminated.
- o Autobaud function will be eliminated, and replaced with output only with terminal parameters stored in NV RAM.
- o Tertiary Loader will be replaced with a Primary Loader (or secondary loader).

The downline loaded software must fit into the 32 KB allowance for the non-modem control version of POSEIDON. Additional Code and RAM estimates for modem POSEIDON and reverse POSEIDON must not exceed 12 KB. The current estimate for the non-modem control version of POSEIDON is 26.25 KB. The following features will be traded off to ensure adherence to the 32 KB limit:

- o The undocumented MONITOR command (which presents a continuous SHOW display for VT100-compatible terminals) would be dropped.
- o Local Mode support for VT100 escape sequences, and terminal type "ANSI" would be dropped.
- o Full two-level HELP facility (compatible with VAX, RSX etc) would be replaced by a HELP facility containing the following capabilities:

HELP  
HELP PRIVILEGED  
HELP TERMINAL PARAMETERS  
HELP SERVER PARAMETERS

o Specification of Server Name and Location would be dropped.

APPENDIX A

DRAFT SOFTWARE PRODUCT DESCRIPTION

PRODUCT NAME: POSEIDON Version 1.0  
Ethernet Terminal Server

DESCRIPTION:

POSEIDON is an Ethernet-based Terminal Server product which allows up to eight interactive terminal users to communicate with host systems on the Ethernet. The software is downline loaded into the POSEIDON Terminal server hardware from a VAX/VMS system running DECnet/VAX. When loaded, terminal users may access Ethernet-based host systems with VAX-11 LAT support.

Features:

A LOCAL MODE interface is provided, allowing a Terminal User to:

- o CONNECT to any authorized host system on the Ethernet
- o Display a list of available hosts
- o SET and SHOW terminal parameters, and permanently retain them
- o TEST the terminal for correct operation

A privileged LOCAL MODE interface is provided, allowing a Terminal Manager to:

- o CONNECT any terminal to any authorized host system on the Ethernet
- o SET and SHOW any terminal's parameters, and permanently retain them
- o SET and SHOW the Terminal Server parameters
- o SHOW Terminal Server characteristics and counters
- o Perform Ethernet maintenance functions

A HOST MODE interface is provided, whereby a Terminal User can communicate with an authorized host system.

Support is provided for the following DIGITAL terminals using the EIA RS-232C CCITT V.24 serial line interface:

VT100, VT101, VT102, VT125, VT131, VT180  
VT50, VT52, VT55, VT62, G1G1  
LA12, LA34, LA36, LA38, LA50, LA100, LA120, LA180  
VT200, VT220, VT240

Support is provided for the following terminals, when in terminal emulation mode:

RAINBOW-100, DECmate-II, PRG-325/350

Supported line speeds are from 50 to 19200 bps in Line Mode, and from 50 to 9600 in Block Mode (VT125/G1G1).

The POSEIDON Terminal Server implements the Local Area Transport (LAT) architecture between server and host. LAT support is also required on the host systems to be accessed.

Other features include:

- o Logon facility, which may be optionally enabled on a per-line basis, provides security against unauthorized access to any POSEIDON functions
- o Full XOFF/XON flow control between terminal and Terminal Server, which may be dynamically enabled/disabled by the user
- o Automatic terminal speed detection
- o Automatic CONNECT to a DEDICATED or PREFERRED host system, the name of which may be stored permanently
- o Access Control, limiting accessibility of certain hosts to certain terminals including 'custom' display of available hosts
- o Functions to distribute terminal connections across hosts within VAX clusters

SOURCE CODE INFORMATION:

No source code is provided

MINIMUM HARDWARE REQUIRED:

POSEIDON Terminal Server

Any VAX-11/730, VAX-11/750, VAX-11/780 and VAX-11/782 system with a DEUNA Ethernet to UNIEUS adapter.

OPTIONAL HARDWARE:

None

PREREQUISITE SOFTWARE:

For the POSEIDON Terminal Server: None

For the VAX/VMS system that is to support cownline loading:

VAX/VMS V4.0  
DECnet-VAX V3.0

For the VAX/VMS system that is to support Terminal Server Operations:

VAX/VMS V4.0  
VAX-11 LAT V1.0

OPTIONAL SOFTWARE:

None

TRAINING CREDITS:

None

SUPPORT CATEGORY:

DIGITAL SUPPORTED  
POSEIDON V1.0 is a DIGITAL supported software product

SOFTWARE INSTALLATION:

CUSTOMER INSTALLED  
POSEIDON V1.0 is engineered to be installed by the Customer.

ORDERING INFORMATION:

All binary licensed software, including any subsequent updates, is furnished under the licensing provisions of DIGITAL's Standard Terms and Conditions of Sale, which provide in part that the software and any part thereof be used on only the single CPU for which it is intended, and may be copied, in whole or in part (with the proper inclusion of the DIGITAL copyright notice and any DIGITAL propriety notices on the software) only for use on such CPU.

Options with no support services are only available after the purchase of one supported license.

A single-use, license-only option is a license to copy the software previously obtained under license.

The following key (G,Y,Z) represents the distribution media for the product and must be specified at the end of the order number, e/g/. QExxx-AY = binaries on RX01 Floppy Diskette.

G = T058 DECTape II Cartridge  
Y = RX01 floppy Diskette  
Z = No hardware Dependency

See Table I for available options

TABLE I

Options	System		
Single-use license, binaries,	VAX-11/730	VAX-11/750	VAX-11/780
Documentation, Support Svcs	QC-xxx-AG	QE-xxx-AG	QE-xxx-AY
Single-use license, no binaries,	QC-xxx-DZ	QE-xxx-DZ	QE-xxx-DZ
no support. Documentation			

ADDITIONAL SERVICES:

TBS



APPENLIX B

POSEIDON ADDRESS SPACE

1C0040	+	-----	+
		Ethernet Address (ROM)	
1C0000	+	-----	+
		:	:
		:	:
188000	+	-----	+
		Initialization	
		Microcode (ROM)	
			6 K
182800	+	-----	+
		Diagnostic Software	
		Area (ROM)	
			10 K
180000	+	-----	+
		:	:
		:	:
108xxx	+	-----	+
		NI Chip I/O Page	
108000	+	-----	+
		:	:
		:	:
100080	+	-----	+
		DUART I/O Page	
100000	+	-----	+
		:	:
		:	:
80800	+	-----	+
		Non-volatile Memory	
		Parameters	
			0.5 K
80000	+	-----	+
		:	:
		:	:
20000	+	-----	+
		Random Access Memory	
		RAM Area	
		(Details on Next Page)	
			127.5 K
200	+	-----	+
		Vectors	
			0.5 K
0	+	-----	+

POSEIDON MEMORY LAYOUT

20000	+	-----	+
		Initialization RAM	128 b
1FF80	+	-----	+
		CRASH/TRAP Area	372 b
1FE00	+	-----	+
		Stack	
			3596 b
1F000	+	-----	+
		Reserved for future implementations	
			12.0 K
1C000	+	-----	+
		High Pool Area for Host Data Base and Dynamic Data	
			34.0 K
13800	+	-----	+
		Low Pool Area for LAT Control blocks, Transmit Buffers	
			14.0 K
10000	+	-----	+
		Receive Buffer Area 20 Buffers @ 1536 each	
			30.0 K
8800	+	-----	+
		Miscellaneous Data	1.5 K
8200	+	-----	+
		LAT Software and Pure Data Area	
			32.0 K
200	+	-----	+
		(Vectors)	0.5 K
	+	-----	+

NON-VOLATILE MEMORY LAYOUT

Circuit Timer	1 byte	000
Keep_Alive Timer	1 byte	001
Server Number	2 bytes	002
Server Type	2 bytes	004
Server Name Length	1 byte	006
Server Name	16 bytes	007
Location Length	1 byte	017
Location	16 bytes	018
Privileged Password Length	1 byte	028
Privileged Password	6 bytes	029
Logon Password Length	1 byte	02F
Logon Password	6 bytes	030
Server Flags	1 byte	036
Spare	13 bytes	037
Checksum	1 bytes	044
Hardware Status	1 byte	045
Diagnostic Test Byte	1 byte	046
Spare	2 bytes	047
Checksum	1 byte	04F
Terminal Parameters, Terminal 1	54 bytes	050
Terminal Parameters, Terminal 2	54 bytes	086
Terminal Parameters, Terminal 3	54 bytes	0BC
Terminal Parameters, Terminal 4	54 bytes	0F2
Terminal Parameters, Terminal 5	54 bytes	128
Terminal Parameters, Terminal 6	54 bytes	15E
Terminal Parameters, Terminal 7	54 bytes	194
Terminal Parameters, Terminal 8	54 bytes	1CA
GRAND TOTAL:	512 bytes	200

APPENDIX C  
 CIRCUIT STATE TABLES

HALT STATE:	Event_action	Next_state
- Circuit_timer_event	CRASH	HALT
- Response_timeout_event	CRASH	HALT
- Keep_alive_timer_event	IGNORE	HALT
- Resend_limit_event	CRASH	HALT
- Start_message_received	Send_stop_message	HALT
- Stop_message_received	IGNORE	HALT
- Run_message_received	Send_stop_message	HALT
- Invalid_message_received	If stop_message, ignore else send_stop_message	HALT
- Illegal_message_received	Send_stop_message	HALT
- Data_waiting	CRASH	HALT
- Circuit_connect	Send_start_message	START
- Circuit_disconnect	CRASH	HALT

START STATE:	Event_actions	Next_state
- Circuit_timer_event	IGNORE	START
- Response_timeout_event	Re_send_start_message	START
- Keep_alive_timer_event	IGNORE	START
- Resend_limit_event	Delete_terminals, delete_circuit	HALT
- Start_message_received	start_circuit	RUN
- Stop_message_received	Delete_terminals, delete_circuit	HALT
- Run_message_received	Delete_terminals, delete_circuit	HALT
- Invalid_message_received	Delete_terminals, delete_circuit	HALT
- Illegal_message_received	Delete_terminals, delete_circuit	HALT
- Data_waiting	IGNORE	START
- Circuit_connect	CRASH	HALT
- Circuit_disconnect	Send_stop_message, delete_circuit	HALT

WAIT STATE:	Event_actions	Next_state
- Circuit_timer_event	None	WAIT
- Response_timeout_event	Re_send_run_message	WAIT
- Keep_alive_timer_event	None	RUN
- Resend_limit_event	warn_users	WAIT
- Start_message_received	None	RUN
- Stop_message_received	Delete_terminals, delete_cricuit	HALT
- Run_message_received	Process_run_message, If data_flag_set else	RUN WAIT
- Invalid_message_received	None	RUN
- Illegal_message_received	Send_stop_message, delete_terminals, delete_circuit	HALT
- Data_waiting	None	RUN
- Circuit_connect	CRASH	HALT
- Circuit_disconnect	Send_stop_message, delete_circuit	HALT

RUN STATE:	Event_actions	Next_state
- Circuit_timer_event	Send_run_message, If data_stili_waiting eise.....	RUN WAIT
- Response_timeout_event	Re_send_run_message	RUN
- Keep_alive_timer_event	IGNORE	RUN
- Resend_limit_event	warn_users	RUN
- Start_message_received	None	RUN
- Stop_message_received	Delete_terminals, delete_circuit	HALT
- Run_message_received	Process_run_message	RUN
- Invalid_message_received	None	RUN
- Illegal_message_received	Send_stop_message, delete terminals, delete_circuit	HALT
- Data_waiting	None	RUN
- Circuit_connect	CRASH	HALT
- Circuit_disconnect	Send_stop_message, delete_circuit	HALT

APPENDIX D  
 SLOT STATE TABLES

HALT STATE:	Event_actions	Next_state
- Connect_request	Create_terminal, send_start_slot	START
- Start_slot_received	Send_stop_slot	HALT
- Stop_slot_received	None	HALT
- Reject_slot_received	None	HALT
- Attention_slot_received	None	HALT
- Invalid_slot_received	None	HALT
- Transmit_slot_processed	Delete_terminal	HALT
- Disconnect_request	CRASH	HALT

START STATE:	Event_actions	Next_state
- Connect_request	CRASH	HALT
- Start_slot_received	Start_terminal	RUN
- Stop_slot_received	None	START
- Reject_slot_received	Delete_terminal	HALT
- Attention_slot_received	None	START
- Invalid_slot_received	None	START
- Transmit_slot_processed	None	START
- Disconnect_request	None	HALT

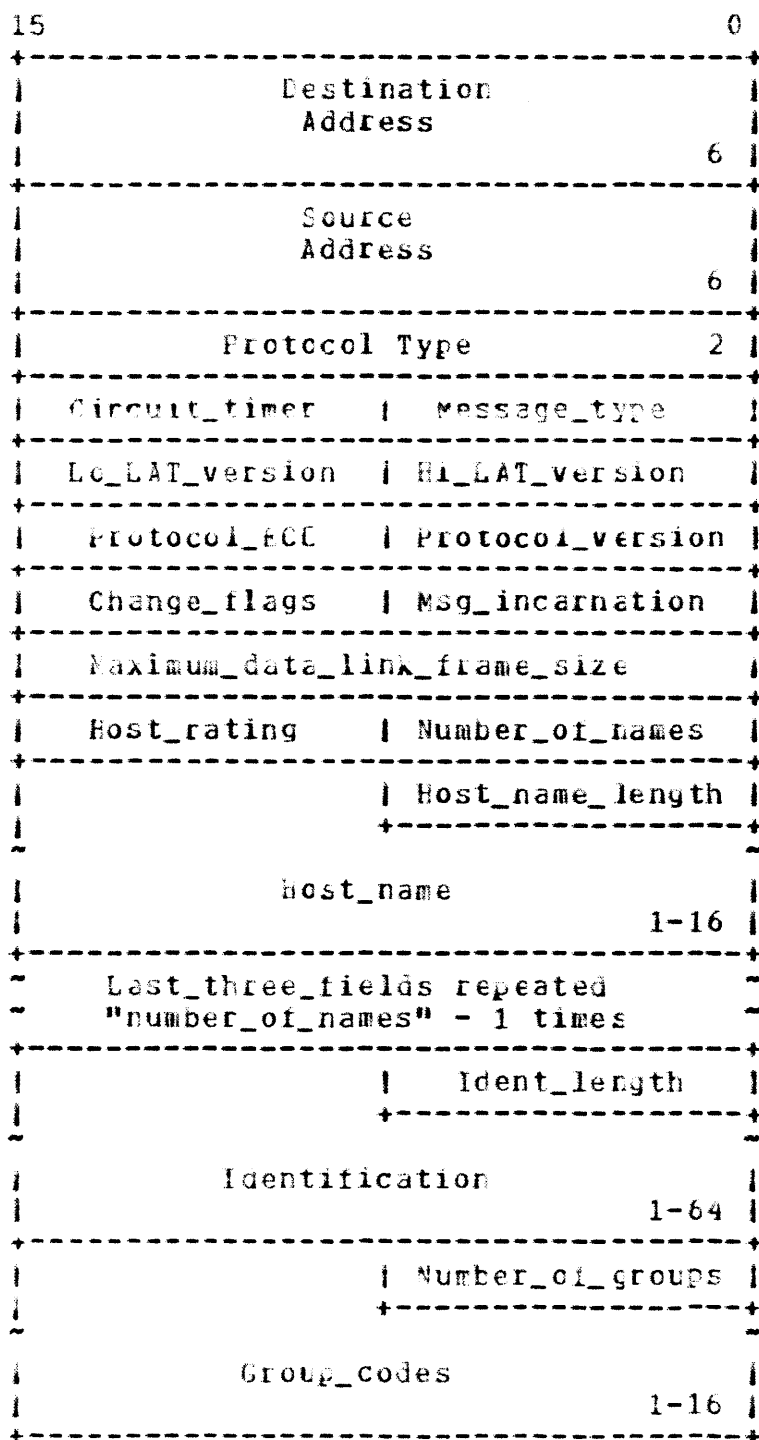
RUN STATE:	Event_actions	Next_state
- Connect_request	CRASH	HALT
- Start_slot_received	None	RUN
- Stop_slot_received	Delete_terminal	HALT
- Reject_slot_received	None	RUN
- Attention_slot_received	Process_attention_slot	RUN
- Invalid_slot_received	Send_stop_slot	HALT
- Transmit_slot_processed	None	RUN
- Disconnect_request	Send_stop_slot	HALT

APPENDIX E

MESSAGE FORMATS

There are five types of messages exchanged between server and host: CONFIGURATION, PATCH, START, RUN and STOP. Formats are shown below:

E.1 CONFIGURATION Message Format:



Continued.....

Continued.....

	Number_services	
	+	+
	Service_classes	
	1-255	
+	+	+







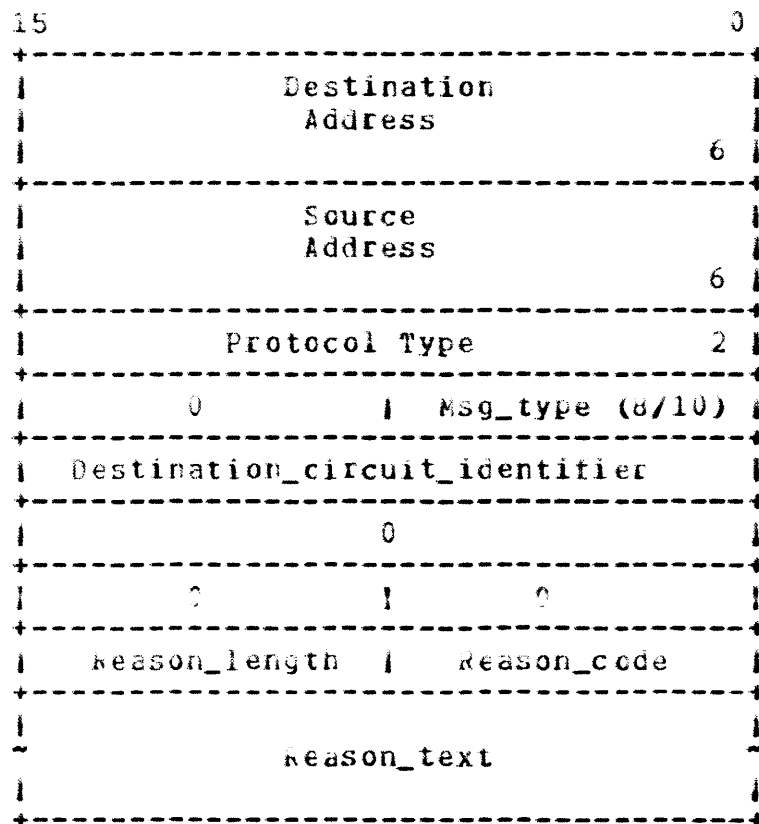
E.5 RUN MESSAGE, SLOT FORMATS

Start Slot		Data_a Slot		Stop/Reject Slot	
7	0	7	0	7	0
Dest_slot_ident	Dest_slot_ident	Dest_slot_ident	Dest_slot_ident	Dest_slot_ident	Dest_slot_ident
Source_slot_ident	Source_slot_ident	Source_slot_ident	Source_slot_ident	Source_slot_ident	Source_slot_ident
Byte_count	Byte_count	Byte_count	Byte_count	Byte_count	Byte_count
Type 9   Credits	Type 0   Credits	Type 0   Credits	Type 0   Credits	Type N   Reason	Type N   Reason
Service_class 1					
Attention_slot_size	Slot_data	Slot_data	Slot_data		
Data_b_slot_size	0-255	0-255	0-255		
Data_a_slot_size					

N=12 Stop Slot  
 N=13 Reject Slot

Data_b_slot		Attention_slot		Credit_withdrawal_slot	
7	0	7	0	7	0
Dest_slot_ident	Dest_slot_ident	Dest_slot_ident	Dest_slot_ident	Dest_slot_ident	Dest_slot_ident
Source_slot_ident	Source_slot_ident	Source_slot_ident	Source_slot_ident	Source_slot_ident	Source_slot_ident
Byte_count	Byte_count	Byte_count	Byte_count	Byte_count	Byte_count
Type 10   Credits	Type 11   0	Type 11   0	Type 11   0	Type 15   Credits	Type 15   Credits
Control_flags	Control_flags	Control_flags	Control_flags		
Output_XOFF_char					
Output_XON_char					
Input_XOFF_char					
Input_XON_char					

E.6 STOP Message Format:



APPENDIX F  
SHOW DISPLAY FORMATS

Non-privileged:

F.1 SHOW CONNECTS

Term: 0 R\_BAILEY  
Host: DELPHI VAX/VMS Development System

F.2 SHOW HOSTS

Host Name	Status	Identification
VMS_COMPUTER.....	* GROUP *	
DELPHI.....	Reachable	32-bit Advanced Development system
STAR.....	Unreachable	VAX/VMS Development
KERNIT.....	Reachable	
ALIEN.....	Overdue	RSX-11M Development System
ELROND.....	Unreachable	RSX-11M-PLUS Development System
SMAUG.....	Reachable	Distributed Systems Software Development
GRC.....	Reachable	Distributed Systems Engineering
EXODUS.....	Reachable	

F.3 SHOW HOST ELROND

ELROND..... Reachable Rating: 25 Connected Terminals: 2  
RSX-11M-PLUS Development System -- Distributed Systems Software Engineering

Seconds since zeroed:	277182	Messages Received:	17872872
Messages Transmitted:	187902827	Duplicates Received:	1127
Messages Re-transmitted:	2891	Illegal Messages Rcv'd:	1
		Illegal Slots Rcv'd:	2

F.4 SHOW TERMINAL

Term: 0 R_BAILEY (R_BAILEY)		
Access: R/W (R/W)	I/P Speed: 9600 (9600)	I/P Flow Ctl: ENA (ENA)
Type: ANSI (ANSI)	O/P Speed: 9600 (9600)	O/P Flow Ctl: ENA (ENA)
Autoconnect: ENA (ENA)	Char Size: 8 (8)	Framing Errors: 0
Mode Char: BRK (BRK)	Parity: NONE (NONE)	Parity Errors: 0
Loss Not'n: PNA (ENA)	Stop Bits: 2 (2)	Overrun Errors: 0

Current host: NONE  
Preferred Host: SMAUG (SMAUG-Dedicated)

Privileged:

F.5 SHOW ALL CONNECTS

```
Term: 0   B_MANN
Host:     DELPHI           VAX/VMS Development System

Term: 1   D_GATTON
Host:     * LOCAL *

Term: 2   R_GRUDA
Host:     ORC             Distributed Systems Engineering

Term: 3   B_KELLY
Host:     * LOCAL *      etc etc
```

F.6 SHOW COUNTERS

\* ETHERNET COUNTERS \*

Seconds since zeroed:	1223	Excessive collisions:	0
Bytes Received:	1728681	Carrier Check failure:	0
Bytes Sent:	789753	Frame too long:	0
Frames Received:	12891	heartbeat absent:	0
Frames Sent:	11627	Late collision:	0
Multicast Bytes Rcv'd:	1781	Data overrun:	0
Multicast Bytes Sent:	0	Block check error:	0
Multicast Frames Rcv'd:	178	Framing error:	0
Multicast Frames Sent:	0	Data overrun:	0
Frames sent, deferred:	12	System buffer unavailable:	0
Frames sent, 1 collision:	1	User buffer unavailable:	0
Frames sent, 2+ collisions:	0		

\* SERVER COUNTERS \*

Messages Received:	17872872	Duplicates Received:	1127
Messages Transmitted:	187902827	Illegal Messages Rcv'd:	1
Messages Re-transmitted:	2891	Illegal Slots Rcv'd:	2

F.7 SHOW ALL HOSTS

Same as SHOW HOSTS, except that All hosts in the data base are shown (not just authorized hosts)

F.8 SHOW SERVER

POSEIDON	Software V01-001	Microcode V01-001	Diagnostics V01-001
Address:	AA-9E-00-49-F1-00	Server Status:	0000
Name:	Marketing Pod	Terminal Status:	000 000 000 000 000 000 000 000
Location:	BLDNG 4, SECT	Hardware Status:	F0
Number:	175	Uptime (seconds):	192020
Circuit Timer:	080 (080)	Software Status:	1FD2-2700-1FD6C
Keepalive Timer:	030 (030)	Dump Host:	A0-12-00-1A-25-01

F.9 SHOW TERMINAL n

same as SHOW TERMINAL, except that terminal n's parameters are displayed

APPENDIX G  
HELP DISPLAY FORMATS

G.1 Non-privileged HELP Display

LOCAL> HELP

The following commands are available:

CONNECT	LOGOFF	SHOW
DEFINE	RESUME	TEST
DISCONNECT	SET	

For more information on a given command, type HELP command.

G.2 Privileged HELP Display

PRIV\_LOCAL> HELP

CONNECT	LOGOFF	SHOW
DEFINE	LOOP	STOP
DISCONNECT	RESUME	TEST
INITIALIZE	SET	ZERO

For more information on a given command, type HELP command.

G.3 Command HELP Displays

- To be provided, following initial documentation release.



APPENDIX H

ERROR PROCESSING SUMMARY

- o Fatal Hardware Error -- Alert users, crash system, invoke self-test
- o Fatal Software Error -- Alert users, crash system, invoke self-test
- o Ethernet Transmit Error (RTTY) -- Count error, retry 10 times, then alert users
- o Ethernet Receive Error (CRC) -- Count error, and ignore message
- o Ethernet Heartbeat Error -- If diagnosed at self-test, ignore else count error and attempt to continue (higher level protocol will alert users etc)
- o Other Ethernet Errors -- Define into classes:
  - Fatal hardware Error - Alert users, crash system, invoke test
  - Network Error on Transmit - Count error, retry up to 10 times, then alert users
  - Network Error on Receive - Count error, ignore message and continue
  - Miscellaneous non-fatal error - Count error and continue
- o UART parity/overflow/framing error - Count error, ignore character and continue. Error is not reported to host:
  - o human user should re-type character
  - o Non-human input must have higher-level protocol with data verification, and retry operation upon error
- o NV RAM checksum error -- Alert users, use system default parameters.

- o Host message timeout -- Retransmit last message 10 times, then alert users. If autoconnect enabled, attempt reconnection to host
  
- o Illegal host message -- Take down virtual circuit, and alert users. If autoconnect enabled, attempt reconnection to host
  
- o User input error in Local mode -- Ignore input and issue error message
  
- o 10-second watchdog timer expires (hardware) -- Simulate power-fail and invoke self-test

## APPENDIX I

### DOWNLINE LOAD PROCESSING

POSEIDON software is downline loaded into the Terminal Server hardware utilizing the standard Maintenance Operations protocol (MCP). The POSEIDON Downline load procedure incorporates a ROM-based TERTIARY LOADER, which requests the POSEIDON software image via the SOFTWARE\_ID field in a REQUEST PROGRAM message.

The load process contains the following steps:

- o Upon successful self-test, a REQUEST PROGRAM message, specifying file PS0801ENG.SYS as the SOFTWARE\_ID, is sent to the LOAD ASSISTANCE volunteer multicast address.
- o Hosts systems that support this message will read the SOFTWARE\_ID field, and WITHOUT ACCESSING A DECnet DATABASE, will attempt to locate the file under the system load default directory. For VAX/VMS, this is SYS\$SYSTEM:PS0801ENG.SYS. If the host finds the file, and wishes to volunteer load assistance, it sends an ASSISTANCE VOLUNTEER message to the requesting POSEIDON. Many load hosts may volunteer.
- o The POSEIDON will then receive one or more ASSISTANCE VOLUNTEER messages. It selects the FIRST message, then sends a REQUEST PROGRAM message again, addressed to the selected load volunteer.
- o The load host then receives a REQUEST PROGRAM addressed specifically to it, and initiates loading. It sends a MEMORY LOAD message (containing the first record of the POSEIDON software image) to the POSEIDON.
- o Upon each receipt of an in-sequence memory load record, POSEIDON loads memory then issues a REQUEST MEMORY LOAD message.
- o When the host receives a REQUEST MEMORY LOAD message, it sends the next record of the POSEIDON software in a MEMORY LOAD message, and so on until all records have been sent. At this point, the host sends a dummy PARAMETER LOAD WITH TRANSFER ADDRESS record to the POSEIDON.
- o Upon receipt of a PARAMETER LOAD WITH TRANSFER ADDRESS, POSEIDON acknowledges with a final REQUEST MEMORY LOAD, then starts the software.
- o When the host receives the final REQUEST MEMORY LOAD message, it terminates the load operation.

## APPENDIX J

### UPLINE DUMP PROCESSING

Upon system crash, the POSEIDON memory image may be upline dumped to a host processor. This process utilizes the standard Maintenance Operations protocol (MOP).

The dump process contains the following steps:

- o Upon crash, a REQUEST DUMP SERVICE message, specifying file PS0801ENG.IMG as the SOFTWARE\_ID, is sent the host system that downline loaded the software into the POSEIDON. If this host chooses to service the dump request, it issues a REQUEST MEMORY DUMP message to the POSEIDON, and the next three steps are eliminated.
- o If the load host does not respond to the dump request within 10 seconds, POSEIDON will issue a REQUEST DUMP SERVICE message to the LOAD ASSISTANCE volunteer multicast address.
- o Hosts systems that support this message will read the SOFTWARE\_ID field, and WITHOUT ACCESSING A DECnet DATABASE, will attempt to verify whether they support dump service. If the host wishes to volunteer dump assistance, it sends an ASSISTANCE VOLUNTEER message to the requesting POSEIDON. Many dump hosts may volunteer.
- o The POSEIDON will then receive one or more ASSISTANCE VOLUNTEER messages. It selects the FIRST message, then sends a REQUEST DUMP SERVICE message again, addressed to the selected load volunteer.
- o The dump host then receives a REQUEST DUMP SERVICE addressed specifically to it, and initiates dumping. It sends a REQUEST MEMORY DUMP message to the POSEIDON.
- o Upon each receipt of an in-sequence REQUEST MEMORY DUMP, POSEIDON issues a MEMORY DUMP message, containing image data for the next section of memory to be dumped. All of POSEIDON memory, including code, is dumped.
- o When the host receives a MEMORY DUMP message, it stores the image in the next record of the POSEIDON dump file, then sends another REQUEST MEMORY DUMP record to the POSEIDON.
- o This continues until the POSEIDON runs out of memory to dump, at which time it sends a DUMP COMPLETE message to the host. At this point, the POSEIDON will either break-into UOI for post-dump analysis (if enabled), or start the diagnostic self-test.

## APPENDIX K

### HARDWARE REQUIREMENTS

- o 68000 microprocessor (10 MHz), which effectively runs at 7.35 MHz. Clock period is thus 136 nanoseconds.
- o wait states are implemented for accesses to ROM and NV-RAM only. RAM, UARTS and LANCE accesses involve no wait states.
- o Ethernet DMA transfer rate is one word per 1.6 microseconds (10 Mbps).
- o worst-case LANCE memory cycle time is 800 ns per word, with 680 ns bus arbitration per 8 words in burst mode. For the last 272 ns of the bus arbitration, the CPU may not access the bus. Therefore during DMA, software effectively may utilize only 47.88% of the CPU.
- o It is assumed that the UARTS handle 19200 full duplex I/O, and that the LANCE handles 10 MHz Ethernet traffic without overruns.
- o It is assumed that an interrupt occurs for each input and output character, and on error and break conditions. These interrupts occur only when the UART is ready, and at the designated vector and priority level.
- o It is assumed that an interrupt occurs for every packet received from the Ethernet (addressed to the station or designated multicast addresses).

APPENDIX 2

OUTSTANDING ISSUES

The following issues remain outstanding with this release of the Specification.

3.1.3.99.1 Extent of Autobaud Functionality to be defined after implementation

3.3.3.99.1 Define Test Options for Initialize command.

3.3.4.99.1 Status Message Codes to be defined.

11.0.99.1 Maintenance: Final strategy to be defined following Phase 1.

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