Intermec
Technologies Corporation

Model 4980 Network Controller

PROGRAMMER'S GUIDE

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GLOSSARY

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Introduction

The 4980 Network Communications Controller provides a data communications interface between the host computer and NORAND® devices. The controller is programmable and can be configured many ways. The possible configuration fall into two basic categories:

- a bisynchronous or asynchronous communications gateway to a host computer
- a hand-held computer communications controller.

Refer to the Glossary for other terms, abbreviations, and initializations.

In the first configuration, the controller is directly connected to a customer's host computer and provides a gateway through which data and data requests pass from remote controllers and hand-held computers to the host on logical channels.

In the second configuration, the controller is usually located at a remote site and provides an interface between hand-held computers and a "gateway" controller. Section 1 provides a pictorial representation of several possible configurations.

A host telecommunication program and associated support programs are required to interface to a 4980 network communications controller. Two host interfaces are provided:

- point-to-point bisynchronous
- asynchronous

The host link can be configured for speeds up to 19,200 bps.

The host telecommunications program initializes the controller and then remains in a loop reading data and request records from the controller. Each record from the controller is preceded by a logical channel identifier and a record type field.

There are eight record types which may be sent from the controller to the host. Some are request records which replace a response from the host computer. Each record from the host computer is preceded by a record type field. There are six record types which may be sent from the host to the controller. Note that the controller translates information to/from EBCDIC for EBCDIC hosts. Translation of the data part of upload and download data records can be disabled.

This book has been divided into five major sections. The following paragraphs detail topics discussed in each section.

Section 1 covers the hardware configuration of the network, the physical port assignments on the controller, and the logical port assignments.

Section 2 covers the data structures you will have to build into your programs.

The file types, their functions and uses are described, as well as the physical record layouts within those files.

The controller initialization and port activation parameters have been split out into separate subsections for ease on referencing.

The status and error codes that are returned from the controller are located in Section 2.

Section 3 describes the modems that the controller can communicate with. Modem configuration data strings are listed in Section 3. The controller display panel is also shown in detail.

Section 4 gives details on how to program the controller for processing of files on the controller. Instructions on how to boot a hand-held computer from the controller are given in Section 4. Autodialing from a remote controller is also covered.

Section 5 shows how to program the controller from its front display panel. It details the steps to follow for each selection. The controller identification and the system mode parameters are defined and set by the display panel.

The appendixes have several examples of programs for a host computer that communicates with the controller.

Section 1

Getting Started

Communication Session

The controller is designed to facilitate the host-to-hand-held computer communications sessions. The controller provides the physical connection for the communications session and maintains the session on a logical channel.

A logical channel between a hand-held computer and the host computer will always pass through one or more controllers. All data sent to the host from a controller is prefixed by a logical channel identifier.

Table 1-1 summarizes the communication abilities of each of the hand-held computer types in specific environments. Other environments may be possible with special adapters.

Table 1-1
Controller Environments

Hand-Held Computer Type	Protocol Option	Environment
101	TTY	Modem, lockbox w/NM602 or NM277, direct connect
121/141	TTY	Modem, lockbox w/NM602 or NM277, direct connect
121/141	ADCCP	Modem, Multi-Quad Lockbox (MQL), direct connect
4000	TTY	Modem (single dock), direct connect
4000	NPCP	Single or multidock directly connected to a controller

" NOTE: *The controller supports only full-duplex modems. Other environments may be possible with special adapters.*

As an example, Table 1-1 indicates that a 4000 Series terminal can communicate using TTY or NPCP (NORAND® Portable Communication Protocol). If NPCP is used, the hand-held computer must be in a dock which is directly cabled to a controller.

The controller minimizes the differences between NORAND hand-held computers. After the physical connection is established, the communications sessions for all of the hand-held computer types are identical.

The communication session for a hand-held computer, currently, consists of:

- An "upload"
- A "download"
- An "end-of-session" from the hand-held computer

Typically, the hand-held computer sends identification information in the first upload record, which can be used by the host to tie a specific packet of download data to the unique route or driver assigned to that particular hand-held computer. This download part is optional.

EXAMPLE: The host will receive upload records from a hand-held computer, on a logical channel, until the upload is complete. After the upload is complete, the host will receive download data requests, on the same logical channel, for the hand-held computer. The host will respond with download data until finished, at which point, an end-of-data record is sent. The host will then receive and end-of-session record which reports the status of the hand-held computer session.

The user must be aware of hand-held computer differences in the NORAND Wide Area Network (WAN) in order to make the correct physical connection to a given remote site.

For example, a port on a local controller which is configured for ADCCP cannot communicate to a remote TTY device. The controller can support several modem types.

If automatic modem configuration and auto-dialing is desired, the user must supply the correct information for each port connected to a modem. Port configuration can be input from the front-panel interface on the controller, or be supplied by the host computer during the host-to-controller communications session. The user can ensure that the correct connections are made by associating phone numbers with ports on the controller.

For example, a dial lost if phone numbers for remote ADCCP and TTY. In this case, only one type is active at a time, and the host must activate the port as either ADCCP or TTY before a connection to a remote site is made.

This is useful in an autodial situation, because the protocol type of the remote site can simply be associated with the phone number of the remote site. Table 1-2 specifies possible configurations for controller ports and the environments to which the ports can connect.

Table 1-2
Possible Controller Port Configurations

Port	Types	Possible Remote Connection
0	Bisync	Bisync host computer
1	Async	Async host computer
2	Primary ADCCP	Remote controller. 121/141 Hand-Held Computer (modem or direct connect) 121/141 Hand-Held Computer in an MQL.
3	TTY	101/121/141 Hand-Held Computer (modem, direct connect, or lockbox attached to an NM602/277) RS-232 to a 4000 Series (modem or direct connect)
2/3	TTY or ADCCP	Same as TTY or primary ADCCP except that the port type can be changed from TTY/ADCCP to ADCCP/TTY during the host-to-controller communications session.
4	NPCP (LAN)	RS-485 Direct Connect to 4000 Series in single dock or multi-dock.
5	Secondary ADCCP	Primary ADCCP port on a host controller.

Network Configurations

The controllers can be configured with four RS-232 ports or with three RS-232 ports and one RS-485 port. Use the RS-485 link for NPCP communications to terminals in a Local Area Network (LAN) environment. One of the RS-232 ports serves as the host port.

The host port may be attached to either a host computer or a host controller. Currently, the connection to the host must use one of three data-link protocols.

If the host is a host computer, the connection must be transparent bisync or async.

If the host is another controller, the connection must use ADCCP with the host controller configured as a “primary” and the remote controller configured as a “secondary”. The remaining three ports can be configured as either:

- Primary ADCCP
- TTY
- Primary ADCCP/TTY
- or NPCP

Primary ADCCP ports can connect to either remote controllers, MQLs, or hand-held computers using ADCCP.

The following Figures represent some of the network configurations possible with the controller.

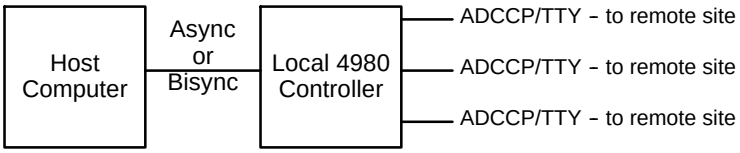


Figure 1-1
Local 4980 Network (ADCCP/TTY)

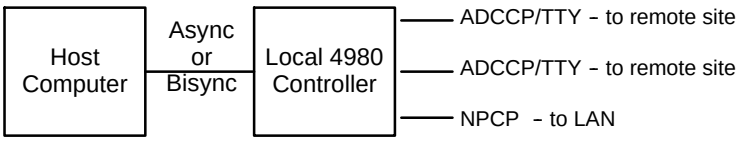


Figure 1-2
Local 4980 Network (NPCP to LAN)

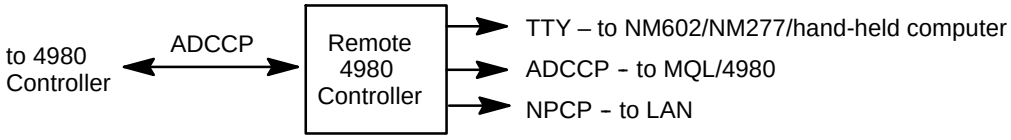


Figure 1-3
Remote 4980

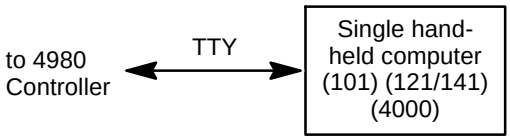


Figure 1-4
Remote Hand-Held Computer (Single Terminal)

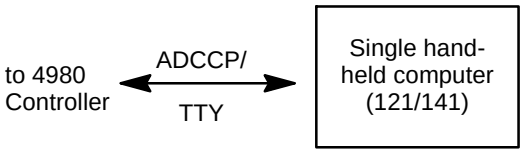


Figure 1-5
Remote Hand-Held Computer (ADCCP/TTY)

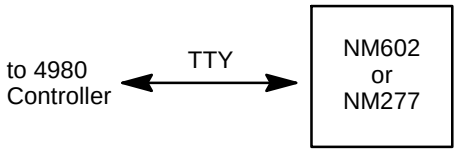


Figure 1-6
Remote 602/277

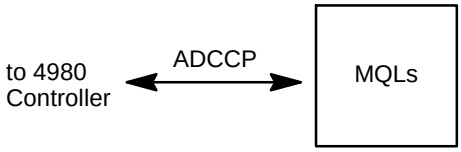


Figure 1-7
Remote MQL

" NOTE: *The 4980-to-4980 controller link can be direct or over a switched line (with full-duplex modems).*

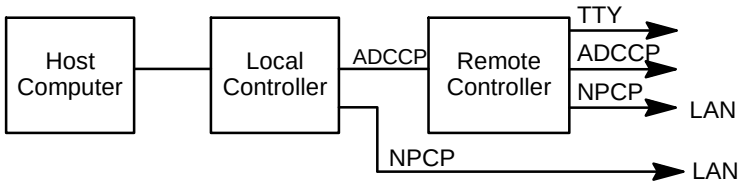


Figure 1-8
Complete Sample Network Configuration

In Figure 1-8, the local controller has two hand-held computer ports: an NPCP LAN port and a primary ADCCP port. The primary ADCCP port is shown connected to a remote controller. The remote controller has three hand-held computer ports: a TTY port, a primary ADCCP port, and an NPCP port. The ADCCP port on the remote controller

can connect to yet another remote controller. In Figure 1-8, data to or from the third controller would be routed through both of the controllers illustrated. Up to nine remote controllers may have active sessions with the host computer at one time.

" NOTE: *A two-byte channel ID is required for this configuration because the remote controller has more than one hand-held computer port.*

Physical Ports, Logical Ports, and Logical Channels

The 4980 Network Communications Controller has four internal physical ports: A, B, C, and D. There are six external connectors on the back of the controller; A, B, C, D, LAN1, and LAN2.

Internal ports B,C, and D are hard-wired to the 15-pin RS-232 external connectors labeled B, C, and D respectively.

An internal software switch links the internal physical port A to the 15-pin RS-232 external connector labeled A, or the two 9-pin RS-485 external connectors labeled LAN1 and LAN2. The selection is automatic based on the protocol type selected for the port.

LAN1 and LAN2 are hard-wired together and are identical, with the exception that LAN1 provides power to hand-held computers in a connected dock. An APU (Auxiliary Power Unit) must be used in conjunction with the LAN2 connector.

When configuring the controller, the user must define two to four *logical* ports, numbered from 0 to 3, and assign them to the internal physical ports. A logical port can be assigned to any one of the four physical ports. Several data-link protocol options are available for each of the ports.

Port 0 is always the host port and must be configured as either bisync, async, or secondary ADCCP. Use ADCCP if

the host will be another controller. Logical Ports 1–3 are hand-held computer ports.

The remote ports can be configured as Primary ADCCP, TTY, ADCCP/TTY, or NPCP.

If NPCP is selected, the logical port is automatically associated with the internal physical port labeled “A”, and the external LAN connectors are automatically selected. NPCP communicates with hand-held computers in the NORAND RS-485 LAN environment.

Primary ADCCP ports can communicate with either remote controllers or hand-held computers in MQLs. TTY communicates with single hand-held computers or older NORAND TTY devices such as an NM602.

If a port is defined as both ADCCP and TTY, it may be dynamically toggled between the two protocols under the direction of the host computer.

The host computer TCOM program interfaces with logical ports, but the host program must be aware of the physical link associated with each logical port.

For example, to implement autodial on logical port 1, the port must be attached to one of the RS-232 ports which is connected to the appropriate modem. It is advisable to store such configuration information in files on the host which can be modified without a program change.

Each of the three remote logical ports may contain up to three logical data channels. The logical channels associated with the logical hand-held computer ports are:

- Port 1 Channels 1, 4, and 7
- Port 2 Channels 2, 5, and 8
- Port 3 Channels 3, 6, and 9

All data from the controller is prefixed by a logical channel number and record type. Data from an hand-held computer will always be in a contiguous sequence on a logical channel. The host TCOM program must maintain the state

variables and file pointers which are indexed by logical channel number.

The lowest logical channel number on each port is also used as the logical port number. Data or requests which are port-specific, such as port activation requests, are always send on the lowest logical channel for the port.

Device Channel Option

A remote port which is configured with primary ADCCP can connect to another controller. Like the host controller, the remote controller may have as many as nine logical channels, three per hand-held computer port. *If none of the remote controllers in the network attached to the host controller (directly or by switched line) has more than one hand-held computer port, then the logical channels for the remote controller can be placed on the logical channels of the host controller.* (This is always true if there are only two ports defined for the remote controllers – a host port and one hand-held computer (remote) port.) In this case, logical channels can be specified by a single hand-held computer channel identifier which precedes each record sent from the controller. *However, if a remote controller has more than one hand-held computer port, then logical channels to the host computer must consist of two parts: a device channel, and a hand-held computer channel.*

The device channel identifies the controller to which the hand-held computer channel belongs. When the device channel option is in effect, a new device channel is opened each time a remote controller comes on line.

The first data the host will receive on the new device channel is an identification record. which contains a user-defined ID and configuration information for the remote controller. Device channels require the host to index state and file variables by device and hand-held computer channel number.

The logical channel ID, which precedes all records sent from the controller to the host, is a 1-byte field if device channels are *not* enabled and is a 2-byte field if device channels are enabled. Therefore, this option should be considered before the host TCOM program is written.

The device channel option can be enabled from the front panel of the controller attached to the host computer, or with an initialization record parameter.

The partial record layouts illustrate the differences in the logical channel options:

- Device channel disabled:
  Position 1 Hand-held computer channel
  Position 2 Record type
  Position 3+ Type-dependent
- Device channel enabled:
  Position 1 Device channel
  Position 2 Hand-held computer channel
  Position 3 Record type
  Position 4+ Type-dependent

Section 2

File Structures

Introduction

You configure the controller by using one of the following methods:

- Initialization record parameters. The host sends this record at the beginning of a session.
- Activation record parameters. The host sends this record to activate a port.
- Control parameters stored in the configuration file. CONFIG.NCC is on the controller system diskette.
- The front panel keyboard and display. Section 5 describes how to configure the controller upon power-up using the front panel keyboard and display. This is part of the initial setup of the controller.

Configuring the controller consists of:

- Defining a host port. The host port can be bisync, async, or secondary ADCCP.
- Defining each of the remote ports.
- Setting system mode parameters.

A description of the mode parameters that can be set with the front-panel user interface is in Section 5.

Pseudo Host Communications Program

Main Routine:

```
Open Files
Initialize counters to 0 and port/channel states to
      inactive.  (Note counters, state variables, etc. are
      indexed by channel)

Send Initialization Record to 4980
While Not Finished
   If Async_host
      Send ready character (e.g. "?") to the 4980.
   Perform 4980_Read.
   Determine Logical Channel and Record Type.
   If type equal Upload_Data
      Perform Received_Upload_Data_Routine.
   Else if type equal End_Tcom_Status
      Perform End_Status_Routine.
   Else if type equal Download_Data_Request
      Perform Download_Data_Routine.
   Else if type equal Inactive_Status
      Display "port inactive".(or ignore)
   Else if type equal Active_Status
      Display "port active".(or ignore)
   Else if type equal Activate_Request
      Perform Activation_Routine.
   Else if type equal Special_Request
      Perform Special_Request_Routine.
   Else if type equal Controller ID
      Perform Remote_4980_Logon.
   Else
      Perform Invalid_Record_Routine.
   Endif
End While Not Finished.
Close Files.
End of Program.
```

End Main Routine

Upload_Data_Routine:

If channel inactive
  Save HHC ID from first upload record in save area for channel (EBCDIC hosts in transparent mode have to translate the hand-held computer ID).
  Reset upload sequence counter for channel.
  Change channel state to "uploading".
  Write upload record with channel/hand-held computer ID/sequence counter key.
Else
  Increment upload sequence counter.
  Write upload record with channel/hand-held computer ID/sequence counter key.
Endif.
Return.

End Upload_Data Routine.

End_Status_Routine:

Log final status of hand-held computer telecom session.
Reset channel status to inactive.
Return.

End End_Status_Routine.

Download_Data_Routine:

(It may be necessary for bisynchronous hosts to explicitly read the EOT, that follows the download request, from the controller at this point.)

If channel state is uploading
  Log good status for upload.
  Reset download sequence counters for channel.
  Change channel state to downloading.
Endif.

If more download data for the hand-held computer
  Send download data record.
Else
  Send an end-of-data record.

Endif.

(Note: One way to associate download data with a hand-held computer is to maintain a “download request” file that contains a list of “download” files for each scheduled hand-held computer. The list of files may actually be a list of keys for indexed file systems.)

Return.

End Download_Data_Routine

Activation_Routine:

(It may be necessary for bisynchronous hosts to explicitly read the EOT,that follows the activation request, from the controller at this point.)

(Note that the hand-held computer channel number is the port number for activation requests.)

```
If a phone number is active on the port
   Log the status of the phone number.
   Store the phone number for possible retry later.
Endif.
Get the next phone number for the port type.
If a phone number is available for the port type
   Send the phone number in the activation record.
Else if too soon to retry phone numbers
   Send an activation_delay record.
Else if no more phone numbers
   Send the default (possibly blank) activation record for
      the port type.
Endif.
Return.
```

End Activation_Routine.

Special Request Routine:

(It may be necessary for bisynchronous hosts to explicitly read the EOT, that follows the activation request, from the controller at this point.)

Display “No special requests are supported”.
Send an end-of-data record.

End Special_Request_Routine

Remote_4980_Logon:

(It may be necessary for bisynchronous hosts to explicitly read the EOT, that follows the activation request, from the controller at this point.)

Send an initialization record for the remote 4980 (The initialization record may be blank).

End Remote_4980_Logon

Common File Structures

The file transfer protocol between the controller and host is implemented with eight controller-to-host record types and six host-to-controller record types.

This section explains the function of each record type. Actual record layouts are in the record layout sections on pages 2-14 (async) and 2-18 (bisync).

Controller-to-Host Record Types

The record types are:

Table 2-1
Controller-to-Host Record Types

Record ID	Type	Description
0	Upload Data	The hand-held computer sends contiguous upload data records to the host on a logical channel.
1	End of Session Status	Indicates the status of a single hand-held computer session. Each hand-held computer sends an end-of-session record as it completes. See page 2-48.
2	Data Request	The hand-held computer sends a download data request to the host. The host sends back a download data record, an end-of-data or a download file directive.
3	Inactive Status	This record indicates the status of a logical port. The host port uses inactive status records as time-fill records whenever it is idle. The host program discards or ignores these records.
4	Active Status	Active status records indicate a logical port status. The host port uses active status records as time-fill records whenever it is idle. The host program discards or ignores these records.
5	Activate Request	The host activates a port using the activate request records. Requests are sent for an enabled port whenever the port disconnects. The prior connection status for the port is also in the request record. The host responds with an autodial record, autoanswer activate record, or a deactivate-for-one-minute record. See page 2-23.
6	Special Request	Special request records lump a variety of special records into one record type. A subtype field determines the actual request type. There are two subtypes specified, see Table 2-2 on page 2-7.

Table 2-1 (Continued)
Controller-to-Host Record Types

Record ID	Type	Description
7	Directive Status	The controller sends directive status records to the host after completing a host directive (with or without error). See page 2-49.
8	Identification	If used, the controller sends an ID record to the host at the beginning of each session with a remote controller. The ID record serves two purposes. It identifies the just connected remote controller, and it opens a new device channel. See page 2-10.

Special Request Subtypes

Table 2-2
Special Request Subtypes

Record ID	Type	Description
1	File request	File requests obtain file processing information from the host. The host responds with a file directive or an end-of-data record.
2	Deactivate Request (Async interface only)	Deactivate requests are enabled using the controller initialization record. When enabled, the controller periodically sends a deactivate request to the host for each autoanswer port. The host then responds with a deactivate directive (yes or no).

Host-to-Controller Records

The record types are:

Table 2-3
Host-to-Controller Records

Record ID	Type	Description
0	Download Data	The host sends download data records in response to a download request. Information obtained from upload data links download data with a specific hand-held computer on a logical channel.
1	End-of-data	The host sends end-of-data records in response to a download request from the controller. This indicates that no more download data exists for this session. End-of-data records are also sent in response to a file request to terminate file processing.
2	Initialization	An initialization record is sent at the beginning of a host/controller session to set the system mode parameters and default port activation parameters. See page 2-37.
3	Activate autoanswer	The host sends an activate record in response to a request record. If the record contains a phone number parameter, an autodial is attempted, else the port is configured for autoanswer. Nonswitched (direct) connections are considered to be autoanswer.
4	Activate autodial	The host sends an activate record in response to a request record. If the record contains a phone number parameter, an autodial is attempted, else the port is set to autoanswer. Nonswitched (direct) connections are considered to be autoanswer. The controller processes autoanswer and autodial activate records identically. A hand-held computer port can be defined as both TTY and primary ADCCP. The activate record specifies the protocol type (TTY or ADCCP) to use for the next connection.

Table 2-3 (Continued)
Host-to-Controller Records

Record ID	Type	Description
5	Deactivate for one minute	Deactivate records can postpone activating a port for one minute. This feature causes a delay between phone number dials or implements an activation window for a port.
6	Host Directive	The host sends a directive in response to a special or download data request from the controller. Six subtypes of host directives are available: ▪ Types 1–3 manage user data files. ▪ Type 4 sends download data to a hand-held computer. ▪ Type 5 deactivates a request, and ▪ Type 6 cancels file processing.

If the *file processing system mode* parameter is enabled, the host receives file requests at the beginning of a host-to-controller session. The six subtypes are as follows:

Table 2-4
Host Directive Subtypes

Record ID	Type	Description
1	File upload directive	The host sends an upload directive in response to an upload data request from the controller.
2	File create/load directive	The host sends this directive in response to a request to create a data file on the controller. After the controller receives a create directive, it sends the host data request records. The host then sends data records until all the data is sent. An end-of-data record from the host marks the end of the data for the file.
3	File Delete Directive	The host sends this directive in response to a request to delete a data file from the controller's directory.

Table 2-4 (Continued)
Host Directive Subtypes

Record ID	Type	Description
4	File download directive	The host sends this directive in response to a request for download data for a hand-held computer. After receiving a download directive, the controller opens the file specified and downloads it to the hand-held computer.
5	Deactivate Directive	The host sends this directive response to a deactivate request. The directive can deactivate an autoanswer port. If the port is deactivated, the host is immediately prompted with an activate record for that port.
6	File Processing Abort	The host sends this directive to inform the controller that a file error has occurred on the host. The controller responds by locking the files on the controller. Normal telecom continues with the hand-held computers at this time. The files are unlocked after a successful file processing session.

" **NOTE:** *The controller sends a directive status to the host immediately after completing a host directive. Directive status codes are on page 2-49.*

Controller-to-Host Record Formats with a 1-byte Channel ID

This section contains record layouts for *ASYNCHRONOUS* (async) and *BISYNCHRONOUS* (bisync) records sent from the controller to a host. The layouts for the bisync and async records are basically identical. Differences are noted in separate bisync and async sections.

Channel ID, record types, status information, etc. is translated to EBCDIC for EBCDIC hosts. Hand-held computer character data (in type 0 records) can optionally be translated.

Table 2-5
Controller-to-Host Records

Position	Bytes	Description
0 – Upload Data Record (258 bytes)		
1	1	Channel ID: "1–9"
2	1	Record Type: "0"
3	256	Upload Data
1 – End of Session Status Record (257 bytes)		
1	1	Channel ID: "1–9"
2	1	Record Type: "1"
3	1	End of session status code. See page 2-48.
4	4	Hand-held computer application status information.
8	1	Local port identifier
9	249	Reserved for diagnostic information.
2 – Download data request record (2 bytes)		
1	1	Channel ID: "1–9"
2	1	Record Type: "2"
3 – Inactive Status Record (2 bytes)		
1	1	Port ID: "1–3"
2	1	Record Type: "3"
4 – Active Status Record (2 bytes)		
1	1	Port ID: "1–3"
2	1	Record Type: "4"
5 – Activate Request and Status Record (7 bytes)		
1	1	Port ID: "1–3"
2	1	Record Type: "5"
3	1	Status code for previous port activation. See page 2-48.
4	4	Reserved for diagnostic information.

Table 2-5 (Continued)
Controller-to-Host Records

Position	Bytes	Description
6 – Special Request Records (3 bytes)		
1	1	Channel ID: "1–9"
2	1	Record Type: "6"
3	1	Special request subtype: "1 or 2" Subtype 1: File request Subtype 2: Deactivate request
7 – Directive Status Record (7 bytes)		
1	1	Channel ID: "1–9"
2	1	Record Type: "7"
3	1	Status Type: "1–4". The status type equates to a host directive type.
4	1	Directive status. See page 2-49.
5	3	Reserved for diagnostic information.
8 – Controller ID Record (258 bytes)		
1	1	Channel ID: "1–9"
2	1	Record Type: "8"
3	8	Controller ID. This is the 0–8 character ID that may be entered with the controller keyboard.
11	10	Controller system data and time in YYMMDDHHMM format.
21	5	The 5-digit system mode. Refer to page 2-46.
26	5	The controller's system software version.
31	2	Number of enabled ports on the controller, including the host port.
33	16	Four digits are allowed to each port, two digits each for the primary and secondary type. The ports are defined in sequence, with "0" as the host port. Only primary ADCCP (type 02) and TTY (type 03) ports may have a secondary type.
48	210	Reserved.

Controller-to-Host Record Formats with 2-byte Channel ID

Records from controller-to-host use a 2-type channel ID that consists of a 1-byte "device channel" field. Hand-held computer channels belong to the active device on the corresponding device channel.

Device channel "0" is reserved for the controller direct-connected to the host. Use channels "1–9" for remote controllers.

The record formats with the 2-byte channel option are the same as 1-byte channels. The difference is that the device channel ID is attached to the beginning of each record.

" NOTE: *The 2-byte channel ID format is required if a remote controller has more than one hand-held computer port.*

The 2-byte format is shown below.

Table 2-6
2-Byte Channel ID

Position	Bytes	Description
1	1	Channel ID: "1–9"
2	1	Hand-held computer Channel ID: "1–9"
3+		Records defined in Table 2-5 beginning with position 2 (page 2-11).

Asynchronous Interface

Controller-to-Host Records

The record layouts specified, starting on page 2-5, do not include optional pad characters. The host may use initialization record parameters to force the controller to pad all records sent, to a minimum or fixed-length record. This is useful for hosts unable to handle variable-length records. *The default is no pad.* If a minimum record length is defined, a pad character may also be given. *The default pad character is an ASCII space.*

An optional end-of-record delimiter (for example, a carriage return) can be appended to the end of each record. The delimiter is defined in the initialization record. *The default delimiter is a carriage return appended to the end of every record sent to the host.*

The record format with optional pad and end-of-record delimiter is generally as follows:

- 1 to M Record as defined.
- M+1 N Optional pad.
- N+1 Optional end-of-record delimiter

"M" is the record length. "N" can be up to 261 bytes, therefore, the maximum record length for an async interface is 262, with the optional pad and end-of-record delimiter.

Host-to-Controller Records

Each record from an asynchronous host must begin with a 1-byte beginning-of-record delimiter (a slash "/") and a 1-byte command code (EBCDIC or ASCII),"0–6".

Records are sent from the host in response to requests from the controller, except for the initialization record.

The host may also send two special commands to the controller. A question mark "?" and an asterisk "*". A question mark indicates the host is ready to receive data. The asterisk resets the controller, although the controller automatically resets after a period of inactivity.

Records from the host (not including the special commands) must all be of the same fixed-length, and may include end-of-line pad bytes.

The controller uses the initialization record sent from the host to determine:

- The record length
- The end-of-line pad length
- Whether the host is an EBCDIC or ASCII machine.

Table 2-7
Async Host-to-Controller Records

Position	Bytes	Description	
0 – Download Data Record			
1	1	Beginning delimiter	"/"
2	1	Command code:	"0"
3	256	Download data	
259+		Optional pad (up to 5 bytes)	
1 – End-of-data Record			
1	1	Beginning delimiter	"/"
2	1	Command code:	"1"
3	256	Filler	
259+		Optional pad (up to 5 bytes)	
2 – Initialization Record			
1	1	Beginning delimiter	"/"
2	1	Command code:	"2"
3	256	Optional initialization parameters list. The parameter list terminates with a slash "/". See page 2-37.	
259+		Optional pad (up to 5 bytes)	

Table 2-7 (Continued)
Async Host-to-Controller Records

Position	Bytes	Description
3 – Activate (autoanswer) Record		
1	1	Beginning delimiter "/"
2	1	Command code: "3"
3	1	This field can change the port type from ADCCP/TTY to TTY/ADCCP for ports defined for both ADCCP and TTY. ▪ Blank No change ▪ 2 Change to ADCCP ▪ 3 Change to TTY *The default is the primary port type.* See page 2-42.
4	255	Optional activation parameters list. This list terminates with a slash "/". See page 2-23.
259+		Optional pad (up to 5 bytes)
4 – Activate (autodial) Record		
1	1	Beginning delimiter "/"
2	1	Command code: "4"
3	1	This field can change the type from ADCCP/TTY to TTY/ADCCP for ports defined for both ADCCP and TTY. ▪ Blank No change ▪ 2 Change to ADCCP ▪ 3 Change to TTY *The default is the primary port type.* See page 2-42.
4	255	Optional activation parameters list. This list terminates with a slash "/". See page 2-23.
259+		Optional pad (up to 5 bytes)
5 – Deactivate for One Minute Record		
1	1	Beginning delimiter "/"
2	1	Command code: "5"

Table 2-7 (Continued)
Async Host-to-Controller Records

Position	Bytes	Description
3	256	Filler
259+		Optional pad (up to 5 bytes)
6 – Host Directive Record		
1	1	Beginning delimiter "/"
2	1	Command code: "6"
3	1	Directive type: "1–5" ▪ 1 File upload directive ▪ 2 File create/load directive ▪ 3 File delete directive ▪ 4 File download directive ▪ 5 Deactivate directive ▪ 6 File processing Abort
4	255	Directive information. See Section 4 for directory entry information. The information required for this field is dependent on the directive type. For example, if you use a directive type of "1" (File upload) then this field holds the 11-byte filename and extension. ▪ 1 11-byte filename and extension ▪ 2 32-byte directory entry ▪ 3 11-byte filename and extension ▪ 4 11-byte filename and extension ▪ 5 Deactivate Yes or No response of byte in length. 0 No, do not deactivate 1 Yes, deactivate the port ▪ 6 Filler
259+		Optional pad (up to 5 bytes)

Special Commands

Table 2-8
Asynchronous Special Commands

Position	Bytes	Description
? – Host Ready Command		
1	1	Question mark: "?"
2+		Optional pad (up to 5 bytes). The pad following the host ready command can be different than the pad following other records. However, the pad must be consistent for each ready command sent.
"*" – Reinitialization Command		
1	1	Asterisk: "*"
2+		Optional pad (up to 5 bytes). This command, "*" is sent only when the controller is expecting a ready command "?" from the host.

Bisynchronous Interface

Controller-to-Host Records

The record layouts specified, starting on page 2-5, do not include bisync framing characters. All records sent from or to the controller must be generally framed as follows:

```
syn syn dle stx (records)   dle etx crc-16 Pad
---+---+---+---+           +---+---+------+----
```

Bisync line control characters are in EBCDIC. The mode is always transparent, even when only character information is sent.

The controller translates data sent to the host from ASCII to EBCDIC and translates data sent from the host from EBCDIC to ASCII. If the port mode is configured as "transparent", the controller does not translate the data portion of upload and download records.

Ports can be configured as transparent individually, or with a global system-mode transparent parameter (see pages 2-23 and 2-37).

Host-to-Controller Records

Each record from the host begins with a 1-byte command code ("0–6"). Records from the host, except for the initialization record are sent in response to requests from the controller.

The record layouts shown do not include bisync framing characters. All records sent from and to the controller must be generally framed as illustrated:

```
syn syn dle stx  (records)    dle etx crc-16 Pad
---+---+---+---+            +---+---+------+----
```

Bisync line control characters are in EBCDIC. The transmission mode is always transparent, even when only character data is sent.

The record layouts described may be padded with spaces to a maximum length of 257 bytes. This is useful for hosts unable to send variable-length records.

Command codes are in ASCII or EBCDIC depending on the host.

Table 2-9
Bisync Host-to-Controller Records

Position	Bytes	Description	
0 – Download Data Record			
1	1	Command code:	"0"
2	256	Download data	

Table 2-9 (Continued)
Bisync Host-to-Controller Records

Position	Bytes	Description
1 – End-of-data Record		
1	1	Command code: "1"
2 – Initialization Record		
1	1	Command code: "2"
2	256	Optional initialization parameters list. The list is terminated with a slash "/". See page 2-37.
3 – Activate (autoanswer) Record		
1	1	Command code: "3"
2	1	The port type field can change the port type from ADCCP/TTY to TTY/ADCCP for ports defined for both ADCCP and TTY. ▪ Blank No change ▪ 2 Change to ADCCP ▪ 3 Change to TTY This field must be blank, or match the current port protocol type, if the port is not defined as ADCCP or TTY. *The default is the primary port type.* See page 2-42.
3	255	Optional activation parameters list. This list terminates with a slash "/". See page 2-23.

Table 2-9 (Continued)
Bisync Host-to-Controller Records

Position	Bytes	Description
4 – Activate (autodial) Record		
1	1	Command code: "4"
2	1	The port type field can change the port type from ADCCP/TTY to TTY/ADCCP for ports defined for both ADCCP and TTY. ▪ Blank No change from current ▪ 2 Change to ADCCP ▪ 3 Change to TTY This field must be blank, or match the current port protocol type, if the port is not defined as ADCCP or TTY. *The default is the primary port type.* See page 2-42.
3	255	Optional activation list parameters. This list terminates with a slash "/". See page 2-23.
5 – Deactivate for One Minute Record		
1	1	Command code: "5"
6 – Host Directive Record		
1	1	Command code: "6"
2	1	Directive type: "1–4" ▪ 1 File upload directive ▪ 2 File create/load directive ▪ 3 File delete directive ▪ 4 File download directive
3	255	Directive information. See Section 4. If you use directive type "1" (File upload) then in this field you enter the 11-byte filename and extension of the upload file. ▪ 1 11-byte filename and extension ▪ 2 32-byte directory entry ▪ 3 11-byte filename and extension ▪ 4 11-byte filename and extension

SNA/SDLC Interface

The SNA 4980 Communication Controller Software emulates a 3174/3274 physical unit type 2 cluster controller. This emulation pertains to the SNA/SDLC interface of these controller types and not the additional features such as NETVIEW, or TOKEN RING.

Only one logical unit is defined for this physical unit. The logical unit must always be defined with the lowest address available for the control unit.

The logical unit local address must always be 2. The logical unit emulates a generic 24x80 screen, 3278 model 2 display type.

A user writing the application should define the screen to be one field for send and receive. Data for both send and receive begins in Row 1, Column 1. The actual record formats of the data being sent and received are defined starting on page 2-5.

Communications with the SNA 4980 is established by first varying the physical and logical units to an active state on VTAM. The next step is to "Bind" the logical unit to an application such as CICS. This is accomplished by "acquiring" the logical unit to CICS. The 4980 controller is now ready to receive an initialization record.

A communication session is started by "Binding" the logical unit to an application followed by sending an initialization record and ended by unbinding the logical unit from the session. For example: A release from CICS.

The SDLC address of the physical unit should match the ADDR statement in the physical unit definition in VTAM.

" NOTE: *The physical unit address in the VTAM definition is in hex.*

If the 4980 controller is to provide the clocking, then a BPS rate should be selected and the 4980 controller connected directly (no modems) to the communications control unit.

This can be done using the 216-690-00x cable for most host computers. (Use the 216-569-00x cable if a male host connection is needed.)

Set the clocking to "EXT" external if there is a clocking device such as modem between the 4980 controller and the communications controller. Clocking should always be set to "EXT" on the BTAM definition.

The SDLC ID option is only used if VTAM is defined to have the control unit on a switched network. The four bytes, eight nibbles, must match the IDBLK and IDNUM definition on the physical unit statement where:

```
xxxyyyyy
xxx = IDBLK
yyyyy = IDNUM
```

NRZI Encoding – Select "yes" or "no" to match the definition on the VTAM gen.

Max Frame – Also known as MAXDATA on VTAM definitions. Either 265/532 can be used. 532 is preferred because it increases efficiency.

Activation Record Parameters

Activation records are in the controller's system configuration file, CONFIG.NCC which is found on the system startup diskette, or they are sent from the host to activate handheld computer ports.

The record layouts are specified in the host-to-controller record layout subsections in this section. The CONFIG.NCC file, found on the system startup diskette, is described on page 2-43.

Optional parameters may be specified in activation records to customize a port configuration. These parameters are port protocol-type specific and are specified later in this section.

Some of the parameters can only be sent in an activation record, from the host. In this case, the parameters are documented as CONFIG.NCC only or host only respectively.

" **NOTE:** *CONFIG.NCC settings override the documented default settings for activation parameters. Most of the CONFIG.NCC parameters can be modified via the front panel user-interface.*

The parameter list has the general form:

-[type][parameter] -[type] is a 1-byte character specifying the parameter type and [parameter] is a string of digits or characters.

" **NOTE:** *All optional parameters begin with a dash.*

Type 0 – Bisynchronous Host (CONFIG.NCC only)

Table 2-10
Type 0 – Bisynchronous Host

Parameter	Description
–a[mode]	[mode] is a 1- to 5-digit numeric field which sets the mode for the host port. *Model should be zero.*
–b[speed]	[speed] is a 1- to 5-digit numeric field which sets the host port speed in bits per second (BPS). *The default is 19200.* Zero specifies that the speed is set by an external source. For example, using zero means the host port speed is determined by the modem the port is talking to. Valid values are: 0, 1200, 2400, 4800, 9600, or 19200.

Type 1 – Asynchronous Host (CONFIG.NCC only)

Table 2-11
Type 1 – Asynchronous Host

Parameter	Description
–a[mode]	[mode] is a 1- to 5-digit numeric field which sets the mode for the host port. *Model should be zero.*
–b[speed]	[speed] is a 1- to 5-digit numeric field which sets the host port speed in BPS. Valid values are: 1200, 2400, 4800, 9600, or 19200. *The default is 19200.*
–c[parity]	[parity] is a 1-digit numeric field which sets parity and number of data bits. *The default is no parity/8 data bits.* Valid values are: ▪ 0 no parity/8 data bits ▪ 1 odd parity/7 data bits ▪ 2 even parity/7 data bits
–d[stopbits]	[stopbits] is a 1-digit numeric field which sets the number of stop bits. Valid values are: ▪ 1 one stop bit ▪ 2 two stop bits ▪ 3 one and one half stop bits

Type 2 – Primary ADCCP (CONFIG.NCC or Host Activation Parameters)

Table 2-12
Type 2 – Primary ADCCP

Parameter	Description
–a[mode]	This is a 1- to 5-digit numeric field which sets the mode for the host port. Mode parameters are associated with a value and can be turned on by "adding in" the value for a specific parameter to the mode. The following mode parameters are supported: ▪ 0 All mode parameters are set off ▪ 4 Disable data translation on this port
–b[speed]	This is a 1- to 5-digit numeric field which sets the hand-held computer port speed in BPS. *The default is zero.* Zero specifies the speed is set by an external source. For example, using zero means the host port speed is determined by the modem the port is talking to. Valid values are 0, 1200, 2400, 4800, 9600, or 19200.
–c[channels]	This field specifies the number of logical channels. It is used only when the controller connects to hand-held computers using ADCCP in MQLs. If [channels] is set to "2" the controller can communicate with two hand-held computers in MQLs concurrently for increased efficiency. *The default is one channel.* Valid values are "1" or "2".

Table 2-12 (Continued)
Type 2 – Primary ADCCP

Parameter	Description
–d[min addr]	This field specifies the minimum ADCCP address to poll. This parameter can skip lower addresses in an array of MQLs. *The default is one.* Valid values are 1–64.
–e[max addr]	This field specifies the maximum ADCCP address to poll. [max addr] should be set to the highest ADCCP address in the WAN. *The default is 64.* Valid values are 1–64. The [min addr] and [max addr] parameters are used together to specify a range of ADCCP addresses to poll. If the network includes MQLs, the highest ADCCP address in the network is also the highest MQL slot number. The highest address is "2" if the network consists of controllers with attached hand-held computers, single hand-held computers, and TTY equipment. Use this parameter to skip upper addresses in an array of MQLs to avoid unnecessary polling time.
–f[block timeout]	This field specifies the ADCCP block time out in tenths of seconds. *The default is 20 (2 seconds).* CONFIG.NCC only. ***This parameter should be modified only by technical personnel.***

Table 2-12 (Continued)
Type 2 – Primary ADCCP

Parameter	Description
–g[poll timeout]	This field specifies the ADCCP poll time out in tenths of seconds. *The default is 5 or 1/2 second.* CONFIG.NCC only ***This parameter should be modified only by technical personnel.***
–h[ADCCP retries]	This field specifies the number of ADCCP retries. *The default is 7.* CONFIG.NCC only ***This parameter should be modified only by technical personnel.***
–m[modem]	This is a 1-byte alphanumeric field which specifies the type of modem attached to the port. *The default is zero.* The valid values are 0–6. ▪ 0 No modem or an unsupported modem is attached to the port. A supported type is required for autodialing. See Section 3 for modems supported by the controller.
–n[cfg str]	This is a 1- to 40-byte alphanumeric field, which may contain a substitute modem configuration string. No edit checking is done on this field. *Default values are specific to the modem and port type.* See Section 3 on modem support for detailed information.

Table 2-12 (Continued)
Type 2 – Primary ADCCP

Parameter	Description
–p[phoneno] (host only)	This is a 1- to 27-byte alphanumeric field which may contain a telephone dial sequence. No edit checking is done on this field. *The default is no dial sequence.* Section 3 on modem support, defines the characters that may be a valid dial sequence. First character must be a "T" or a "P". If a character is not entered, "T" becomes the default.
–r[modem reset]	This is a 1- to 10-byte alphanumeric field which may contain a modem reset string. The reset string is sent to the modem before the modem is configured setting the modem to a known state. This parameter prevents a reset to factory options ("at"), or for selecting one of several factory default configuration ("at&F1"). No edit checking is done. *The default for the modem types which are supported is "At&F".*
–t[timeout]	This is a numeric field specifying an autoanswer timeout in seconds. When a timeout is specified, the primary ADCCP port waits for a connection for [timeout] seconds. If a connection is not made, the port deactivates and the host is prompted with another activate request for the port. *The default depends on the host port type.* If the host port configuration is secondary ADCCP, the default is 60 seconds. Otherwise, the default is zero, which specifies no timeout. Valid values are 0–3600.

Type 3 – Primary TTY (CONFIG.NCC or Host Activation Parameters)

Table 2-13
Type 3 – Primary TTY

Parameter	Description
–a[mode]	This is a 1- to 5-digit numeric field which sets the mode for the host port. Mode parameters are associated with a value and can be turned on by "adding in" the value for a specific parameter to the mode. Currently the following mode parameters are supported: ▪ 0 All mode parameters are set off. ▪ 4 Disable data translation on this port. ▪ 8 Single TCOM per call. This parameter should be set for "single terminal" ports.
–b[speed]	This is a 1- to 5-digit numeric field which sets the hand-held computer port speed in BPS. *The default is 9600.* Valid values are 1200, 2400, 4800, 9600, or 19200.
–c[parity]	This is a 1-digit numeric field which sets parity and number of data bits. Valid values are: ▪ 0 No parity/8 data bits ▪ 1 Odd parity/7 data bits ▪ 2 Even parity/7 data bits ▪ 3 Odd parity/8 data bits ▪ 4 Even parity/8 data bits
–d[stopbits]	[stopbits] is a 1-digit numeric field which sets the number of stop bits. Valid values are: ▪ 1 One stop bit ▪ 2 Two stop bits ▪ 3 One and one half stop bits

Table 2-13 (Continued)
Type 3 – Primary TTY

Parameter	Description
–f[tty timeout]	This is a 1- to 3-digit numeric field specifying the maximum time, in tenths of seconds, that the controller's TTY receiver waits for a block of data before retransmitting an ENQ, ACK, or NAK. The timeout can be increased to run TTY over networks which have propagation delays. *Valid values are 0 (no timeout) to 300 (30 seconds).*
–m[modem]	This is a 1-byte alphanumeric field which specifies the type of modem attached to the port. *The valid values are 0–6.* Zero indicates that no modem or an unsupported modem is attached to the port. A supported type is required for autodialing. See Section 3 for the modems which are supported by the controller. *The default is zero.*
–n[cfg str]	This is a 1- to 40-byte alphanumeric field which may contain a substitute modem configuration string. No edit checking is done on this field. *Default values are specific to the modem and port type.* See Section 3 on modem support for detailed information.
–p[phoneno] (host only)	This is a 1- to 28-byte alphanumeric field which may contain a telephone dial sequence. Section 3 defines the characters that may be in a valid dial sequence. No edit checking is done. *The default is no dial sequence.*

Table 2-13 (Continued)
Type 3 – Primary TTY

Parameter	Description
–r[modem reset]	This is a 1- to 10-byte alphanumeric field which may contain a modem reset string. The reset string is sent to the modem before the modem is configured, setting the modem to a known state. This parameter prevents a reset to factory options ("at"), or for selecting one of several factory default configuration ("at&F1"). No edit checking is done. *The default for the modem types which are supported is "At&F".*
–t[timeout]	This is a numeric field which specifies an auto-answer timeout in seconds. When a timeout is specified, the primary ADCCP port waits for a connection for [timeout] seconds. If no connection is made, the port deactivates and the host is prompted with another activate request for the port. *The default depends on the host port type.* If the host port configuration is secondary ADCCP, the default is 60 seconds. Otherwise, the default is zero, no timeout. Valid values are 0–3600.

Type 4 – LAN (CONFIG.NCC or Host Activation Parameters)

Table 2-14
Type 4 – LAN

Parameter	Description
–a[mode]	This is a 1- to 5-digit numeric field which sets the mode for the host port. Mode parameters are associated with a value and can be turned on by "adding in" the value for a specific parameter to the mode. The following mode parameters are supported: ▪ 0 All mode parameters are set off. ▪ 4 Disable data translation on this port.
–c[channels]	This field specifies the number of logical channels. Valid values are 1 or 2. *The default is 1 channel.*
–t[timeout]	This field specifies a "no activity" timeout period, in tenths of seconds. If the timeout period expires the port will deactivate. The remote controller hangs up the phone when all ports are inactive.

Type 5 – Secondary ADCCP Host (CONFIG.NCC only)

Table 2-15
Type 5 – Secondary ADCCP Host

Parameter	Description
–a[mode]	This is a 1- to 5-digit numeric field which sets the mode for the host port. *Mode should be zero.*
–b[speed]	This is a 1- to 5-digit numeric field which sets the hand-held computer port speed in BPS. *The default is zero.* Valid values are 0, 1200, 2400, 4800, 9600, or 19200. (Zero specifies external clocking for example, by modem.)
–m[modem]	This is a 1-byte alphanumeric field which specifies the type of modem attached to the port. Section 3 details the modems which are supported by the controller. *The default is zero.* Valid values are 0–6. Zero indicates that no modem or an unsupported modem is attached to the port. A supported type is required for autodialing.
–n[cfg str]	This is a 1- to 40-byte alphanumeric field which may contain a substitute modem configuration string. No edit checking is done. *Default values are specific to the modem and port type.* Refer to Section 3 on modem support for detailed information.
–o[retry wait]	This is a 1- to 4-digit numeric field specifying the number of seconds to wait before dialing a phone number. This parameter regulates dial retries. Valid values are 0–7200 seconds. *The default is 20 seconds.*

Table 2-15 (Continued)
Type 5 – Secondary ADCCP Host

Parameter	Description
–p[phoneno]	This is a 1- to 28-byte alphanumeric field which may contain a telephone dial sequence. Section 3 defines the characters that may be in a valid dial sequence. No edit checking is done. *The default is no dial sequence.*
–q[sec phoneno]	This is a 1- to 28-byte alphanumeric field which may contain a second telephone dial sequence. If a second dial sequence is specified, the controller switches to the other sequence anytime a dial fails for any reason. No edit checking is done. *The default is no second dial sequence.*
–r[modem reset]	This is a 1- to 10-byte alphanumeric field which may contain a modem reset string. The reset string is sent to the modem before the modem is configured, setting the modem to a known state. This parameter prevents a reset to factory options ("at"), or for selecting one of several factory default configuration ("at&F1"). No edit checking is done. *The default for the modem types which are supported is "At&F".*

Table 2-15 (Continued)
Type 5 – Secondary ADCCP Host

Parameter	Description
–U[dial time]	This is a 4-digit numeric field which specifies an optional 24-hour begin dial time in HHMM format. After the begin [dial time] is reached, the controller attempts to autodial if an attached hand-held computer is ready to TCOM. The [ENT] key on the controller can be pressed to start an early dial, when the controller is waiting for the begin [dial time] to be reached. Valid values are 0000–2359. "0000" specifies no begin-dial time. *The controller system time must be set correctly before this feature is used.*
–V[dial cutoff]	This is a 4-digit numeric field which specifies an optional 24-hour dial cutoff time in HHMM format. The cutoff-time is used with the begin dial-time to define an autodial window. Valid values are 0000–2359. "0000" specifies no dial cutoff time. If the cutoff-time is less than the begin dial-time, then the window spans midnight. Example: If the begin time is 2200 and the cutoff time is 0300, then the autodial window is from 10:00 pm, until 3:00 am the following day. *The default cutoff time is 1200 (12 noon).*

Initialization Record Parameters

The host can change system and port parameters with an initialization record sent at the beginning of a session.

These parameters can be subdivided into:

- System parameters,
- host parameters, and
- port parameters.

Initialization parameters are terminated with a slash "/" if the initialization record is not padded with spaces.

System Parameters

You can customize the controller configuration using system parameters.

A parameter list has the general form:

"-[type]parm"	[type] is a 1-byte field specifying the parameter type. "parm" contains the actual value of the parameter.

Table 2-16
System Parameters

Parameter	Description
–s[system mode]	This is a 1- to 5-digit numeric field adjusting the operational mode for the controller. Mode parameters are associated with a value and can be turned on by adding in the value for a specific parameter to the mode. See page 2-43 for details. The following mode parameters are supported: ▪ 0 All mode parameters are set off ▪ 4 Disable data translation on all ports ▪ 32 Enable the device channel option (2-byte channel ID) ▪ 64 Forward ID records from remote controllers to the host. ▪ 128 Enable file processing on the controller. (Must be on to use file processing.) ▪ 256 Forward port activation requests from remote controllers to the host. ▪ 512 Sets "local ID" on. When "local ID" is on, the local controller begins a TCOM session by sending an ID record to the host. The host must respond with an initialization record. Using this option prevents the controller from automatically detecting if the host is EBCDIC.

Note: If file processing is set on, it will stay on until the controller is "booted", or a command is sent explicitly turning file processing off (–s0)

Table 2-16 (Continued)
System Parameters

Parameter	Description
	▪ 1024 Forced autoanswer ON. This parameter applies only to remote controllers. When this parameter is on, a remote controller will always answer the phone, even when there are no attached handheld computers in a ready state. ▪ 4096 Deactivate Request ON. *(Async only).* If deactivate requests is "on", the controller periodically sends a deactivate request to the host for each enabled autoanswer port not currently active (such as port is waiting for a phone call). The host can then time window port configurations. (See pages 2-14 and 2-18.) ▪ 8192 Cyclic Redundancy Check (CRC) ON. *(Async only).* If CRC is "on", the controller appends two CRC characters to the end of the upload data (type 0) records. The host is also expected to append two characters to the end of download data blocks (type 0). See page 2-14.
–t[date-time]	This is a 10-digit numeric field setting the date and time. It must be in yymmddhhmm (year-month-day-hour-minute) format. The time is in a 24-hour clock format. (0000–2359)

Host Parameters

Host parameters have the following general form:

"-[type]parm"	[type] is a 1-byte field specifying the parameter type. "parm" contains the actual value of the parameter.

Host parameters are specific to the host type (asynchronous or bisynchronous). The following are the initialization parameters for each host type.

Table 2-17
Asynchronous Host

Parameter	Description
–a[mode]	This is a 1- to 5-digit numeric field setting the mode for the host port. *Mode should be zero.*
–c[parity]	This is a 1-digit numeric field setting parity and number of data bits. *The default is no parity/8 data bits.* Valid values are: ▪ 0 No parity/8 data bits ▪ 1 Odd parity/7 data bits ▪ 2 Even parity/7 data bits
–d[stopbits]	This is a 1-digit numeric field setting stop bits. *The default is one stop bit.* Valid values are: ▪ 1 One stop bit ▪ 2 Two stop bits ▪ 3 One and one half stop bits
–e[delimiter]	This is a 1- or 2-digit numeric field specifying the collating sequence number of the character used to mark the end of all records sent from the controller to the host. A delimiter of "0" specifies no end-of-record delimiter. *The default is a Carriage Return (CR).* ***Example:*** "E10" changes the end-of-record delimiter to an ASCII line-feed (LF) character. The ASCII collating sequence number of a CR is 13.
–f[block size]	This is a 1- to 3-digit numeric field specifying the minimum host block size. It does not include the end-of-record delimiter character. Records shorter than block size are padded to the block size and the delimiter character is appended. This option forces the controller to send fixed-length blocks to the host.

Table 2-17 (Continued)
Asynchronous Host

Parameter	Description
–g[pad char]	This is a 1- to 3-digit numeric field specifying the collating sequence number of the character that should be used to pad short blocks when a minimum block size is specified. *The default is a space.* (The collating sequence number of an ASCII space is 32).
–h[ready char]	This is a 1- to 3-digit number field specifying the collating sequence number of the character that the host sends to the controller to indicate it is ready to receive. ***Example:*** –h17 could change the ready character to an XON character.
–i[read time-out]	This is a 2- or 3-digit numeric field specifying the maximum time in seconds, that the controller waits for a response from the host. Valid values are 10–120.
–j[host -delay]	This is a 1- or 2-digit numeric field specifying a delay in hundredths of a second increments, before the controller sends the next message to the host after receiving a ready character from the host. Valid values are 0–50.
–k[char-gap]	This is a 1- or 2-digit numeric field specifying the maximum intercharacter gap time in whole seconds allowed in a block of data sent from the host. Valid values are 1–10. *The default value is 3 seconds.*
–l[cts-gap]	This is a 1- to 3-digit numeric field specifying the maximum time in tenths of seconds that the controller waits for CTS after raising RTS. Valid values are 0–100.

Bisynchronous Host

There are no host initialization parameters for a bisynchronous host.

Port Parameters

Port parameters change the activation defaults for handheld computer ports attached to the controller for which the initialization record is intended. These changes remain in effect until the controller is rebooted. Port parameters are placed in the initialization record after the system and host initialization parameters.

Port parameters have the following general format.

```
@[port], [porT-type], activation parameters
```

- **[port]** is a 1-digit number (1–3) specifying the handheld computer port.
- **[port type]** is a 1-digit number specifying the port type. Valid port types are:
  - 2 – ADCCP,
  - 3 – TTY, and
  - 4 – LAN (NPCP)
- **"Activation parameters"** can be the same as those parameters allowed in an activation record for the port type specified. (See page 2-23).

If a port is defined as both TTY and ADCCP, the type named in the initialization record port parameter becomes the current active type. If both types are specified successively, the last type named will be the current active type.

Record Examples

Asynchronous Host Example

```
/2 –S4 –C0 @1,2,–B2400,@2,3,–M1/
```

- "–S4" Disables data translation on all ports on the controller.
- "–C0" Specifies 8 data bits/no parity.
- "@1,2,–B2400" Changes the default speed of port number 1 to 2400 BPS. Port 1 is an ADCCP port.
- "@2,3,–M1" Changes the default modem type on port number 2 to an NM2400A. Port 2 is a TTY port.
- "/" The end of the string terminating the initialization data. The slash is required only if the record is not padded with spaces.

Bisynchronous Host Example

```
2 –S36 @1,2,–E32/
```

- "–S36" Disables data translation on all ports on the controller and enables the device channel option.
- "@1,2,–E32" Sets the maximum ADCCP polling addresses on port 1 to decimal 32.

System Mode Parameters

You use system mode parameters to select controller operational modes. The system mode is stored in CONFIG.NCC on the controller's system disk. Most of the parameters can be modified with the user interface or overridden with the initialization record sent from the host.

See Section 5 and page 2-37 for information on which parameters can be changed and how to change them. A majority of these parameters should be set when the controller is installed.

A mode of operation must be determined before the host communications program is coded. Mode parameters are associated with a value, and the associated option can be turned on by "adding in" the value for a specific parameter to the mode.

EXAMPLE: If the system mode is 104 (8 + 32 + 64), then boot processing, 2-byte channel IDs, and remote controller IDs are enabled.

The system mode is stored in the CONFIG.NCC file. If no mode is stored, then *the default system mode is:*

- 0 If a LAN port is not defined on the controller
- 8 If a LAN port is defined

Table 2-18
System Mode Parameter Codes

Value	Description
0	All mode parameters are set off
1	EBCDIC host. The controller automatically determines if the host is EBCDIC or ASCII if this field is not added in.
4	Transparent mode on all ports. This parameter only applies to EBCDIC hosts. When this option is added in, ASCII/EBCDIC data translation is disabled on all ports. Data translation can be enabled or disabled for individual ports.
8	Boot 4000 Series Hand-Held Computers in a LAN directly connected to the controller. This option is automatically enabled when a LAN port is installed and a list of boot files exists on the controller's system disk.
16	Debug mode. This option is reserved for diagnostic use.
32	2-byte channel option. When this option is added in, all records sent to the host are preceded by a 2-byte channel identifier. The 2-byte channel option is required if any of the remote controllers in the network have more than one hand-held computer port.

Table 2-18 (Continued)
System Mode Parameter Codes

Value	Description
64	Forwards ID records from remote controllers to the host. This option must be "on" if the 2-byte channel option is enabled.
128	Controller file processing. When this option is added in, the host is prompted with file requests at the beginning of a host-controller communications session.
256	Forwards port activation requests from remote controllers to the host. This option should be enabled only if it is necessary for the host computer to send activation parameters to ports on remote controllers. Normally, the host does not need to see activation requests from remote controllers, unless the remote controller is directly cabled to a host controller which is directly connected to the host computer.
512	Local controller ID. When this option is added in, the local controller begins a communications session with the host by sending an ID record. The host then responds with an initialization record. This option should normally be disabled, because it prohibits the host from using initialization record parameters to tailor the host-controller interface. When this option is enabled, the EBCDIC host option must be set for EBCDIC host computers.
1024	Force autoanswer for remote controllers. When this option is enabled, a remote controller always answers the phone, even when no hand-held computers are ready to communicate. If this option is not enabled, a remote controller will not answer the phone unless a hand-held computer is ready.
2048	The secondary controller is direct-connected. This option applies only to remote controllers. If this option is enabled, a controller which is connected to a hand-held computer port on a host controller always holds up the link to the host controller.

Table 2-18 (Continued)
System Mode Parameter Codes

Value	Description
4096	Deactivate Request ON. Async only. If deactivate requests is "on", the controller periodically sends a deactivate request to the host for each enabled autoanswer port not currently active (such as a port waiting for a phone call). The host can then time window port configurations, see pages 2-14 and 2-18.
8192	Cyclic Redundancy Check (CRC) is "on". (Async only) If CRC is "on", the controller appends two CRC characters to the end of the upload data (type 0) records. The host is also expected to append two characters to the end of download data blocks (type 0).

System Configuration File – CONFIG.NCC

Configuration parameters for the controller are stored on the system diskette in a file called CONFIG.NCC. Most of the CONFIG.NCC parameters can be modified with the front panel user interface.

CONFIG.NCC is a DOS-compatible ASCII file. The file is composed of records which are delimited by a CR and LF character. Each record in the file begins with a 1-byte record identifier in the first column, which is followed by required or optional parameters.

Required parameters are separated by commas and may be null. Optional parameters are preceded by a dash and 1-byte parameter type.

Numeric parameters are enclosed in [ ] brackets. Character parameters are enclosed in double quotes. Optional parameters are enclosed in [ ] brackets. Comment lines are preceded by an *.

" NOTE: *The CONFIG.NCC parameters are not intended to be directly modified by the user and are not defined in this guide.*

Valid record formats are illustrated below.

```
*This is a comment record
*
S,[system mode],"8-character identifier"
*
*–p– records define ports  port 0 – the host port.
*
P,[minor]
*
*–T– records define the port type.
*
T,[type],[run mode],"name","command line parms"
*
*–A– records store activation parameters for the port.
*
A,[type],{activation parameters}
*
*–L– records load modules (for example a port driver)
*
L,"name"
*
*–R– records execute modules.
*
R,[run mode],[0],"name","command line parms"
*
*port 1 the first logical hand-held computer port.
*
P,[minor[
T,[type],[run mode],"name","command line parms"
A,[type],{activation parameters}
L,"name"
R,[run mode],[priority],"name","command line parms"
*
*Note: up to two types (ADCCP and TTY) can be defined.
*
T,[type],[run mode],"name","command line parms"
A,[type],{activation parameters}
L,"name"
R,[run mode],[priority],"name","command line parms"
*
*Port 2 – the second logical hand-held computer port
*
P,[minor[
T,[type],[run mode],"name","command line parms"
A,[type],{activation parameters}
L,"name"
R,[run mode],[priority],"name","command line parms"
*
*Port 3 is not defined
*
```

Controller Error Status Codes

End of Session Status Codes

An End of session record is sent to the host at the end of each hand-held computer session. End of session status codes are ASCII or EBCDIC numeric characters and are listed below.

Table 2-19
End of Session Status Codes

Code	Description
0	Good status
1	Abort. The port connection was lost.
4	Disconnect. The session was disconnected, probably due to a datalink protocol error.
8	Hand-held computer logic error. The hand-held computer detected a logic error in the file transfer process. Status information from the hand-held computer follows the status code.

Activate Request Status Codes

An activate request record is sent to the host whenever a port is inactive. The request contains a status code indicating the state of the previous activation attempt or connection. The status codes are ASCII or EBCDIC numeric characters and are listed below.

Table 2-20
Activate Request Status Codes

Code	Description
0	No status (first request only)
1	Abort. The physical connection was lost. A port deactivates normally with an abort status when no hand-held computers are active on the port.

Table 2-20 (Continued)
Activate Request Status Codes

Code	Description
2	No answer.
3	Modem configuration error or bad modem status.
4	Disconnect.
5	Activation parameter error.
6	General port activation error.
7	Autoanswer timeout. If a timeout is defined for a hand-held computer port, and the timeout period expires with no activity, the port deactivates with a timeout status code.
9	Line busy.

Host File Directive Status Codes

Currently, four types of file directives are implemented on the controller. After a directive is completed, successfully or unsuccessfully, the controller sends a directive status record to the host containing the directive type and a 1-byte status code. The status codes for the file processing directives are ASCII or EBCDIC 1-byte characters and are listed below.

Table 2-21
Host File Directive Status Codes

Code	Description
0	Good status
A	File open error.
B	File read error.
C	File write error.
D	The maximum number of files exceeded on a create operation.

Table 2-21 (Continued)
Host File Directive Status Codes

Code	Description
E	The maximum number of open files exceeded on a file open operation.
F	File not found error.
G	Bad file handle (internal only).
H	File in use error. A file cannot be overwritten with a create operation or deleted while it is in use. This situation could occur if a file was used to boot a hand-held computer when the host attempted to recreate the file.
I	File not open error (internal only).
J	File allocation error.
K	End of file (internal only).
L	File directory error.

Section 3

Equipment Interfaces

Modem Support

The controller supports a number of Hayes-compatible modem types with respect to configuration and autodial. Any support provided is subject to changes made in the modem interface by the modem vendor.

Currently, supported modems are as follows:

- 0 No modem/unsupported modem
- 1 NORAND® NM2400A
- 2 NORAND NM2400 — TTY only
- 3 Hayes 1200
- 4 Hayes 2400
- 5 Codex 2260
- 6 NORAND 9600 V.32

The NORAND NM2400 is supported for TTY communications only. Automatic fallback is not supported for the NM2400. The NM2400 must be configured for Hayes mode communications.

If a modem type is defined for a controller port, the controller follows the following steps each time the port is activated:

1. A reset string is sent to the modem. The reset string is currently “AT&F” for all modem types.
2. A string is sent to the modem to disable command echoing and to set the modem response mode. The controller recognizes only digital responses. Currently, the response mode string is “ATE0X4V0” for all modem types.
3. An “AT” is sent to the modem to determine whether the modem is responding correctly.
4. A configuration string is sent to the modem. The default configuration string depends on the modem type and can be found in Table 3-1.
5. If a phone number dial sequence is sent as an activation parameter, the controller prefixes “ATD” to the dial sequence and sends the sequence to the modem.
   - Begin the dial sequence with a “T” or “P” to specify tone or pulse dial respectively.
   - A “W” embedded in the dial digits inserts an arbitrary wait.
   - A “P” embedded in the dial digits forces the modem to wait for a second dial tone.

   The “W” is the recommended method for inserting a pause for a second dial tone.

EXAMPLE: T9W13128880000

The leading “T” indicates a tone dial. The embedded “W” tells the modem to wait. This allows you to use phones which require a special number to be dialed before connecting you to an outside line.

6. On ADCCP ports only. “ATS0=0” is sent to disabled autoanswer on the port when the port is inactive. Autoanswer is automatically disabled on TTY ports when the port is inactive.

Table 3-1 lists the default configuration string and configuration speed for each modem type for ADCCP and TTY ports.

Table 3-1
Configuration Strings for Modems

Port Type	Modem Type	Config. Speed	Configuration String
ADCCP	1	2400	AT&C1&M1&R1S0=1
ADCCP	2	2400	AT&C1&M1&R1S0=1
ADCCP	3	1200	AT&C1&M1&R1S0=1
ADCCP	4	2400	AT&C1&M1&R1S0=1
ADCCP	5	9600	AT&C1&M1&R1*AA5S0=1
ADCCP	6	9600	AT&C1&D2&M1&R1S0=1
TTY	1	2400	AT&C1&D2&M0&R1S0=1
TTY	2	2400	AT&C1&D2&M0&R1S0=1
TTY	3	1200	AT&C1&D2&M0&R1S0=1
TTY	4	2400	AT&C1&D2&M0&R1S0=1
TTY	5	9600	AT&C1&D2&M0&R*AA5S0=1
TTY	6	9600	AT&S1&C1&D2&M0&RS0=1

Both ADCCP and TTY ports fall back to the connect speed of the modems automatically. Note that a NORAND 9600 V.32 modem can connect to another NORAND 9600 V.32 modem or to a NORAND NM2400A. Also, a NORAND NM2400A can connect to another 2400A or to a NORAND full-duplex 1200-bps acoustic coupler.

Front Panel Run-Time Display

The front panel display on the controller records the status and type of each port on the controller. The display specifies:

- The logical port number of each port implicitly.
- The physical connector to which each logical port is assigned.
- The type of each port.
- The state of each port.

The display for each port is four columns wide by two rows long.

- The ports are displayed in logical port order from left to right. The first port is always the host port. Handheld computer ports 1–3 follow.
- The left-most character in the first row for each port specifies the physical connector to which the port is connected. The connectors are labeled “A”, “B”, “C”, or “D”. “A” refers to the 15-pin connector labeled “A” and the two 9-pin connectors labeled “LAN1” and “LAN2”, since all three connectors are attached to the same internal port.

  If the port type is LAN, then the LAN connectors are automatically selected. Otherwise, the 15-pin RS-232 connector is selected.
- The type of each port is specified in character positions “2” and “3” in the first row for each port. Position “3” specifies the alternate port type for ADCCP/TTY ports.

  Possible port types are:

  - 0 Bisynchronous host
  - 1 Asynchronous host
  - 2 Primary ADCCP
  - 3 TTY
  - 4 LAN (NPCP)
  - 5 Secondary ADCCP

- The state of each port is specified in character position "1–3" in the second row for each port. Possible states are:
  - **OFF** Disabled status
  - **INA** Inactive status
  - **RDY** *on a host port.* Indicates that the port is ready to connect to the host. The host cannot begin a session with the controller until the status is RDY.
  - **RDY** *on a hand-held computer port.* Indicates that a hand-held computer is ready to communicate on a hand-held computer port of a remote controller.
  - **ACT** Active status. A port is active when a hand-held computer attached to the port has established a session with the host.

In the above sample:

- The host port is configured as secondary ADCCP and is attached to the 15-pin connector labeled "B" on the back of the controller. The port is in a "ready" state.
- Port 1 is configured for the LAN and must be attached to the 9-pin connectors labeled "LAN1" and "LAN2". (The connectors are tied together and are identical, except that LAN1 provides power to terminals in a multidock.) The port is in a "ready" state which indicates that a hand-held computer on the LAN is ready to begin a session with the host computer.
- Port 2 is a TTY/ADCCP port attached to connector "C" and is inactive. The primary type is TTY and the alternate type is ADCCP.
- Port 3 is disabled.

Section 4

Other Features

This section covers several of the more advanced processes and features that are available with the controller.

Controller-Based File Processing

The controller can store up to 30 data files on the system diskette. The total file size must not exceed 240K. The data files may include files which boot hand-held computers.

The files are stored in a directory named “DATA”. A directory file, NCDIR.NCC, contains a 32-byte directory entry for each data file in the DATA directory.

The following is the format of a single directory entry:

Table 4-1
NCDIR.NCC Directory Entries

Position	Bytes	Description
1	8	DOS compatible filename *(Required)*
9	3	DOS compatible file extension *(Required field)*
12	6	Date field (YYMMDD)
18	4	Military 24-hour time (HHMM)
22	2	User-defined filler
24	1	User-defined file type "0" or blank – hand-held computer boot file
25	1	Translation type *(Required field)* " 0 or blank No translation " 1 Translate file data from EBCDIC to ASCII as received from host computer
26	1	File status: " 0 Defined (good) " 1 Undefined " 2 Deleted " 3 System
27	6	File length (in bytes) *Required field*

All data entry fields must contain ASCII character data.

" **NOTE:** *Directory entries which are sent in a file directive from an EBCDIC host will be translated from EBCDIC to ASCII.*

All the fields in a directory entry, except for the status field, are filled out by the user when the file is created.

The file status field indicates the current status of the file.

The filename and extension fields, translation type field, and file length field are required.

The filename and extension must be DOS compatible, left-justified, and padded with blanks. If an extension is not used, it must be blank.

The translation field applies only to file data which is sent from a host computer.

The file length field must contain the exact length of the file in bytes, must be right-justified, and padded to the left with leading zeros.

The date, time, fill, and type fields can be filled out as required by the user. Future NORAND® software products may use the fields as specified.

The following is a sample of a directory entry:

```
"MYFILE    DAT8906222322 000001064"
```

The file in the example is called MYFILE.DAT, was created on June 22 at 11:22 p.m., has a good status, and is 1064 bytes long.

Directory entries are maintained in a file in the DATA directory called NCDIR.NNN. The file contains 32-byte records with one directory entry per record. A blank directory entry must mark the end of the file.

Files on the controller can be maintained by the host computer, if "file processing" is enabled (with the controller front panel interface or with an initialization record parameter).

The controller provides three file directives for this purpose:

- Upload
- Create/load
- Delete

If file processing is enabled, the host will have the opportunity to update controller files at the beginning of each host-to-controller session.

After the host sends the initialization record, the controller will send file requests to the host until the host responds

with an end-of-data record. The host may respond to a file request with any of the three directives listed previously.

Typically, the host will use an "upload" directive to obtain the NCDIR.NCC directory file for comparison with a directory maintained on the host computer.

" **NOTE:** *The directory is sorted and sent in "upload data" records. The host then uses "delete" and "create" directives to update the controller files.*

EXAMPLE: The following is an example of a file processing session:

HOST		CONTROLLER
	<————	File processing request
NCDIR.NCC upload directive		
	————>	
	<————	Data record
	<————	Data record
	<————	Directive status record
	<————	File processing request
Delete directive	————>	
	<————	Directive status record
	<————	File processing request
Create directive	————>	
	<————	Data request
Data record	————>	
	. .	
	. .	
	<————	Data request
End-of-data record	————>	
	<————	Directive status record
	<————	File processing request
End-of-data record	————>	

" **NOTE:** *"Create" directives must contain a directory entry, and "delete" and "upload" directives must contain a filename and extension as specified on pages 2-8 and 2-14.*

" **NOTE:** *The last data record for a file must be padded with blanks if the file length is not an even multiple of 256. The pad should not be included in the file length field in the directory entry for the file.*

Booting Hand-Held Computers from the Controller

The controller can boot 4000 Series Hand-Held Computers in the LAN environment with a list of files kept in a file named NETRPL.LST.

NETRPL.LST is a data file in the controller "DATA" directory which as 11-byte records. Each record contains an 8-byte filename and 3-byte extensions.

A blank filename terminates the list of files.

When the "boot option" is in effect, the controller attempts to send all the files specified in NETRPL.LST to any terminal on the attached LAN trying to boot.

Normally, NETRPL.LST and the associated boot files are copied onto the controller's system disk with a utility provided by us. However, the host computer can maintain NETRPL.LST and the boot files with the facilities described on page 4-1.

" **NOTE:** *The controller's system disk can be damaged or left in an undefined state if the controller loses power while files are updated. It is the user's responsibility to ensure that a backup copy of the controller's system disk is always available.*

Autodialing from a Remote Controller

A remote controller can be configured to automatically dial a host controller. Note: The host port is always defined as Secondary ADCCP on a remote controller.

Autodial is enabled if a phone number and valid modem type are entered via the front panel user interface.

The user must enter a primary phone number and can optionally enter a secondary phone number. If a secondary phone number is entered, the controller will toggle to the second phone number whenever the first phone number fails to connect. The same (primary or secondary) phone number is used as long as a successful connection is made with that number.

The remote autodial can be configured with or without a dial time window.

To define a dial-time window, enter a dial-time and a cutoff time in HHMM 24-hour format via the front panel user interface.

If a time window is not defined, the controller dials whenever an attached hand-held computer is ready to communicate. If a time window is defined the controller dials only in the defined window when an attached hand-held computer is ready.

If the dial time equals the cutoff time or if the dial time is "0000", then no dial window is used. If the cutoff time is less than the dial time, then the window spans midnight.

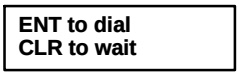
EXAMPLE: If the dial time is 2300 and the cutoff time is 0300, then the controller dials the phone only from 11 p.m. until 3 a.m. when a hand-held computer is ready.

While the controller is waiting for the dial time to be reached, the following screen appears on the front panel:

```
system time:hhmm
dial:hhmm – hhmm
```

The current system time displays on the first line and the dial window displays on the second line. When this screen is displayed, the user may press <ENT> to force an early dial.

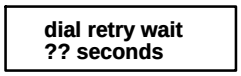
The following screen appears:



If <ENT> is pressed, the controller dials immediately. If [CLR] is pressed, the controller returns to the first display and waits for the dial time to arrive.

This feature can implement a “send data” function on the controller similar to the “send data” function on a NORAND NM277.

The controller waits 10 to 7200 seconds between dial attempts. The retry wait time can be specified with the user interface. The default wait time is 20 seconds, but a longer time is recommended. When the controller is waiting between attempts, the following screen displays:



?? is replaced by the remaining wait time in seconds. Note that the retry wait time is not intended to provide an accurate dial window, but is rather intended to reduce the number of total dial attempts.

Section 5

Front Panel User Interface

The Model 4980 Network Communications Controller ships with a default configuration. After it is installed, you can reconfigure the controller with the user interface.

This section explains how to set the various options from the front panel user interface. It includes a map of the entire menu series and describes how to move through the various menus, how to select a function, and how to use the editing features to change a parameter.

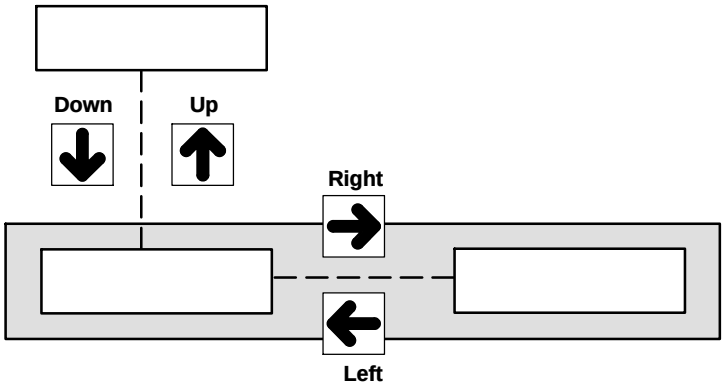


Figure 5-1
Navigating the Menus

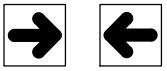
Navigating the Menus

You reach the controller's options by moving through a series of menus displayed on the screen.

The menu system is hierarchical. You can move from one menu level down through a series of subordinate menus until you reach specific operating parameters. You can return to a higher level menu from any lower level and you can view options in a particular menu.

Down Arrow: Means "Yes" or "Enter". Has the same meaning and function as the [ENT] key.

Up Arrow: Returns from a lower level display to a higher level display.



Right and Left Arrows: View displays on the same level.

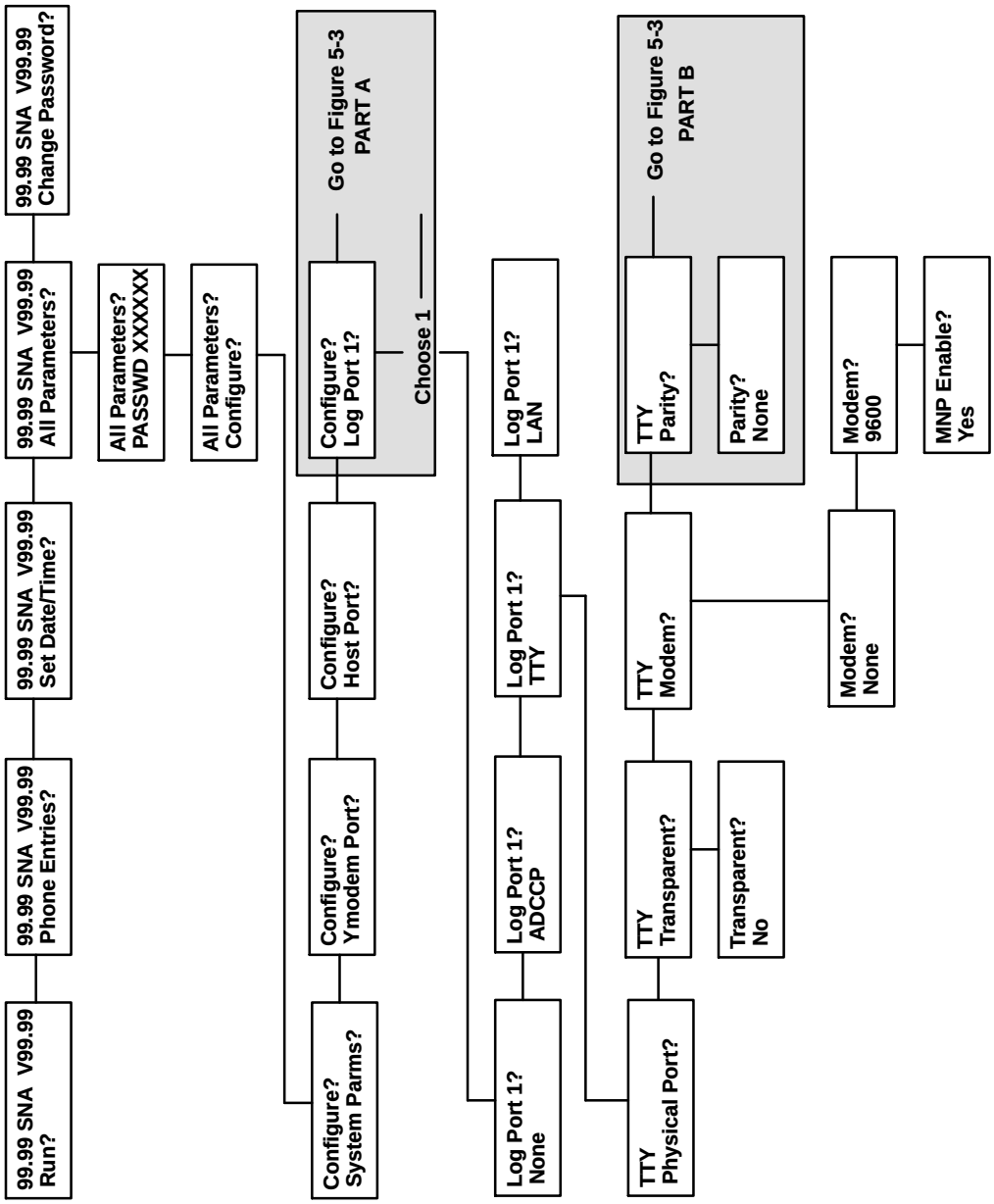


Figure 5-2

TTY Specific Parameters Overview Part 1

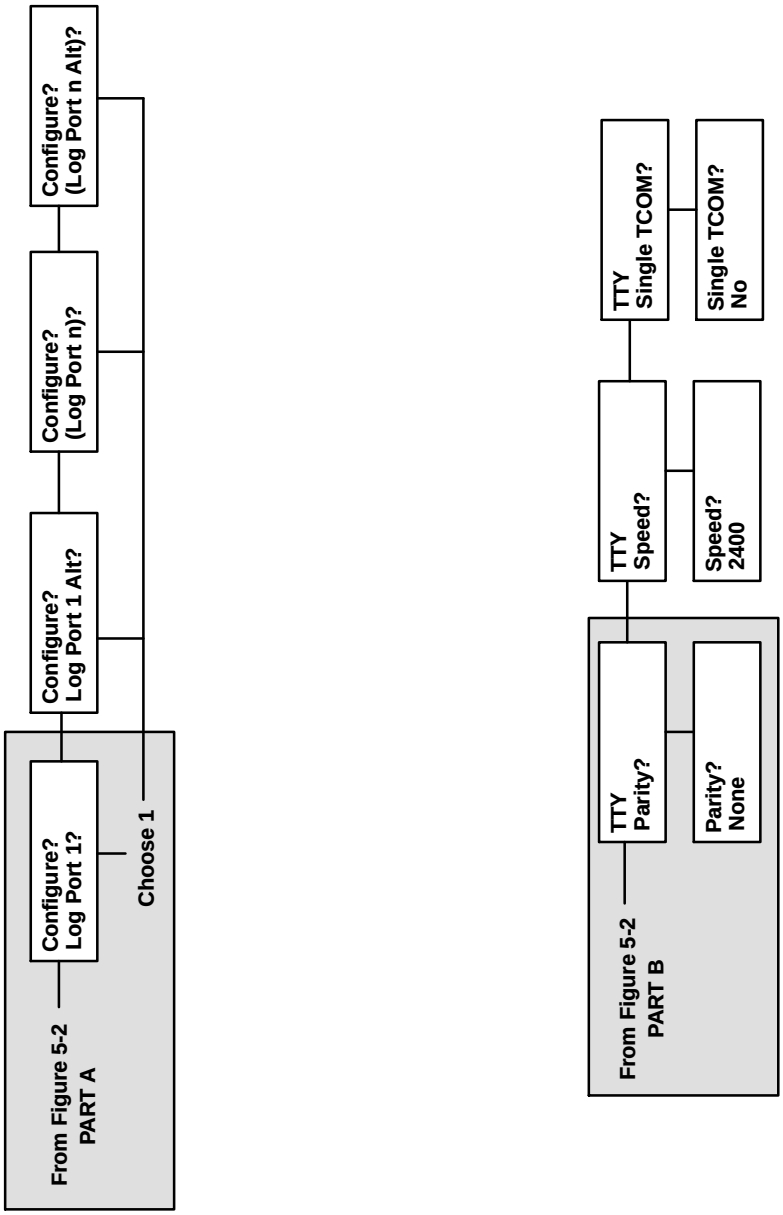


Figure 5-3
TTY Specific Parameters Overview Part 2

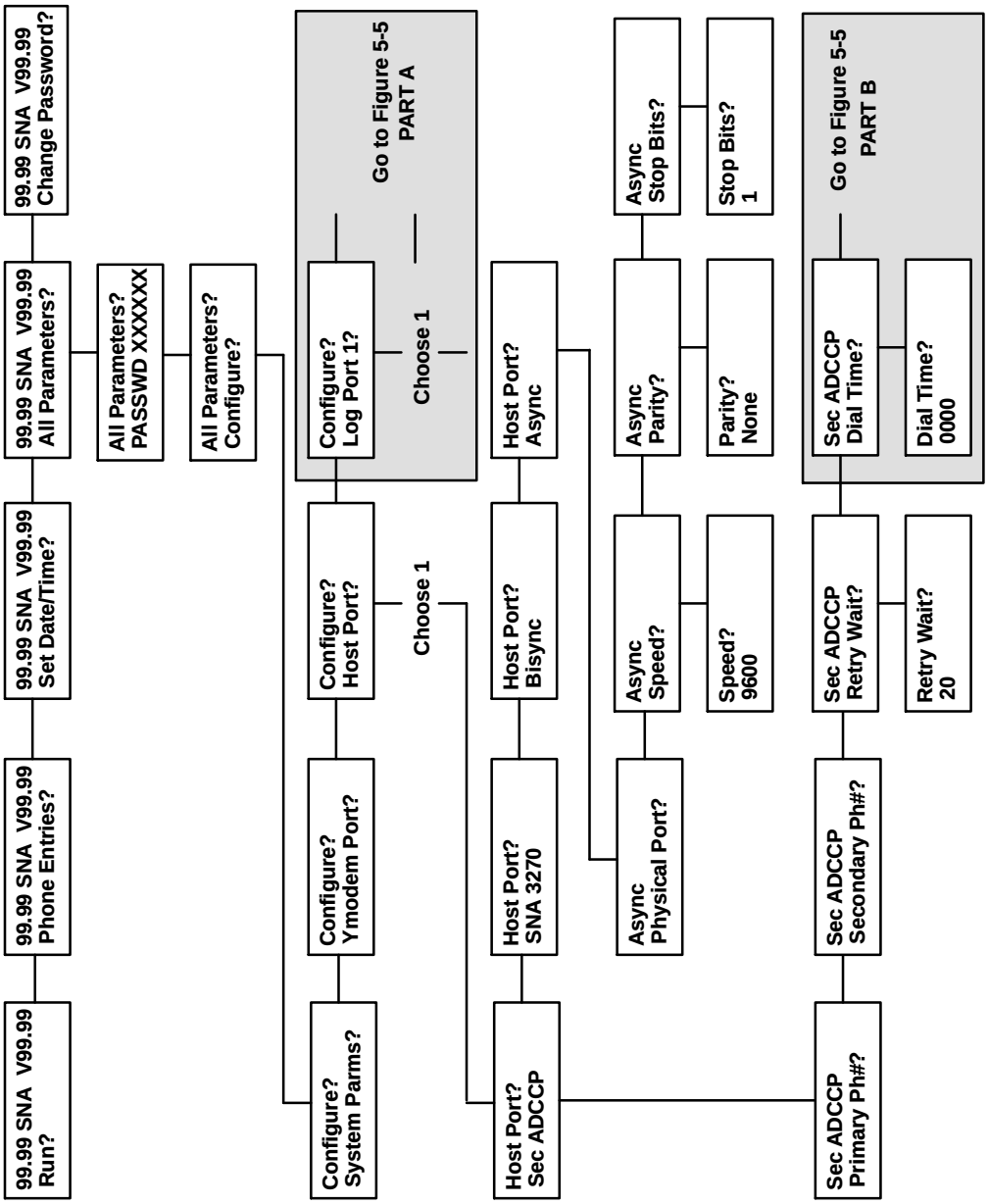


Figure 5-4

ASYNC and Secondary ADCCP Parameters Overview Part 1

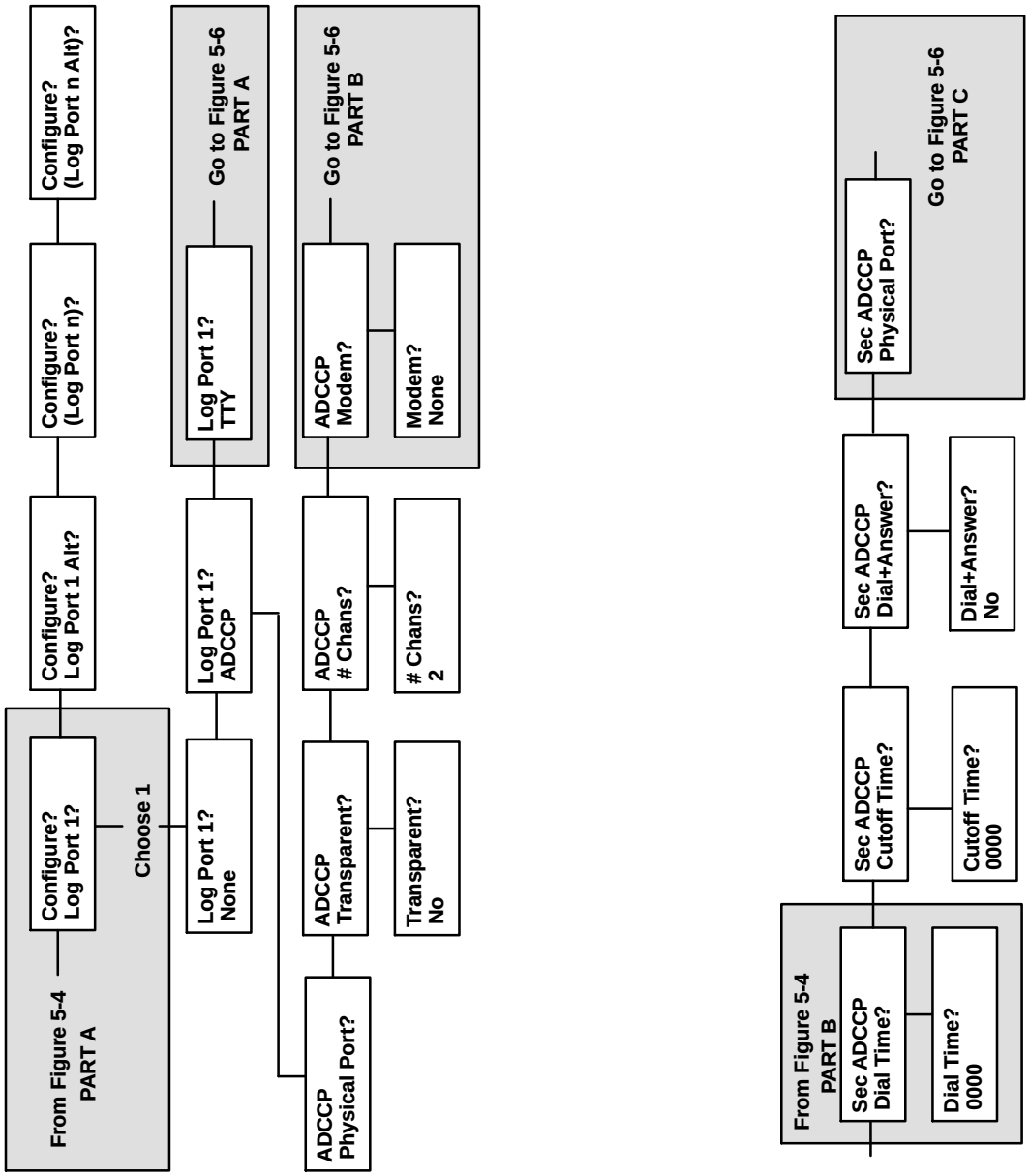


Figure 5-5
ASYNC and Secondary ADCCP Parameters Overview Part 2

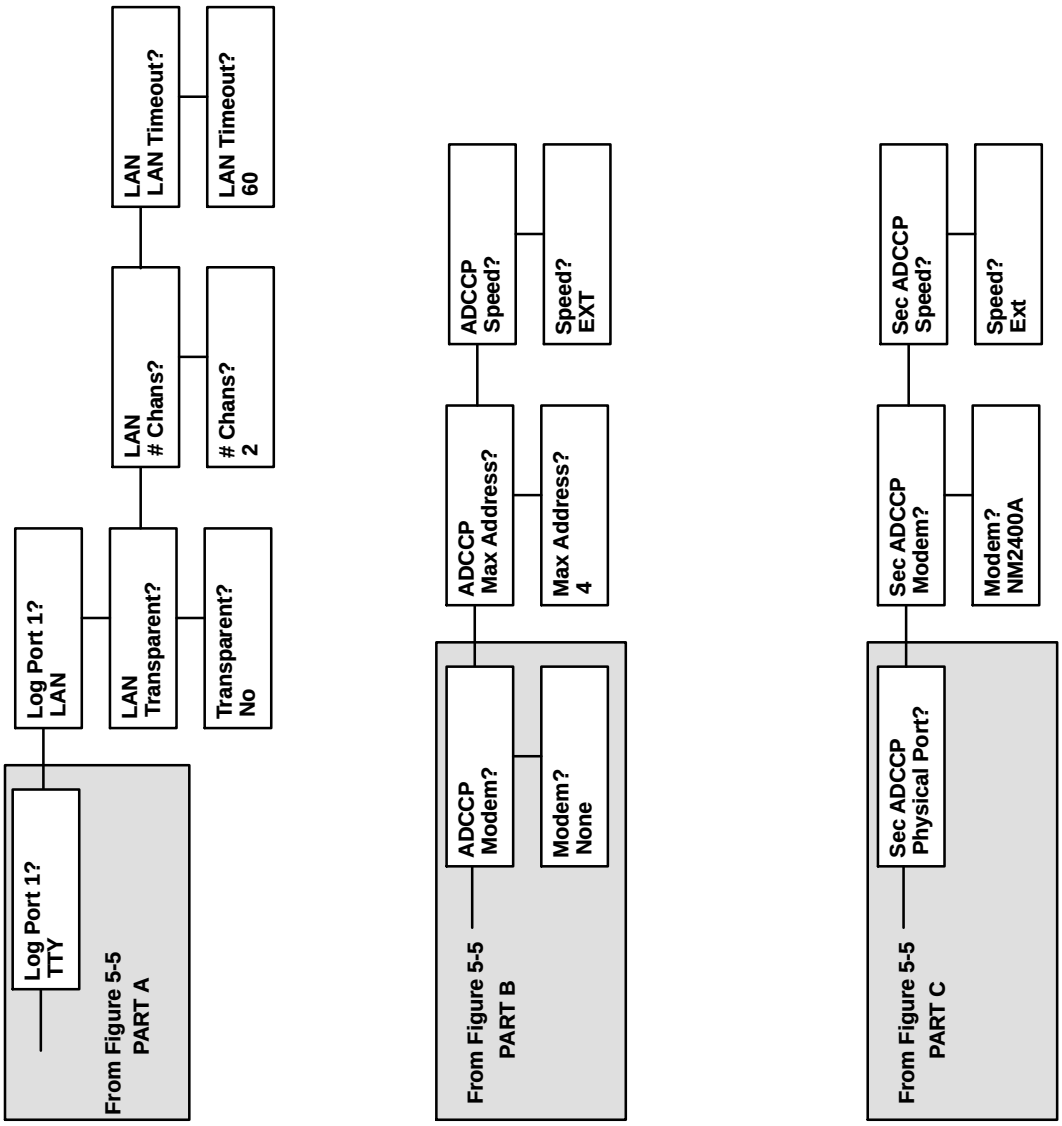


Figure 5-6
ASYNC and Secondary ADCCP Parameters Overview Part 3

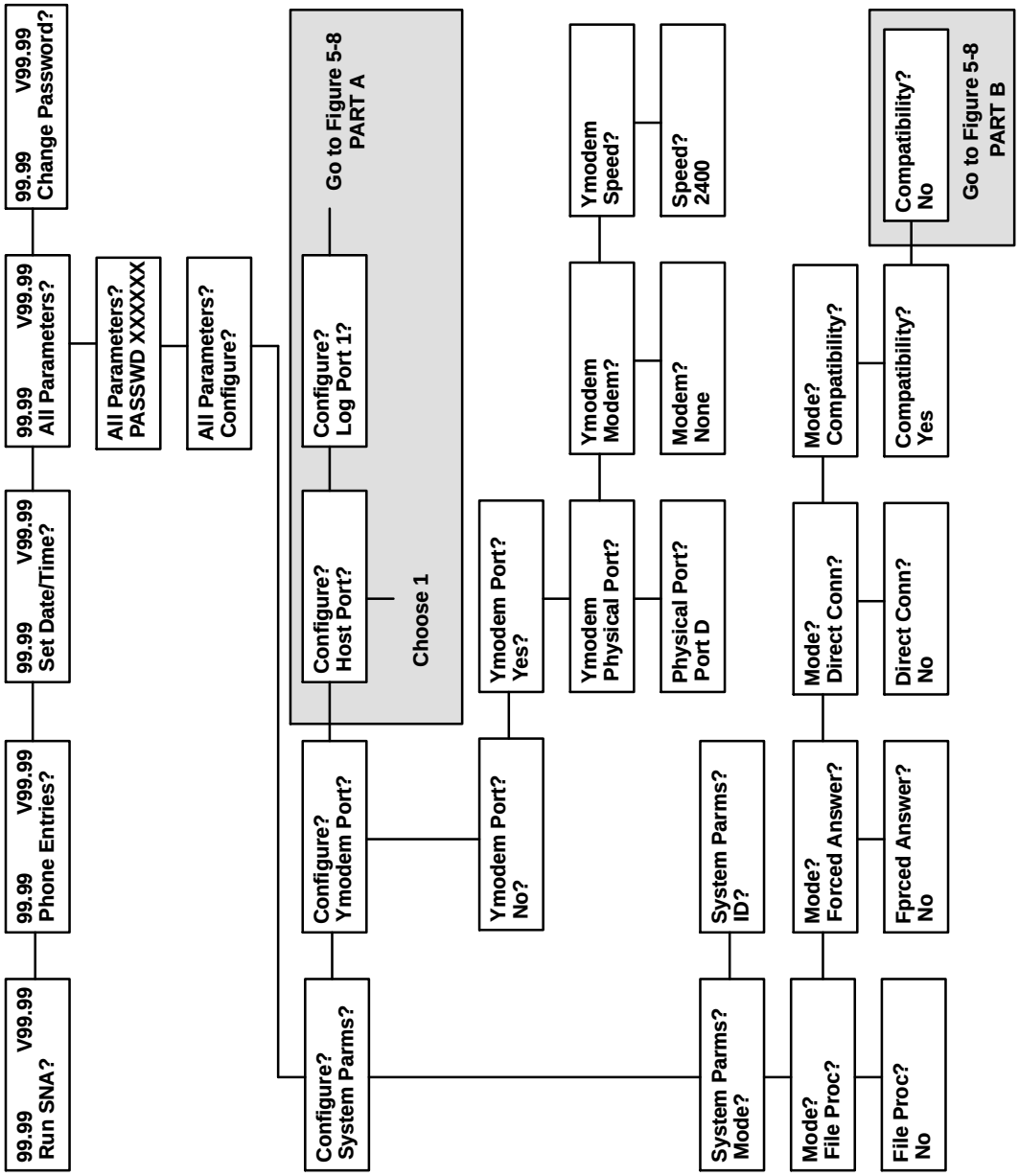


Figure 5-7

YModem, Bisync, 3270 SNA, and System Parameters Overview Part 1

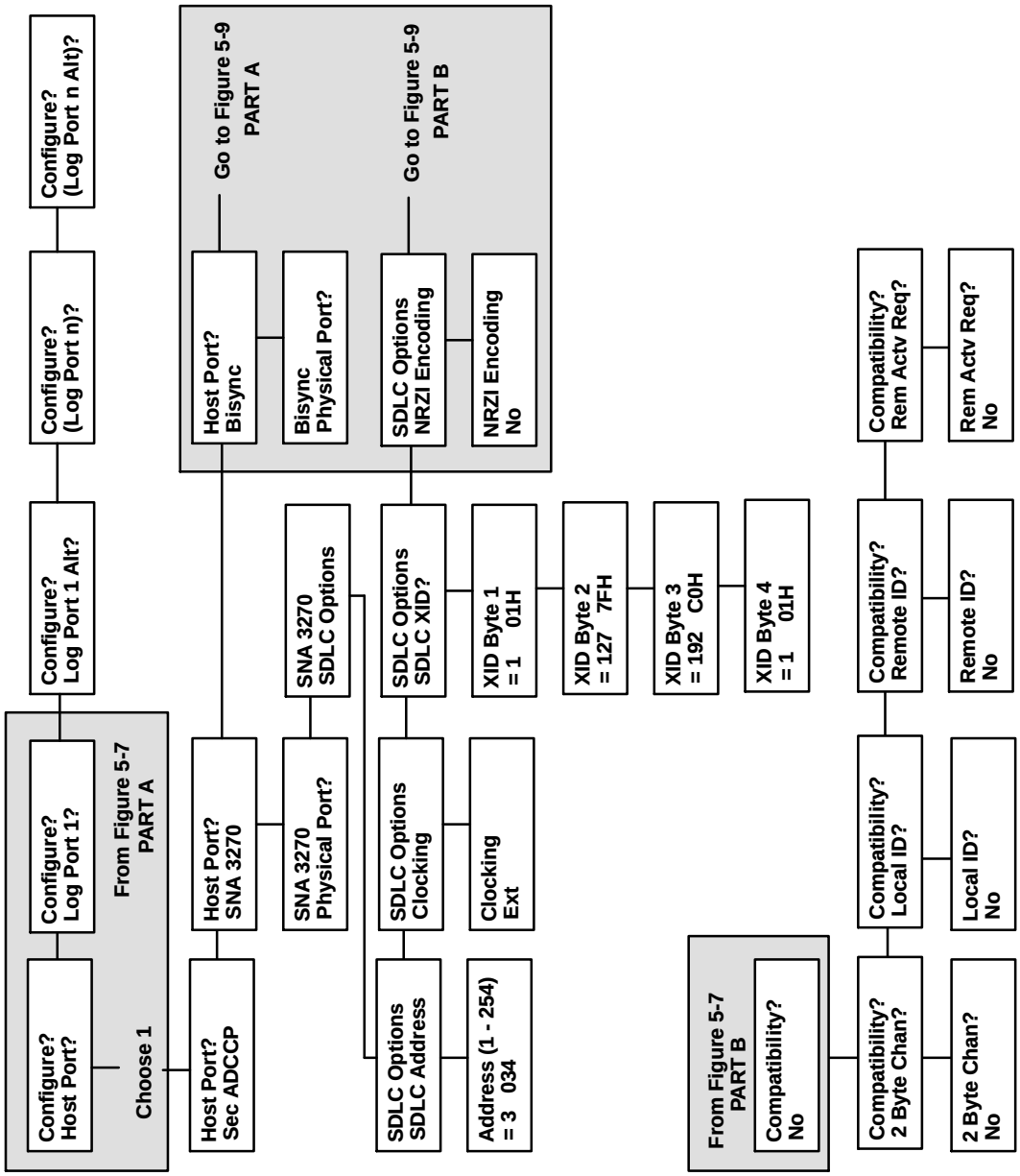


Figure 5-8

YModem, Bisync, 3270 SNA, and System Parameters Overview Part 2

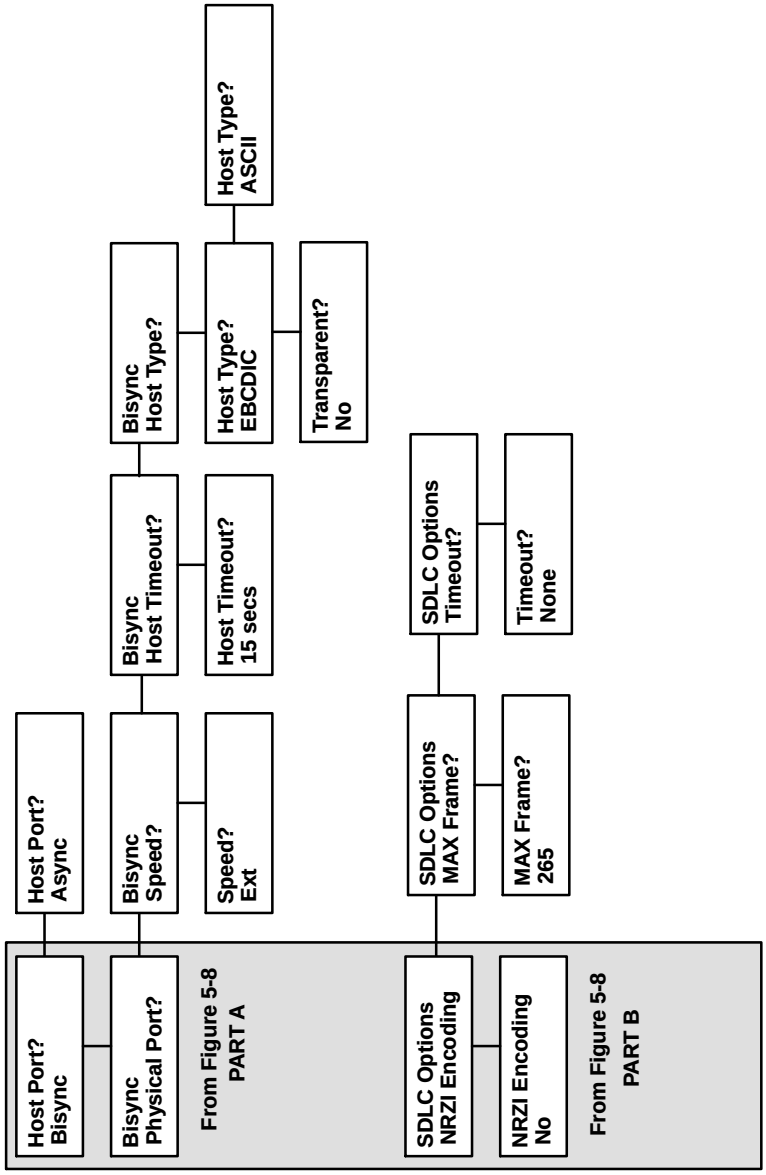


Figure 5-9

YModem, Bisync, 3270 SNA, and System Parameters Overview Part 3

The previous pages show complete menus. Each block represents a menu option. Each horizontal group of two or more blocks represents a menu. Information is given in a hierarchical format, i.e. the menu that lets you access the port parameter options is "lower" than the menu that lets you access the date and time options.

These Figures show options in the order they appear if you view them using the **RIGHT** arrow, i.e. the "Run" option appears before the "Set Parms" option.

Some options only appear with another selected option, i.e. "Phone Entries" appear in the top level menu when the host port type is Secondary ADCCP.

Not shown: "Phone entries" and "Logging Off".

1. Use the **RIGHT** or **LEFT** arrow until the "All Parameters" option appears.
2. Use the **DOWN** arrow to move to "System Parms".
3. Use the **RIGHT** or **LEFT** arrow to reach the menu.

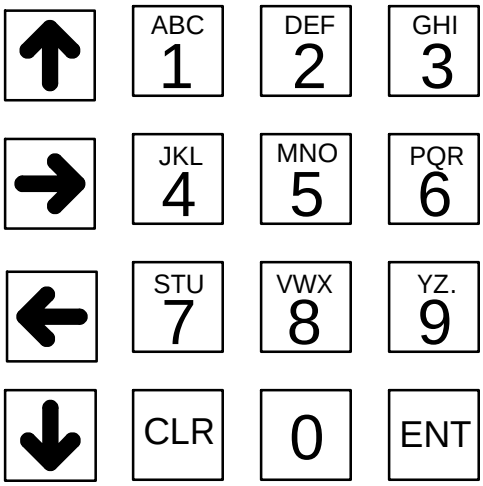


Figure 5-10
Front Panel of 4980 Controller

Selecting and Changing a Value Option

Select specific options from the lower level menus. The controller shows you the current value for that option.

You type new information to change some options. Other options are assigned a limited number of values: you scroll through specific choices and select one. The instructions that follow tell you which action to take.

- **Select a menu option:**
  At a menu level, press the **DOWN** arrow or [ENT] to reach the option to be changed.
- **List of choices:**
  Press the **RIGHT** or **LEFT** arrow to see the choices and use the **DOWN** arrow or [ENT] to select one.
- **Alphabetic characters:**
  Scroll through the alphabet with the **RIGHT** or **LEFT** arrow. Press [ENT] to accept the letter.
- **Numbers:**
  Press keypad keys.
- **Accept changes:**
  Press [ENT] or the **DOWN** arrow.
- **Cancel changes:**
  Press the **UP** arrow.

Conventions

The procedures tell you how to set the controller's options. They show you how to reach the appropriate menu options and explain the choices you have for each option. Each procedure includes a diagram of the path through the menus to the correct options.

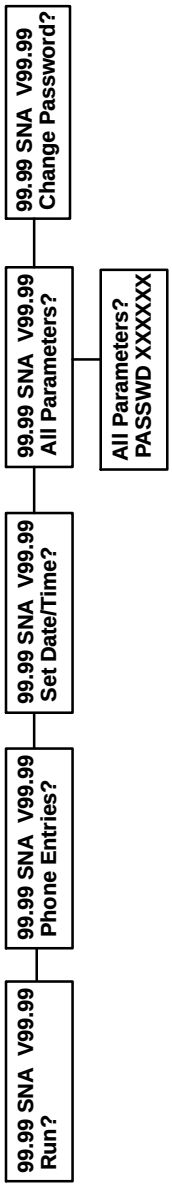


Figure 5-11
Logging On Parameters

Logging On

On power up the controller begins with the clock display. You have 20 seconds at the clock display to press a key before the controller continues initialization with the current program configuration.

A password, up to six digits, may be required to view or change options.

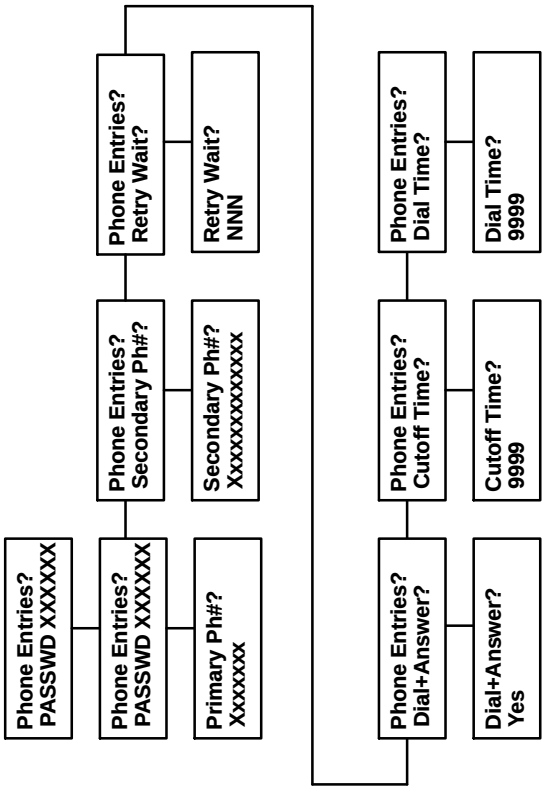


Figure 5-12
Phone Entries Parameters

Setting Phone Entries

The top level menu option "Phone Entries" appears in the list only when the controller's host port is defined as Secondary ADCCP.

1. Enter at the Phone Entries prompt in the main menu.
2. Type a password for this function, then press [ENT]. Press the **RIGHT** or **LEFT** arrow to move between the following parameters:

Primary Ph#?
The primary phone number to be dialed first by the modem.

1. Press the **DOWN** arrow to advance to the phone number entry.
2. Enter one of three letters to indicate the type of phone being dialed — "P" (pulse dial), "T" (tone dial), or "W" (wait — if using an internal business phone system, key in a "9", then a "W.")
3. Key the rest of the phone number, then [ENT].

Secondary Ph#?
The secondary phone number to be dialed by the modem only after the primary phone number has failed to answer after three retries.

Retry Wait?
The length of time (in seconds) the controller is to wait between calls. *Maximum time: 7200 seconds*

Dial Time?
The time (based on military 24-hour clock) when the controller is to begin automatic dialing, i.e. 1600 = 4:00 pm.

Cutoff Time?
The time when the controller is to stop automatic dialing.

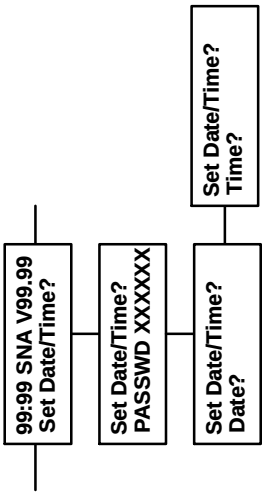


Figure 5-13
Date and Time Parameters

Setting Date and Time

You can set the systems date and time from the controller's user interface.

1. Follow the map to the date and time menu.
2. Press the **RIGHT** or **LEFT** arrow to reach the option you want to see.
3. Press the **DOWN** arrow to select a particular option.
4. Press the **UP** arrow to return to a higher level menu.

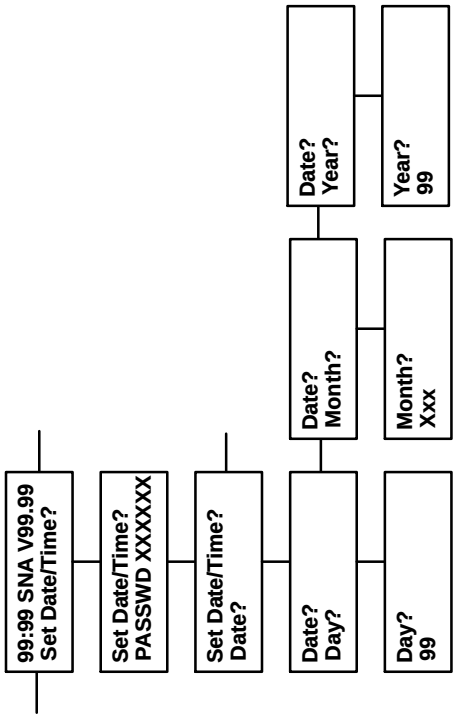


Figure 5-14
Additional Date Parameters

Date

Figure 5-14 shows the choices you have for setting the date. Follow the general editing instruction on page 5-13.

1. To reach the date menu, press the **DOWN** arrow at the "Set Date/Time?" screen.
2. Press the **DOWN** arrow at the "Date?" screen.
3. The "Day?" screen appears. To see the "Month?" screen, press the **RIGHT** arrow. To see the "Year?" screen, press the **RIGHT** arrow again.
4. Press the **DOWN** arrow to select an option.

Day?
Two-digit day of the month. Use the numeric keys to type the day, use [CLR] to erase a number.

Month?
Abbreviation of the month's name. Scroll through the names using the **RIGHT** or **LEFT** arrows.

Year?
Last two digits of the year. Use the numeric keys to type the year, use [CLR] to erase a number.

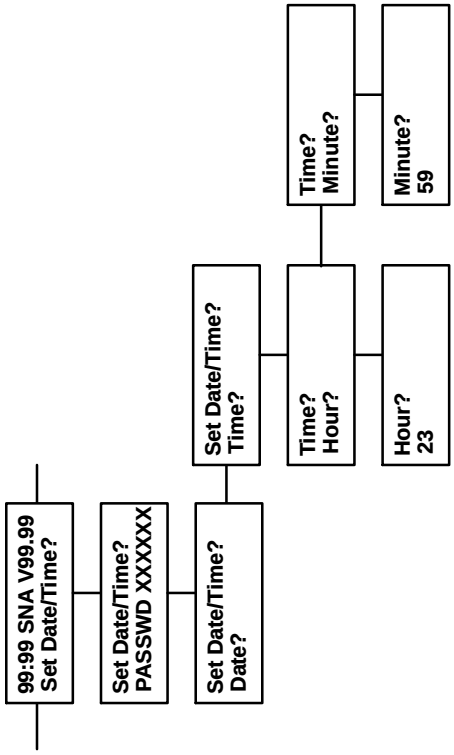


Figure 5-15
Additional Time Parameters

Time

Figure 5-15 shows the choices you have for setting the time. Follow the general editing instructions on page 5-13.

1. To reach the "Time" menu, press the **DOWN** arrow at the "Set Date/Time?" screen.
2. At the "Time?" screen, press the **DOWN** arrow.
3. The "Hour?" screen appears. To see the "Minute?" screen, press the **RIGHT** arrow.
4. Select an option by pressing the **DOWN** arrow.

Hour?
Two-digit hour of the day. Use the numeric keys to type the hour. Use [CLR] to erase a number.

The controller uses a 24-hour clock; both digits must be typed. If the hour is 5:00 PM, type "17". If the hour is 3:00 AM, type "03".

Minute?
Two-digit minute of the day. Use the numeric keys to type the minute. Use [CLR] to erase a number.

Both digits must be typed. If the time is 4:05 PM, type "05".

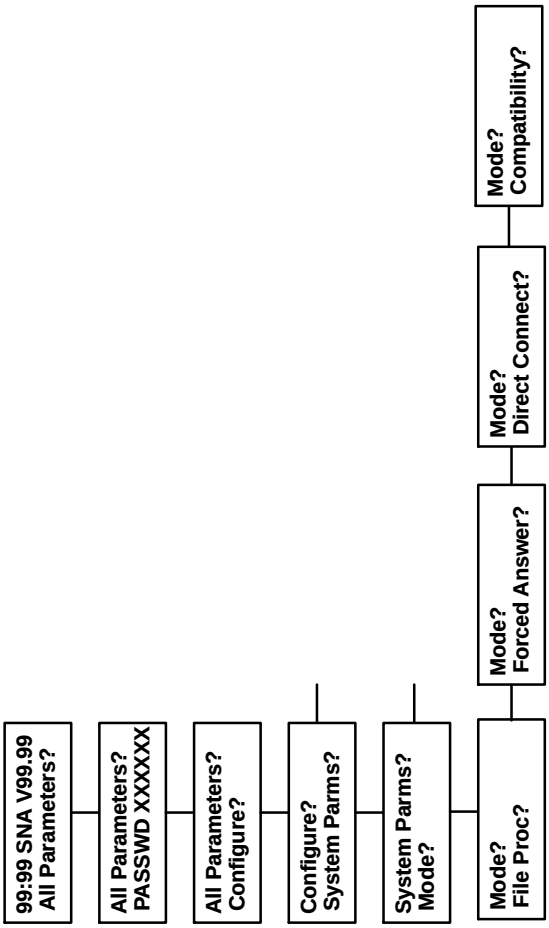


Figure 5-16
System Mode Parameters

Define System Mode Parameters

The system mode parameters define some of the host's characteristics for the controller and other features that affect the controller's operations.

1. Follow the map to the system parameters menu.
2. Press the **RIGHT** or **LEFT** arrow to reach the option you want to see.
3. Select an option by pressing the **DOWN** arrow.
4. Press the **UP** arrow to return to a higher level menu.

Follow the general editing instructions on page 5-13. In all cases, toggle between "Yes" and "No" using either the **RIGHT** or **LEFT** arrow.

File Proc?
Enables file processing — YES (enable file processing) or NO (do not enable file processing).

Forced Answer?
Forces the controller to answer even if it has no data to send — YES (force answer) or NO (do not force answer).

Direct Conn?
Indicates that the secondary controller's host port is directly connected to a host controller. Use this option only when the host port is defined as Secondary ADCCP — YES (controller is direct-connected) or NO (controller is not direct-connected).

Compatibility?
Enables or disables the next four options — YES (do not show the next four options) or NO (show the next four options).

When compatibility is set to "No" the menu selections in Figure 5-17 (on the next page) become available.

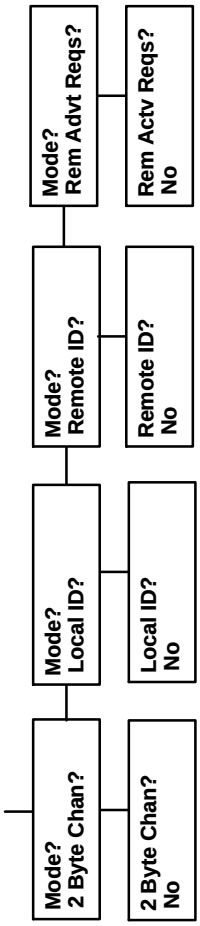


Figure 5-17
System Mode Compatibility Parameters

2 Byte Chan?
A two-byte logical channel ID is used — YES (use the 2-byte channel ID; "Remote ID" must be YES) or NO (use a 1-byte channel ID). *Default is NO*

Local ID?
The controller directly connected to the host begins the communications session with the host by sending an identification record — YES (send the ID; EBCDIC host option must be accurate) or NO (do not send ID). Normally, this should be "No." *Default is NO*

Remote ID?
Forward identification records from remote controllers to the host controller — YES (send remote identification records) or NO (do not send remote identification records). *Default is NO*

Rem Actv Reqs?
Remote activation requests. The controller forwards remote port activation requests to the host — YES (forward requests) or NO (do not forward requests). *Default is NO*

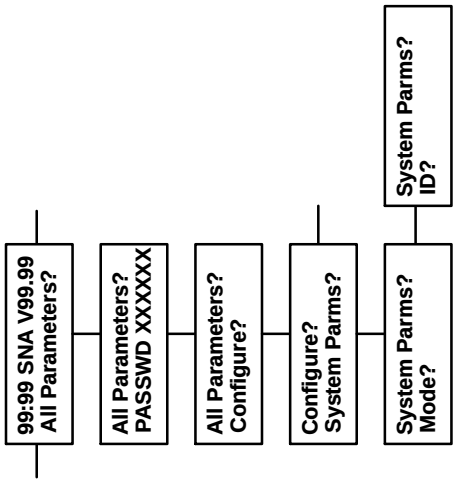


Figure 5-18
Controller ID Parameters

Set the Controller ID

You may set a specific controller ID at this option. Figure 5-18 shows the path to take to reach the "ID" screen from the clock display.

1. At the clock display, press the **DOWN** arrow.
2. At the "Run?" screen, press the **RIGHT** arrow.
3. At the "Set Parms?" screen, press the **DOWN** arrow.
4. At the "PASSWD" screen, type your password and press the **DOWN** arrow.
5. At the "Configure?" screen, press the **DOWN** arrow.
6. At the "System Parms?" screen, press the **DOWN** arrow.
7. At the "Mode?" screen, press the **RIGHT** arrow.
8. The "ID?" screen appears, press the **DOWN** arrow to see or change the controller's ID.

ID?
The controller's ID. The length may be zero to eight characters. Both numbers and uppercase letters may be used. If the ID is less than eight characters, it is padded with blanks.

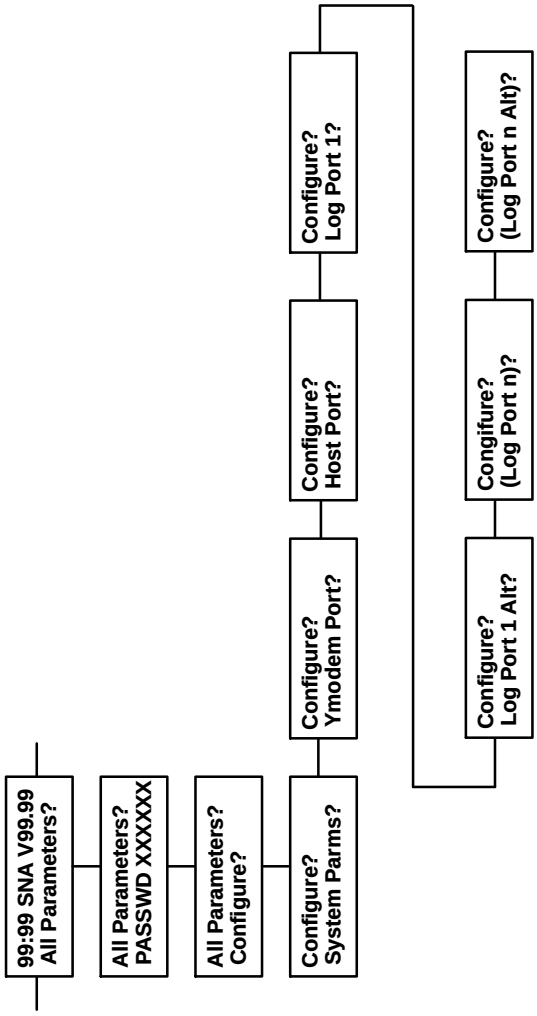


Figure 5-19
Port Parameters

Configuring Port Parameters

The controller's ports consist of a host port, up to three logical ports, and up to three alternative logical ports.

The host port connects the controller either to the host computer or to the next controller up the line. The logical ports connect peripheral devices to the controller.

If you define a logical port as either ADCCP or TTY, you can define an alternate logical port of the other type. This allows the host computer to dynamically change the port type with a port activation parameter. The primary port type is the active port type.

Each port must be assigned a physical port (A, B, C, or D) that corresponds to the appropriate connector on the back of the controller. A physical port can be assigned to only one logical or host port per controller.

1. Follow the map to the port parameters menu.
2. Press the **RIGHT** or **LEFT** arrow to reach the option you want to see.
3. Press the **DOWN** arrow to select a particular option.
4. Press the **UP** arrow to return to a higher level menu.

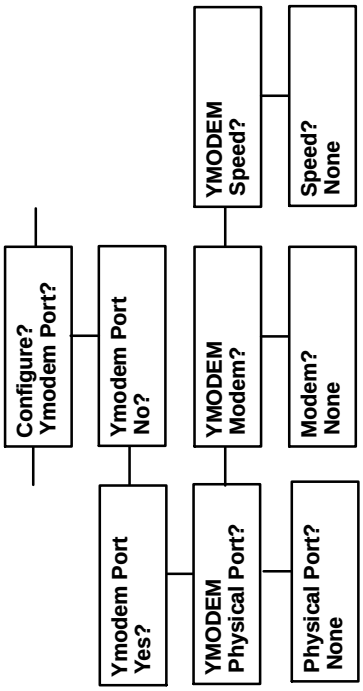


Figure 5-20
Ymodem Port Parameters

Ymodem Port

At the Ymodem Port option you must make a choice between "Yes" or "No." If you choose "Yes" then three additional choices appear on the next menu level. Scroll through the choices by using either the **RIGHT** or **LEFT** arrow.

Figure 5-20 displays your choices.

1. At the "System Parms?" screen, press the **RIGHT** arrow.
2. At the "Ymodem Port?" screen, press the **DOWN** arrow.
3. The current value appears (either "YES," Ymodem is enabled, or "NO," Ymodem is not enabled.
4. To scroll through the "Physical?" "Modem?" and "Speed?" options, press the **RIGHT** or **LEFT** arrow.
5. To select an option, press the **DOWN** arrow.

Physical Port?
Indicates the physical port used for the host port — A, B, C, or D. *Default is D*

Modem?
Lets you choose the modem type — none, NM2400A, NM2400 (TTY ports only), Hayes 1200, Hayes 2400, Codex 2260, or Hayes 9600.

Speed?
Sets the port speed — 1200, 2400, 4800, or 9600 bps. *Default is 2400.*

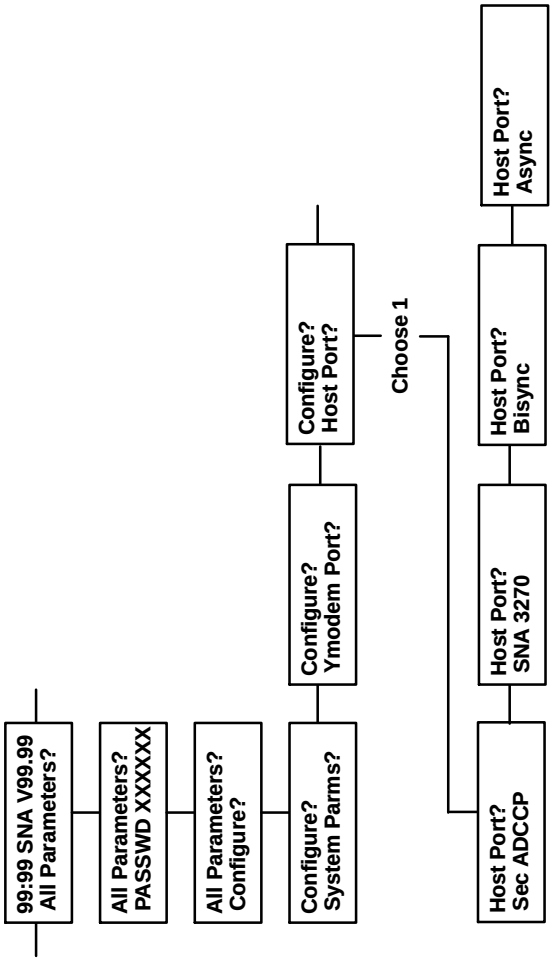


Figure 5-21
Host Port Parameters

Host Port

At the “Host Port?” option you must make a choice between Secondary ADCCP, SNA 3270, Bisync, or Async. You then see another layer of menus depending on your choice.

Figure 5-21 shows your choices.

1. At the “System Parms?” screen, press the **RIGHT** arrow.
2. At the “Host Port?”, press the **DOWN** arrow.
3. The current value appears (either Secondary ADCCP, SNA 3270, Bisync, or Async.)
4. To scroll through the options, press the **RIGHT** or **LEFT** arrow.
5. To select an option, press the **DOWN** arrow.

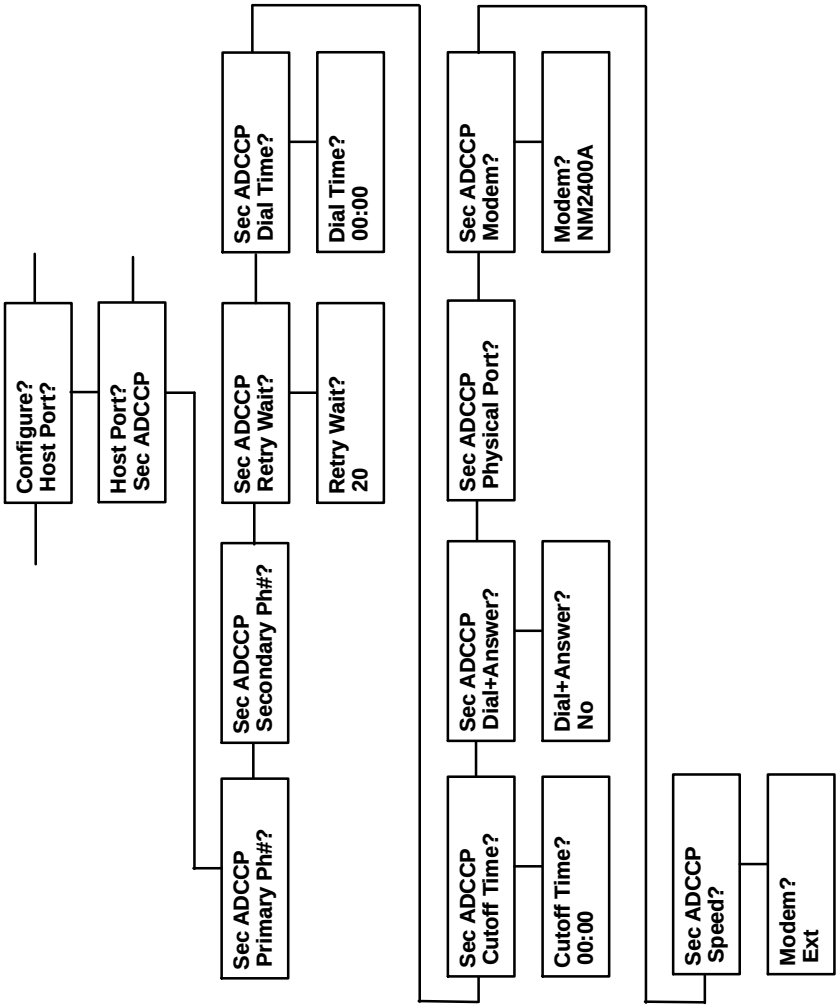


Figure 5-22
Secondary ADCCP Parameters

Secondary ADCCP

Figure 5-22 shows the choices under Secondary ADCCP. To reach an option, press the **RIGHT** arrow until the option shows on the display. To see or change an option's current setting, press the **DOWN** arrow. See the general editing instructions on page 5-13. Scroll through the choices by using either the **RIGHT** or **LEFT** arrow.

Primary Ph#?
The primary phone number is the first number the controller dials to start a telecommunications session.

1. Each number must start with a "P" (rotary or pulse dialing) or "T" (DTMF or touch-tone dialing). Scroll through these choices, then select them using the **DOWN** arrow or [ENT] key.
2. Type the telephone number. Add pauses by scrolling to the "W" (wait for dial tone), then pressing the **DOWN** arrow or [ENT] key.
3. Accept or abort the change.

Secondary Ph#?
If you enter a secondary phone number, the controller toggles to it if the primary phone number fails. The "Primary Ph#" phone number is used first.

" **NOTE:** *Follow the instructions under "Primary Ph#" to add the "Secondary Ph#."*

Modem?
Lets you choose the modem type — none, NM2400A, NM2400 (TTY ports only), Hayes 1200, Hayes 2400, Codex 2260, or Hayes 9600. *Default is NM2400A*

Physical Port?
Indicates the physical port used for the host port — A, B, C, or D.

Retry Wait?
Sets the number of seconds the controller waits until it re-dials the current active phone number — 10-7200 seconds. *Default is 20 seconds*

Dial Time?
Determines the time when the controller starts dialing for the telecom session. The format is HHMM. Time is kept on a 24-hour clock so 5:00 PM is typed as 1700. *Default is 0000*

Cutoff Time?
Determines the time when the controller stops dialing for the telecom session. The format is HHMM. *Default is 0000*

Time is kept on a 24-hour clock, so 5:00 PM is typed as 1700.

If "Cutoff Time?" is less than "Dial Time?", the telecom window spans midnight. If "Dial Time?" = 2300, and "Cutoff Time?" = 0300, then the telecom dial-window is from 11:00 pm to 3:00 AM.

Speed?
This sets the port speed. — Ext, 1200, 2400, 4800, 9600, or 19200 bps. *Default is Ext (External Clocking)*

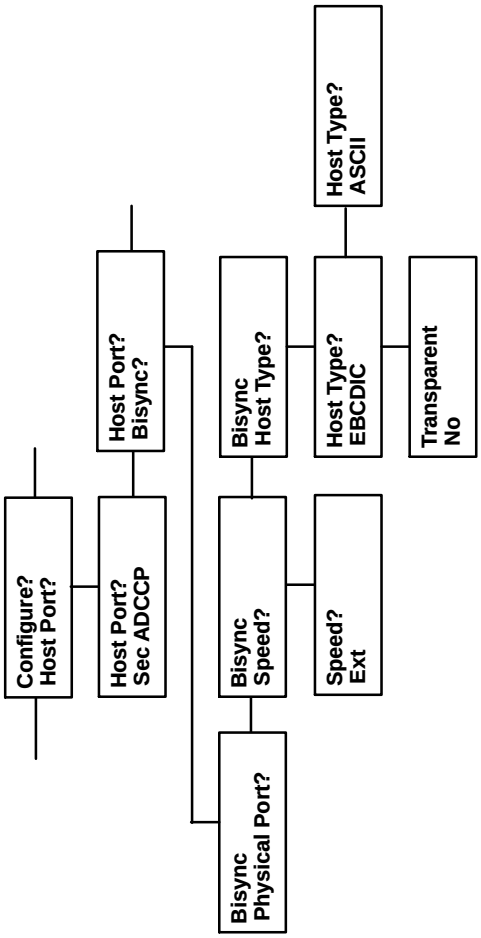


Figure 5-23
Bisync Parameters

Bisync

Figure 5-23 shows the choices under bisync. To reach an option, press the **RIGHT** arrow until the option shows on the display. To see or change an option's current setting, press the **DOWN** arrow. Follow the general editing instructions on page 5-13. View your choices by using either the **RIGHT** or **LEFT** arrow.

Physical Port?
This indicates the physical port used for the host port — A, B, C, or D.

Speed?
This sets the port speed — Ext, 1200, 2400, 4800, 9600, or 19200 bps. *Default is Ext (External Clocking)*

Host Type?
Sets the host data type — EBCDIC or ASCII.

Transparent
Determines whether data from the controller to the host should be translated from ASCII to EBCDIC — YES (disable data translation for an EBCDIC host) or NO (enable data translation).

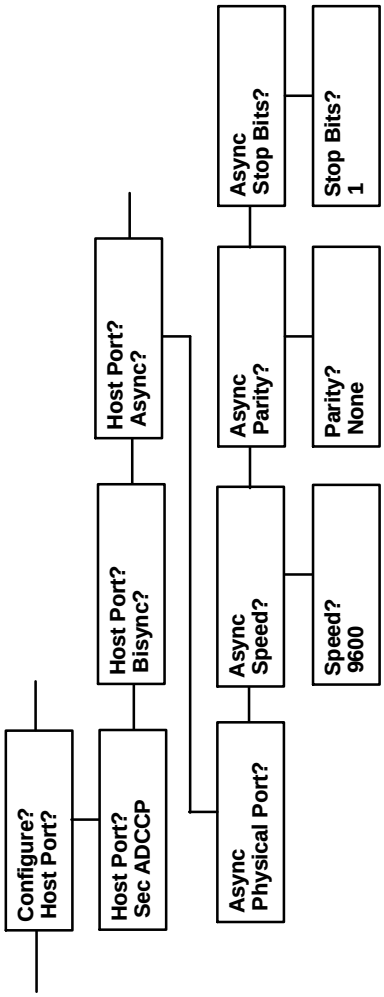


Figure 5-24
Async Parameters

Async

Figure 5-24 shows the choices under async. To reach an option, press the **RIGHT** arrow until the option shows on the display. To see or change an option's current setting, press the **DOWN** arrow. Follow the general editing instructions on page 5-13. View your choices by using either the **RIGHT** or **LEFT** arrow.

Physical Port?
Indicates the physical port used for the host port — A, B, C, or D.

Speed?
Sets the port speed — 1200, 2400, 4800, 9600, or 19200. *Default is 9600*

Parity?
Sets the port parity and number of stop bits — None (no parity/8 data bits), Odd (odd parity/7 data bits), or Even (even parity/7 data bits). *Default is None*

Stop Bits?
Sets the stop bits sent — 1, 2, or 1 1/2. *Default is 1*

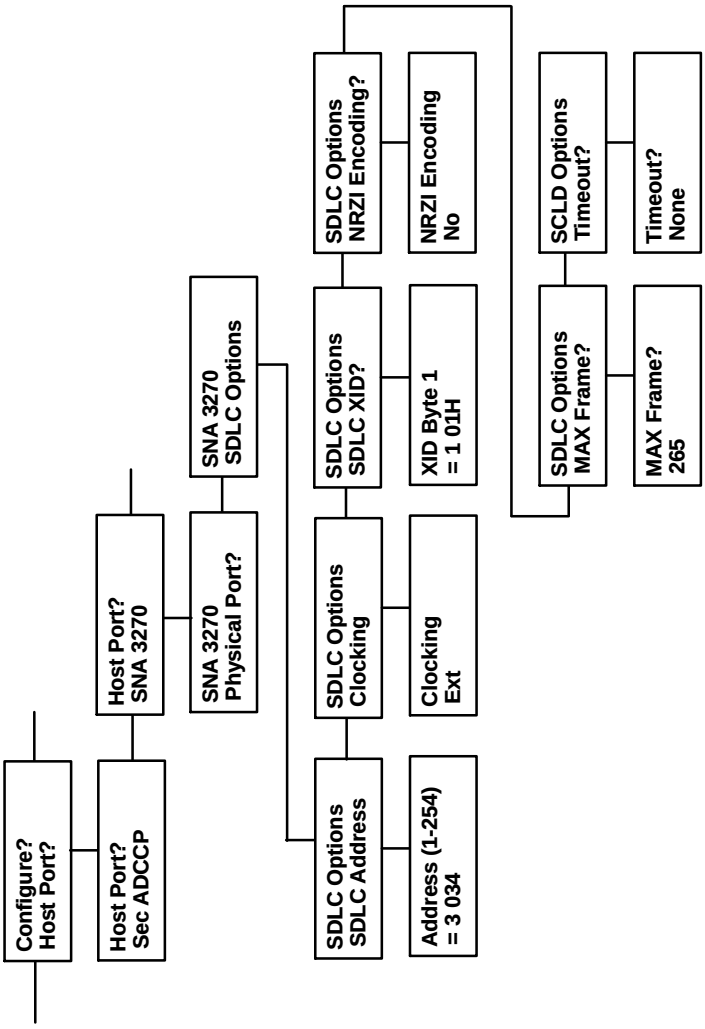


Figure 5-25
SNA/SDLC Parameters

SNA/SDLC

The SNA/SDLC parameters define some of the host's characteristics for the controller and other features that affect the controller's operations.

1. Follow the map to the "Host Port" "SNA 3270" parameters menu.
2. Press the **RIGHT** or **LEFT** arrow to reach the option you want to see.
3. Press the **DOWN** arrow to select a particular option.
4. Press the **UP** arrow to return to a higher menu.

See the general editing instructions on page 5-13. In all cases, toggle between "Yes" and "No" using either the **RIGHT** or **LEFT** arrow.

SDLC Options
Further defines the SNA host parameters.

SDLC Address
Defines the address of the physical unit. Should match the physical unit definition in VTAM — address may be any number from 1–254.

Clocking
Data transfer rate — EXT, 1200, 2400, 4800, 9600, 12900, 38400, 56000, or 64000 bps. *Default is EXT (external)*

SDLC XID?
Used only if VTAM was to have the control unit on a switched network. This must match the IDBLK and IDNUM definition of the physical port:

- XID BYTE 1 0–256 *Default is 1*
- XID BYTE 2 0–256 *Default is 127*
- XID BYTE 3 0–256 *Default is 192*
- XID BYTE 4 0–256 *Default is 1*

NRZI Encoding
Matches the definition in VTAM (Non-returned zero inverted) — YES (enable NRZI encoding) or NO (do not enable). *Default is NO*

MAX Frame?
Maximum amount of data per SDLC frame. Also know as MAXDATA on VTAM definition. Entry is from 265–521. *Default is 265*

Timeout?
Time with no SDLC activity before controller resets connection to host — none, 30, 60, 90, or 120 seconds.

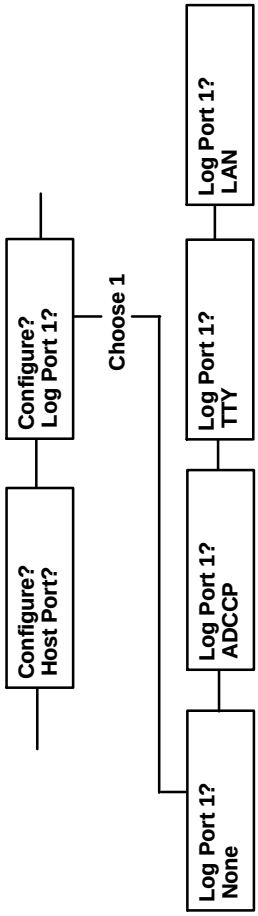


Figure 5-26
Logical Port 1 Parameters

Logical Port 1

At the Logical Port 1 option you must choose a communication protocol. The choices are ADCCP, TTY, or LAN configurations. After choosing one of these, configuration options for the protocol chosen appear.

1. Follow the map to "Log Port 1?"
2. The current value appears (either none, ADCCP, or TTY, or LAN).
3. To scroll through the options, press the **RIGHT** or **LEFT** arrow.
4. To select an option, press the **DOWN** arrow.

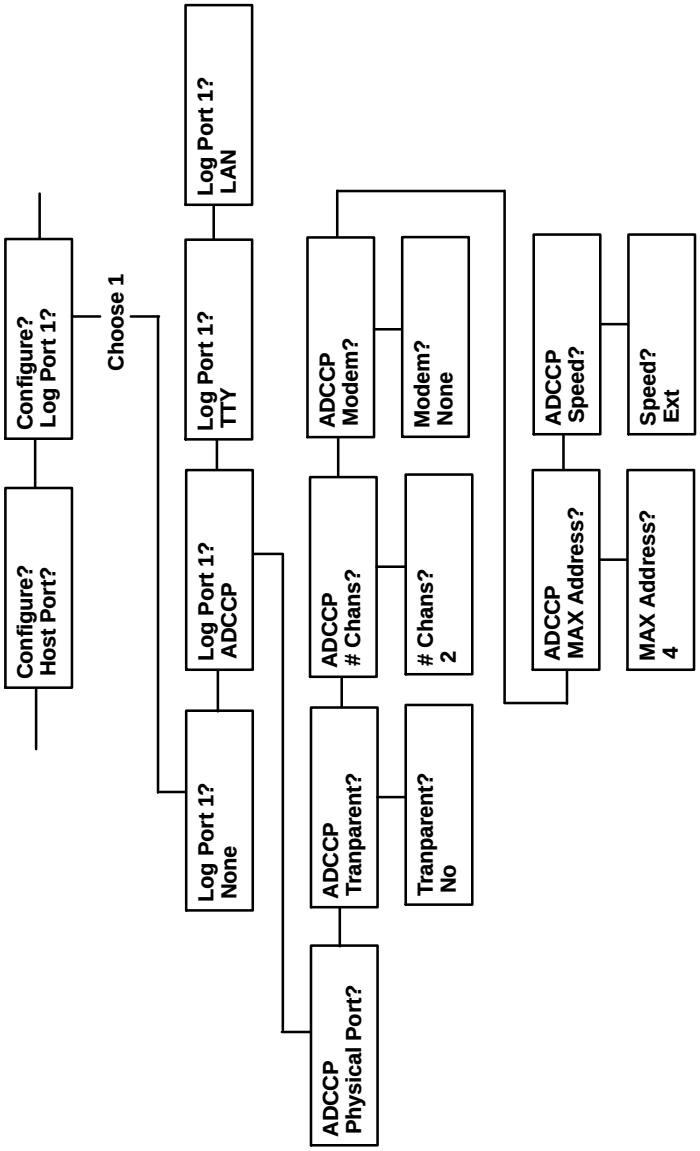


Figure 5-27
ADCCP Parameters

ADCCP

Figure 5-27 shows the choices under ADCCP. To reach an option, press the **RIGHT** arrow until the option shows on the display. To see or change an option's current setting, press the **DOWN** arrow. See the general editing instructions on page 5-13. View your choices by using either the **RIGHT** or **LEFT** arrow.

Physical Port?
Indicates the physical port used for the host port — A, B, C, or D.

Transparent?
Determines whether data should be translated — YES (disables data translation for EBCDIC host on this port) or NO (enables data translation on this port). *Default is NO*

 # Chans?
Determines the number of channels in an MQL environment. The number of hand-held computers that can be active at the same time on this port. Type the correct number — 1 or 2. *Default is 2*

Modem?
Lets you choose the modem type — none, NM2400A, NM2400 (TTY ports only), Hayes 1200, Hayes 2400, Codex 2260, or Hayes 9600. *Default is none*

Max Address?
Sets the highest address of hand-held computers to poll during the telecommunication session. *Default is 4*

Speed?
Sets the port speed — Ext (external clocking, modem provides clocking), 1200, 2400, 4800, or 9600 bps. *Default is Ext*

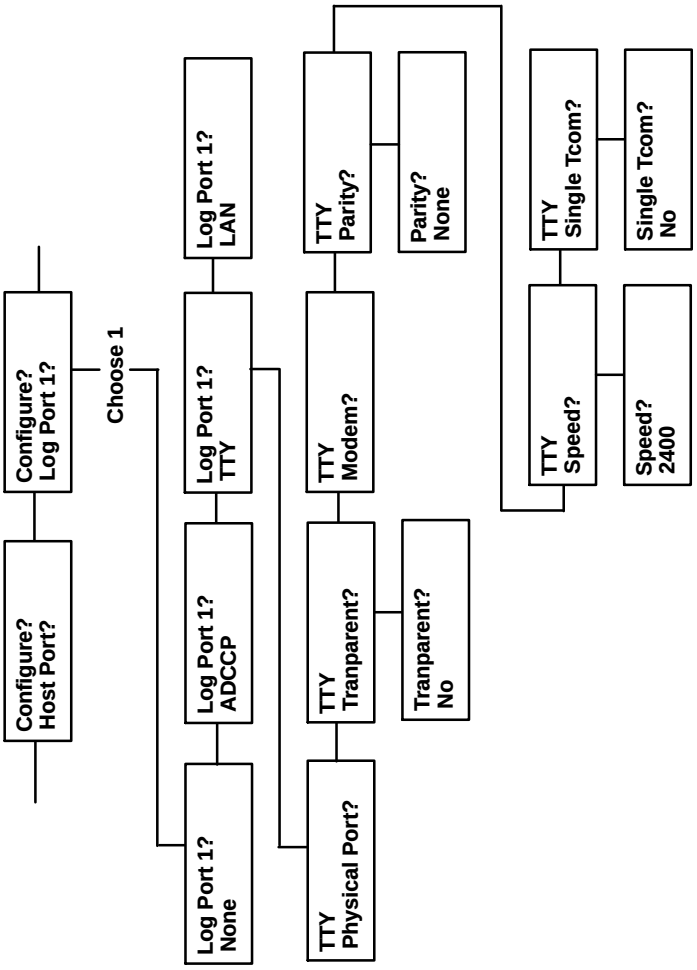


Figure 5-28
TTY Parameters

TTY

Figure 5-28 shows the choices under TTY. To reach an option, press the **RIGHT** arrow until the option shows on the display. To see or change an option's current setting, press the **DOWN** arrow. See the general editing instructions on page 5-13. View your choices by using either the **RIGHT** or **LEFT** arrow.

Physical Port?
Indicates the physical port used for the host port — A, B, C, or D.

Transparent?
Determines whether data from the controller to the host should be translated from ASCII to EBCDIC — YES (disable data translation for EBCDIC host on this port) or NO (enable data translation on this port). *Default is NO*

Modem?
Lets you choose the modem type — None, NM2400A, NM2400 (TTY ports only), Hayes 1200, Hayes 2400, Codex 2260, or Hayes 9600. *Default is None*

Parity?
Sets the port's parity and number of stop bits — None (no parity/8 data bits), Odd (odd parity/7 data bits), or Even (even parity/7 data bits). *Default is None*

Speed?
Sets the port speed — 1200, 2400, 4800, or 9600 bps. *Default is 2400*

Single Tcom?
Is there only one hand-held computer to be telecommed? — YES (after one hand-held computer has concluded a telecom session, the controller hangs up immediately without polling other hand-held computers) or NO (the controller polls for additional hand-held computers after concluding a telecom session). *Default is NO*

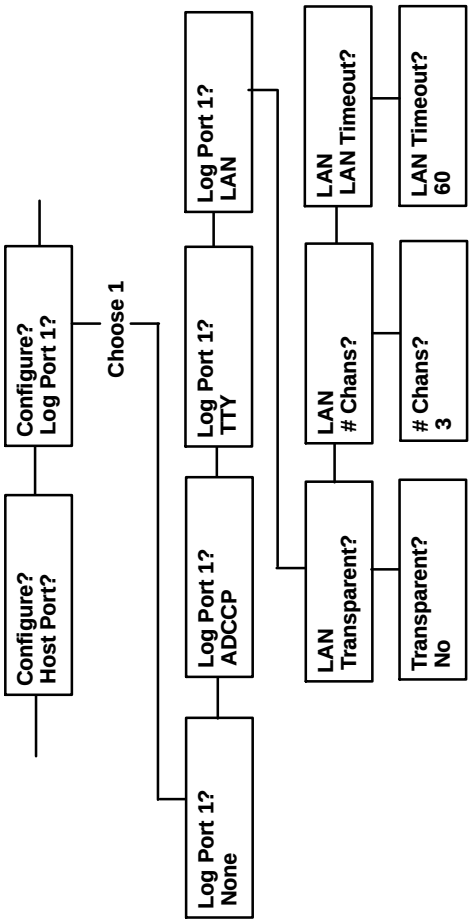


Figure 5-29
LAN Parameters

LAN

Figure 5-29 shows the choices under TTY. To reach an option, press the **RIGHT** arrow until the option shows on the display. To see or change an option's current setting, press the **DOWN** arrow. See the general editing instructions on page 5-13. View your choices by using either the **RIGHT** or **LEFT** arrow.

Transparent?
Determines whether data from the hand-held computer to the host should be translated from ASCII to EBCDIC — YES (disable data translation for EBCDIC host on this port) or NO (enable data translation on this port). *Default is NO*

 # Chans?
This determines the number of channels available of the 4960 Multidock. This is the number of hand-held computers which can be active at the same time on this port. Type the correct number (1, 2, or 3), then press [ENT]. *Default is 3*

LAN Timeout?
This determines the amount of time the LAN port stays active after completing the last hand-held computer telecom. *Default is 60 seconds*

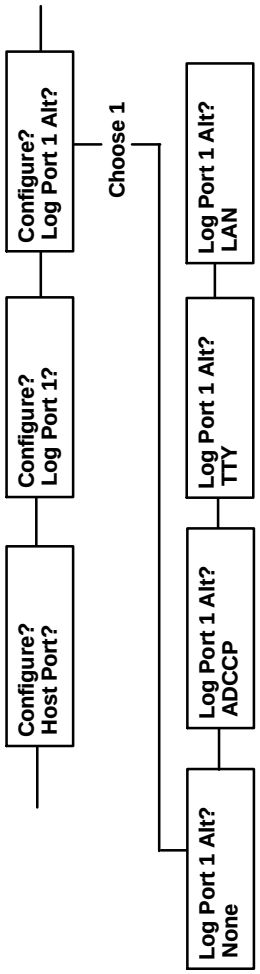


Figure 5-30
Logical Port 1 Alt Parameters

Logical Port 1 Alt

At the Logical Port 1 Alt option you must choose between no alternative logical port 1 or ADCCP, LAN, or TTY configurations. An alternate port type can only be selected if the primary type is ADCCP or TTY. If an alternate type is enabled, the host can change the port between the two types using port activation record parameters.

1. Follow the map to “Log Port 1 Alt?”.
2. The current value appears (none, ADCCP, TTY, or LAN).
3. To scroll through the options, press the **RIGHT** or **LEFT** arrow.
4. To select an option, press the **DOWN** arrow.
5. See page 5-49 for an explanation of the ADCCP options. See page 5-51 for an explanation of TTY options. See page 5-53 for an explanation of LAN options.

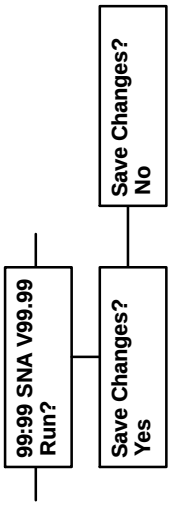


Figure 5-31
Logging Off

Logging Off

After configuring the controller you must log off the control panel menus. The system gives you the option of saving all your changes and writing a new configuration file on the floppy disk, or rejecting changes and loading the existing configuration from disk.

1. Enter at the "Run?" prompt in the main menu.
2. At the "Save Changes? – Yes" prompt, either press [ENT] for YES or press the **RIGHT** arrow to bring up the "Save Changes – No" prompt. Pressing [ENT] at the NO prompt leaves the original parameters intact.

To exit the communications program and reach this prompt, press the **UP** arrow until you reach the "Run?" prompt.

Appendix A

Communications Session

Asynchronous Host to 4980 Network Communications Controller

ASYNC Host Computer		NCC8000
Init “2 –S0/”	————>	
“?”	————>	
	<————	Channel 1 Activate Request
Activate Parms	————>	
“?”	————>	
	<————	Channel 2 Activate Request
Activate Parms	————>	
“?”	————>	
	<————	Channel 3 Activate Request
Activate Parms	————>	
“?”	————>	
	<————	Channel 1 Inactivate Status
“?”	————>	
	<————	Channel 1 Upload Data
“?”	————>	
	<————	Channel 4 Upload Data
“?”	————>	
	<————	Channel 4 Upload Data
“?”	————>	
	<————	Channel 2 Upload Data
“?”	————>	
	<————	Channel 2 Activate Status
“?”	————>	
	<————	Channel 3 Upload Data

“?”	————>	
	<————	Channel 2 Upload Data
“?”	————>	
	<————	Channel 1 Upload Request
Download Data	————>	
“?”	————>	
	<————	Channel 1 Data Request
Download Data	————>	
“?”	————>	
	<————	Channel 3 Upload Data
“?”	————>	
	<————	Channel 1 Data Request
End of Data	————>	
“?”	————>	
	<————	Channel 2 Upload Data
“?”	————>	
	<————	Channel 1 End Status
“?”	————>	
	<————	Channel 3 Data Request
End of Data	————>	
“?”	————>	
	<————	Channel 2 Data Request
Download Data	————>	
“?”	————>	
	<————	Channel 3 End Status
“?”	————>	
	<————	Channel 3 Activate Request
Activate Delay	————>	
“?”	————>	
	<————	Channel 2 Data Request
End of Data	————>	
“?”	————>	
	<————	Channel 3 Activate Request
Activate Parms	————>	
“?”	————>	
	<————	Channel 3 Inactivate Status
“?”	————>	
	<————	Channel 1 Upload Data

Bisynchronous Host to 4980 Communications Session

BISYNC Host Computer		NCC8000
Init “2 –S0/”	————>	
	<————	Channel 1 Activate Request
Activate Parms	————>	
	<————	Channel 2 Activate Request
Activate Parms	————>	
	<————	Channel 3 Activate Request
Activate Parms	————>	
	<————	Channel 1 Inactivate Status
	<————	Channel 1 Upload Data
	<————	Channel 4 Upload Data
	<————	Channel 4 Upload Data
	<————	Channel 2 Upload Data
	<————	Channel 2 Active Status
	<————	Channel 3 Upload Data
	<————	Channel 2 Upload Data
	<————	Channel 1 Data Request
Download Data	————>	
	<————	Channel 1 Data Request
Download Data	————>	
	<————	Channel 3 Upload Data
	<————	Channel 1 Data Request
End of Data	————>	
	<————	Channel 2 Upload Data
	<————	Channel 1 End Status
	<————	Channel 3 Data Request
End of Data	————>	
	<————	Channel 2 Data Request
Download Data	————>	
	<————	Channel 3 End Status
	<————	Channel 3 Activate Request
Activate Delay	————>	
	<————	Channel 2 Data Request
End of Data	————>	
	<————	Channel 3 Activate Request
Activate Parms	————>	
	<————	Channel 3 Inactivate Status

<———— Channel 1 Upload Data
.
.
.

Bisynchronous Host-to-Controller

The following is the same example session with line control characters displayed:

BISYNC Host Computer		4980 Controller
ENQ	——————>	
	<——————	ACK0
Init “2 –S0/”	——————>	
	<——————	ACK1
EOT	——————>	
	<——————	ENQ
ACK0	——————>	
	<——————	Channel 1 Activate Request
ACK1	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
Activate Parms	——————>	
	<——————	ACK1
EOT	——————>	
	<——————	ENQ
ACK0	——————>	
	<——————	Channel 2 Activate Request
ACK1	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
Activate Parms	——————>	
	<——————	ACK1
EOT	——————>	
	<——————	ENQ
ACK0	——————>	
	<——————	Channel 3 Activate Request
ACK1	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
Activate Parms	——————>	
	<——————	ACK1
EOT	——————>	

	<————	ENQ
ACK0	————>	
	<————	Channel 1 Inactive Status
ACK1	————>	
	<————	Channel 1 Upload Data
ACK0	————>	
	<————	Channel 4 Upload Data
ACK1	————>	
	<————	Channel 4 Upload Data
ACK0	————>	
	<————	Channel 2 Upload Data
ACK1	————>	
	<————	Channel 2 Active Status
ACK0	————>	
	<————	Channel 3 Upload Data
ACK1	————>	
	<————	Channel 2 Upload Data
ACK0	————>	
	<————	Channel 1 Data Request
ACK1	————>	
	<————	EOT
ENQ	————>	
	<————	ACK0
Download Data	————>	
	<————	ACK1
EOT	————>	
	<————	ENQ
ACK0	————>	
	<————	Channel 1 Data Request
ACK1	————>	
	<————	EOT
ENQ	————>	
	<————	ACK0
Download Data	————>	
	<————	ACK1
EOT	————>	
	<————	ENQ
ACK0	————>	
	<————	Channel 3 Upload Data
ACK1	————>	
	<————	Channel 1 Data Request

ACK0	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
End of Data	——————>	
	<——————	ACK1
EOT	——————>	
	<——————	ENQ
ACK0	——————>	
	<——————	Channel 2 Upload Data
ACK1	——————>	
	<——————	Channel 1 End Status
ACK0	——————>	
	<——————	Channel 3 Data Request
ACK1	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
End of Data	——————>	
	<——————	ACK1
EOT	——————>	
	<——————	ENQ
ACK0	——————>	
	<——————	Channel 2 Data Request
ACK1	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
Download Data	——————>	
	<——————	ACK1
EOT	——————>	
	<——————	ENQ
ACK0	——————>	
	<——————	Channel 3 End Status
ACK1	——————>	
	<——————	Channel 3 Activate Request
ACK0	——————>	
	<——————	EOT
ENQ	——————>	
	<——————	ACK0
Activate Delay	——————>	

	<————	ACK1
EOT	————>	
	<————	ENQ
ACK0	————>	
	<————	Channel 2 Data Request
ACK1	————>	
	<————	EOT
ENQ	————>	
	<————	ACK0
End of Data	————>	
	<————	ACK1
EOT	————>	
	<————	ENQ
ACK0	————>	
	<————	Channel 3 Activate Request
ACK1	————>	
	<————	EOT
ENQ	————>	
	<————	ACK0
Activate Parms	————>	
	<————	ACK1
EOT	————>	
	<————	ENQ
ACK0	————>	
	<————	Channel 3 Inactive Status
ACK1	————>	
	<————	Channel 1 Upload Data

Appendix B

Example C-Program

You will need to contact your representative for more information regarding the actual program code examples.

Appendix C

Adapting Programs Used with the NI315 Protocol Converter

A wide-area communications network based on the NORAND® 4980 Communications Controller can be configured to be functionally compatible with a network based on a NORAND NI315 protocol converter. Host programs designed to run with an NI315 will require minimum changes, as specified below, to communicate with controllers running in a "compatibility mode."

The required changes generally fall into the following categories:

- *Record types* — The controller adds a number of new record types and the function of some of the old NI315 record types has changed.
- *Logical channels* — The controller may have up to three logical channels per physical port.
- *New enhancements* — The controller provides a number of new enhancements which may be enabled when the host is ready to support them.

Other major areas of change are:

- Data record length — The length of a data block has increased from 128 bytes to 256 bytes.
- ASCII host support — The controller supports both ASCII and EBCDIC hosts.
- Transparent Bisync — The host bisync port must be configured for transparent mode, even for character data transmissions.

Record Types

Record types for both the NI315 Controller and the 4980 Controllers are listed in the following paragraphs. Differences in the way the records are used (if any) are noted.

NI315 Record Types

NI315 to host records

- 0 Upload Data
- 1 End-of-call Status
- 2 Data Request
- 3 Inactive Status
- 4 Active Status
- 5 Phone Number Request

Host to NI315 records

- 0 Download Data
- 1 End-of-data
- 2 Initialization
- 3 Cancel Autodial
- 4 Phone Number
- 5 Deactivate autodial for one minute

4980 Network Controller

The length of the data block has increased from 128 bytes to 256 bytes.

4980 Controller-to-host records

- 0 Upload Data
- 1 End-of-session Status

  End-of-session records are sent after each computer communications session completes to indicate the status of a single computer session. This differs from the NI315 end-of-call record which is sent after a port connection is lost to provide the status of the connection.

- 2 Data Request
- 3 Inactive Status
  Inactive Status records are associated with a logical port and indicate the status of the port.
- 4 Active Status
  See Inactive Status.
- 5 Activate Request
  Activate request records obtain the information from the host which is necessary to activate a port. Activate requests are sent for a physical port whenever the port is disconnected and include the status of the previous activate request for the port. The host may respond with an autodial activate record, an autoanswer activate record, or with a deactivate-for-one-minute record.

  For compatibility, the activate request record can be processed exactly like an NI315 phone request record, with the following restrictions:

  - No additional parameters are required if the correct default parameters are stored on the controller system diskette.
  - A 1-byte status field follows the record type in the activation request; this field indicates the status of the previous activation request. This status corresponds to the NI315 end-of-call status.
  - Responding to an activation request with an autoanswer activate record corresponds to responding to an NI315 phone number request with a cancel-autodial record. However, the controller continues to prompt the host with activation requests each time a port disconnects.
  - Phone numbers must be formatted as specified on pages 2-26, 2-30, and 2-34.

The following record types are not NI315 compatible, and are not sent to the host unless the associated options are enabled.

- 6 Special Request
  Currently, one subtype is specified:
  1 File Requests
- 7 Directive Status
- 8 Controller Identification

Host-to-controller records

- 0 Download Data
- 1 End-of-data
- 2 Initialization
  The initialization record supplies system configuration parameters. To avoid host program changes, initialization information should be stored in a file that can be easily modified.
- 3 Autoanswer Activate
  Autoanswer activate records are sent in response to an activate request and may include optional modem and port configuration parameters. The autoanswer activate record replaces the NI315 cancel-autodial record.
- 4 Autodial Activate
  Autodial activate records are sent in response to an activate request, and may include optional modem and port configuration parameters (for example, a phone number). The autodial activate record replaces the NI315 phone number record.

NOTE: *Autoanswer and Autodial Activate records are processed identically. The autodial activate record replaces the NI315 phone number record.*

- 5 Deactivate for One Minute

The following record types are not NI315 compatible, and cannot be sent to the controller unless the associated options are enabled.

- 6 Host Directive:
  A host directive may be sent by the host in response to a special request or data request from the controller. Currently, four subtypes of host directives are specified:
  1 File Upload
  2 File Create/Load
  3 File Delete
  4 File Download

Logical Channels

The controller has four physical ports which are logically numbered from 0 to 3. Logical port 0 is always the host port. Ports 1 to 3 are hand-held computer ports. There may be up to three logical channels for each hand-held computer port. Thus, there may be up to nine hand-held computer channels.

It is the logical channel number which is prefixed to each communications controller record sent to the host. The first logical channel ID for each port corresponds to the port ID for that port.

EXAMPLE: If ports 1–3 are enabled, port 1 may have logical channels 1, 4, and 7; port 2 may have logical channels 2, 5, and 8; and port 3 may have logical channels 3, 6, and 9.

Records from the controller specific to a port (for example: Activate Requests) always use the logical channel which equates to the logical port ID. After the physical connection on a port is established, data to or from a hand-held computer terminal is contiguous on a logical channel, and the location of the logical channel should not concern the host programmer.

Data Record Length

The controller data record length is 256 bytes, not including channel and record type bytes. The NI315 data record length is 128 bytes.

ASCII/EBCDIC Host Support

The controller keys on the record type in the initialization record to determine whether the host is ASCII or EBCDIC. The controller uses EBCDIC bisync line control characters even if the host is determined to be ASCII.

Enhancements

The communications controller provides a number of new enhancements:

- File support
  The controller allows the host computer to download a limited number of files that can be stored on the controller system diskette. These files can include customer data files, which can be forwarded to a hand-held terminal at the direction of the host computer, or boot files, which can boot a hand-held terminal independently of the host computer.

  The host may also upload or delete any data or boot file from the controller.
- Line disciplines
  The 4980 Communications Controller supports a variety of line disciplines, including ADCCP, NORAND TTY, Bisync, Async, and NPCP.

- Dynamic port configuration
  The host computer can dynamically change a number of port configuration parameters during the communications session. These parameters include the line discipline, modem configuration, autoanswer/autodial, etc.
- Chaining controllers
  The controllers can be "chained" so that a controller connected directly to the host computer functions as a gateway for a "secondary" controller connected to one of the hand-held computer ports (either directly or over a switched line). The secondary controller is placed on a separate "controller channel" which provides a direct logical link to the host. An identification record is sent to the host before each new controller is brought on-line.

NOTE: *Controller-to-controller communications are possible without using the chaining option if hand-held computers attached to secondary controllers are placed on logical channels belonging to the primary controller. This is possible if the secondary controller has only one hand-held computer port.*

- Autodial/Autoanswer
  Ports on the controller can be toggled as either autodial or autoanswer. A timeout can be specified for autoanswer ports.
- Booting Hand-Held Computers
  The controller has the ability to boot hand-held terminals. Boot files can be downloaded from the host or directly copied (by a special copy utility) into a "DATA" directory on the DOS-compatible system diskette.

- Modifying System and Port Configurations
  The controller system and port configurations can be easily modified in one (or more) of the following ways:
  - By the host computer with initialization and activation parameters.
  - By modifying tables stored on the system diskette.
  - By the user with the keyboard and display.

Support for any of the preceding enhancements can be added to an existing controller host program running in an NI315 compatibility mode without changing the general structure of the host program.

Appendix D

Adapting Programs Used with the NI311 Protocol Converter

A wide-area communications network based on the NORAND® 4980 Communications Controller can be configured to be functionally compatible with a network based on a NORAND NI311 protocol converter. Host programs designed to run with an NI311 will require minimum changes, as specified below, to communicate with controllers running in a "compatibility mode."

The required changes generally fall into the following categories:

- *Record types* — The controller adds a number of new record types and the function of some of the old NI311 record types has changed.
- *Special commands*
- *Logical channels* — The controller may have up to three logical channels per physical port.
- *New enhancements* — The controller provides a number of new enhancements which may be enabled when the host is ready to support them.

The other major area of change is in the data record. The length of the data block has increased from 128 bytes to 256 bytes.

Record Types

Record types for both the NI311 and 4980 Controllers are listed in the following paragraphs. Differences (if any) in the way the records are used are noted.

NI311 Record Types

NI311-to-host

- 0 Upload Data
- 1 End-of-call Status
- 2 Data Request
- 5 Phone Number Request

Host-to-NI311

- 0 Download Data
- 1 End-of-data
- 2 Initialization
- 3 Cancel Autodial
- 4 Phone Number
- 5 Deactivate autodial for one minute

4980 Network Controller

The length of the data block has increased from 128 bytes to 256 bytes.

Controller-to-host

- 0 Upload Data
- 1 End-of-session Status

  End-of-session records are sent after each hand-held computer communications session completes to indicate the status of a single hand-held computer session. This differs from the NI311 end-of-call record which is sent after a port connection is lost to provide the status of the connection.

- 2 Data Request
- 3 Inactive Status
  Inactive status records are sent to the host whenever a period of time expires without any activity on the host port. The status records indicate the status of the associated port.
- 4 Active Status
  See preceding Inactive Status record.
- 5 Activate Request
  Activate request records obtain the information from the host which is necessary to activate a port. Activate requests are sent for a physical port whenever the port is disconnected and include the status of the previous activate request for the port. The host may respond with an autodial activate record, an autoanswer activate record, or with a deactivate-for-one-minute record.

  For compatibility, the activate request record can be processed exactly like an NI311 phone request record, with the following restrictions:

  - No additional parameters are required if the correct default parameters are stored on the controller system diskette.
  - A 1-byte status field follows the record type in the activation request; this field indicates the status of the previous activate request. This status corresponds to the NI311 end-of-call status.
  - Responding to an activate request with an autoanswer activate record corresponds to responding to an NI311 phone number request with a cancel-autodial record. However, the controller continues to prompt the host with activate requests each time a port disconnects.
  - Phone numbers must be formatted as specified on pages 2-26, 2-30, and 2-34.

The following record types are not NI311 compatible, and are not sent to the host unless the associated options are enabled.

- 6 Special Request
  Currently, one subtype is specified:
  1 File Requests
- 7 Directive Status
- 8 Controller Identification

Host-to-controller records

- 0 Download Data
- 1 End-of-data
- 2 Initialization
  The initialization record supplies system configuration parameters.

NOTE: *To avoid host program changes, initialization information should be stored in a file that can be easily modified.*

The controller uses the initialization record to determine the block size of the host computer. The block size includes a beginning-of-record delimiter, record types, data, and an optional “end-of-line” pad characters (that is, a carriage return).

All records sent to the controller must have the same size, with the exception of special commands. Any end-of-line pad, appended to records, and special commands sent to the controller must be consistent.

- 3 Autoanswer Activate
  Autoanswer activate records are sent in response to an activate request and may include optional modem and port configuration parameters. The autoanswer activate record replaces the NI311 cancel-autodial record.

- 4 Autodial Activate
  Autodial activate records are sent in response to an activate request, and may include optional modem and port configuration parameters (for example, a phone number). The autodial activate record replaces the NI311 phone number record.

NOTE: *Autoanswer and Autodial Activate records are processed identically. The autoanswer type is provided for backward compatibility.*

- 5 Deactivate for One Minute

The following record types are not NI311 compatible, and cannot be sent to the controller unless the associated options are enabled.

- 6 Host Directive
  A host directive may be sent by the host in response to a special request or data request from the controller. Currently, four subtypes of host directives are specified:
  1 File Upload
  2 File Create/Load
  3 File Delete
  4 File Download

Special Commands

In addition to the preceding records, the host may send two other commands to the controller.

- The host must send a question mark (“?”) to the controller to indicate that it is ready to receive data. The question mark can be changed to any other character (for example, an XON character) with an initialization record parameter. If optional pad characters follow the question mark, they must be consistent.

- The host may reinitialize the controller by sending an asterisk (*). This parallels sending a slash and an asterisk (/*) to the NI311. The host must wait at least 30 seconds before sending another initialization record after sending the asterisk.

NOTE: *The asterisk can be sent only when the controller is expecting a question mark or before sending the initialization record.*

Logical Channels

The controller has four physical ports which are logically numbered from 0 to 3. Logical port 0 is always the host port. Ports 1 to 3 are hand-held computer ports. There may be up to three logical channels for each hand-held computer port. Thus, there may be up to nine hand-held computer channels.

It is the logical channel number which is prefixed to each controller record sent to the host. The first logical channel ID for each port corresponds to the port ID for that port.

EXAMPLE: If ports 1–3 are enabled, port 1 may have logical channels 1, 4, and 7; port 2 may have logical channels 2, 5, and 8; and port 3 may have logical channels 3, 6, and 9.

Records from the controller specific to a port (for example: Activate Requests) always use the logical channel which equates to the logical port ID. After the physical connection on a port is established, data to or from a hand-held terminal is sequential on a logical channel, and the location of the logical channel should not concern the host programmer.

Data Record Length

The controller data record length is 256 bytes, not including channel and record type bytes. The NI311 data record length is 128 bytes.

Enhancements

The communications controller provides a number of new features:

- File support
  The controller allows the host computer to download a limited number of files that can be stored on the controller system diskette. These files can include customer data files, which can be forwarded to a hand-held terminal at the direction of the host computer, or boot files, which can boot a hand-held computer independently of the host computer.

  The host may also upload or delete any data or boot file from the controller.
- Line disciplines
  The controller supports a variety of line disciplines, including ADCCP, NORAND TTY, Bisync, Async, and NPCP.
- Dynamic port configuration
  The host computer can dynamically change a number of port configuration parameters during the communications session. These parameters include the line discipline, modem configuration, autoanswer, autodial, etc.

- Chaining communications controllers
  The controllers can be "chained" so that a controller connected directly to the host computer functions as a gateway for a "secondary" controller connected to one of the hand-held computer ports (either directly or over a switched line).

  The secondary controller is placed on a separate "controller channel" which provides a direct logical link to the host. An identification record is sent to the host before each new controller is brought on-line.

NOTE: *Controller-to-controller communications are possible without using the chaining option if hand-held terminals attached to secondary controllers are placed on logical channels belonging to the primary controller. This is possible if the secondary controller has only one hand-held computer port.*

- Autodial/Autoanswer
  Ports on the controller can be toggled as either autodial or autoanswer. A timeout can be specified for autoanswer ports.
- Booting Hand-Held Computers
  The controller can boot hand-held computers. Boot files can be downloaded from the host, or directly copied (by a special copy utility) into a "DATA" directory on the DOS-compatible system diskette.
- Modifying System and Port Configurations
  The controller system and port configurations can be easily modified in one (or more) of the following ways:
  - By the host computer with initialization and activation parameters.
  - By modifying tables stored on system diskettes.
  - By the user with the keyboard and display.

Support for any of the above enhancements can be added to an existing controller host program running in an NI311 compatibility mode without changing the general structure of the host program.

Appendix E

Xenix Line Definition

The following configuration is for 8-bit data with no parity checking:

```
#include <signal.h>
#include <termio.h>
#define NCC 8

struct termio
{
   unsigned short c_iflag;     /* input modes */
   unsigned short c_oflag;     /* output modes */
   unsigned short c_clfag;     /* control modes */
   unsigned short c_lflag;     /* local modes */
   char     c_line;            /* line discipline */
   unsigned char c_cc[NCC]; /* control characters */
};

termio  t;

tc_iflag=IGNBRK;          /* ignores break condition */

tc_oflag=ONOCR;           /* no CR output at column 0 */

tc_cflag=EXTA+CS8+CREAD+HUPCL;
/* 19200 bps, 8 bit, enable read, hang up after last close */

tc_lflag=XCLUDE;          /* exclusive use of the port */

   ioctl(filedescriptor, TCSETA,&t);
```

To prevent a read from hanging, an alarm should be set to signal a timeout.

EXAMPLE:

```
signal(SIGALRM,process_abort);    /* set signal to catch alarm */
.
.
.
alarm(thirty_seconds);            /* set timeout to 30 seconds*/
error=read(file_descriptor,buffer,byte_count) alarm(0);
                                  /* turn alarm off */
```

" NOTE: *The communications buffer for the host communications port should be at least 260 bytes. The default buffer for SCO Xenix users is 256 bytes. The size of a TTYIO buffer can be increased by modifying a variable called TTYHOG in the Xenix system kernel. Contact SCO for support.*

Appendix F

3275 Line Definition

The following is the line definition for a 9600 bps BTAM line for communications with the 4980 Communications Controller.

```
GROUP1      GROUP     DIAL=YES
            TYPE=EP,
            USE=EP,
            LNCTL=BSC
LINE1 LINE  ADDRESS=(001,01),
            SPEED=9600,
            DUPLEX=FULL,
            TERM=3275,
            CU=2703,
            CLOCKING=EXT
```

" NOTE: *A BTAM program written to communicate with the communications controller must use only transparent BTAM write macros.*

Appendix G

Asynchronous Hosts

The communications controller offers several options designed to provide flexible options for reading records from the communications controller (see page 2-22).

- An end-of-record delimiter can be added to the end of each record. The default delimiter is a carriage return (CR).
- The communications controller can be configured to pad all records to a fixed block size. The pad character can be set by the host. The default is a blank.
- The host-ready character, a question mark by default, can be changed to any other character, such as an XON character.
- The data portion of an upload data record may contain transparent data if the port is configured for transparent mode. All other data sent to the host is guaranteed to be character data.
- The communications controller reads the initialization record as 8-bit data, so that the host can set the parity for the host-communications controller connection in the initialization record.

If the host is reading transparent data from the communications controller, then the host cannot read to an end-of-record delimiter. This problem can be solved by padding all records to a fixed length. However, this is inefficient because of the extra length added to download requests.

As an alternative the channel ID and record type portion of each record can be read before the rest of the record is read. The host could then use a table, indexed by record type, to determine the number of bytes which remain to be read for the record.

Alternatively, the host could read a fixed number of remaining bytes for upload data records and read to an end-of-record delimiter for other record types.

" NOTE: *Some host communications drivers delete the entire contents of the communications buffer attached to a port when a read is issued on the port. A nondestructive read must be available to read a partial record from the communications controller.*

Appendix H
3745 Nonswitched Line Definition

NCP subset Vtam 3.1 Nonswitched Line

```
A03SNA4 GROUP     ANS-CONT,
                  CLOCKING=EXT,
                  DIAL=NO,
                  LNCTL=SDLC,
                  MAXDATA=265,
                  MAXOUT=7,
                  NEWSYNC=NO,
                  NRZI=NO,
                  OWNER=VTAM01,
                  PACING=0,
                  PASSLEM=7,
                  PUDR=YES,
                  LUDR=YES,
                  PUTYPE=2,
                  REPLYTO=1,
                  RETRIES=(5, 2, 3),
                  SERVLIM=7,
                  SCCPRM=USSSCS,
                  TRANSFR=5,
                  TYPE=NCP,
                  VPACING=0,
AL03035 LINE      ADDRESS=(35, HALF),
                  ISTATUS=ACTIVE,
                  MODETAB=MODTRSNA,
                  DLOGMOD=73278M2,
                  USSTAB=USSTRSNA,
                  SERVICE ORDER=(AC00064)
AC00064   PU      ADDR=40,ISTATUS=ACTIVE,
          LU      LOCADDR=2,ISTATUS=ACTIVE,
                  LOGAPPL=CICSA
```

Glossary

ADCCP (Advanced Data Communications Control Procedures)

The U.S. Federal Standard communications protocol. The American National Standards Institute version of a bit-oriented synchronous data link protocol.

APU

Auxiliary Power Unit.

ASYNC

Asynchronous communications. A method of transmitting data using an external clocking source (the transmitted characters are preceded by a start bit and followed by a stop bit).

BISYNC (BInary SYNChronous communications)

A method of transmitting data in which the transmission of a character is marked by a drop or rise in the signal. An IBM defined, byte-controlled communications protocol, using control characters and synchronized transmission of binary coded data.

Channel

This guide uses “channel” to refer to a logical data channel. A port may contain one or more channels. Data for any

given terminal is contiguous on a channel. Each of the three remote ports on a controller may contain up to three channels.

Direct Connect

The hand-held computer is directly cabled to a port on the controller.

DSD (Direct Store Delivery)

That section of the grocery industry dealing with products delivered from a supplier directly to a store, rather than to some intermediate warehouse or distributor. DSD offers retailers reduced overhead expenses, but carries as a cost a loss of inventory control.

HHC (Hand-Held Computer)

A generic acronym for a NORAND® Hand-Held Computer, including the 4000 Series (43XX, 44XX, 4500) and the PEN*KEY® or 6000 Series (61XX, 62XX, 63XX, 6400, 65XX, 66XX).

Also a trademark for the product of another company.

Host

A customer's host computer or a controller that is functioning as a host to a second controller.

Host Computer

A large computer that serves many users, such as a PC, minicomputer, or mainframe.

Host Controller

A controller (4980) that is functioning as a host to a secondary controller.

LAN (Local Area Network)

A group of network devices in which each device can communicate through a wired link. The wired link may consist of several segments joined by repeaters and bridges. The LAN is characterized by the relatively short distance it is designed to cover, a high speed of operation, and relatively low error rates. The geographic scope of LANs is limited to thousands of feet or closely-spaced building complexes.

Local Controller

A controller which is directly connected to a host computer. A local controller uses either secondary ADCCP or ASYNC on its host port.

Lockbox

A 4-slot communications rack, used for NORAND TTY/ADCCP communications with 101/121/141 HHCs.

Logical Port

The host port on the controller is logically numbered 0. Port 0 is always the host port.

MQL (Multi-Quad Lockbox)

Multi-quad lockboxes are used for ADCCP communications with 121/141 HHCs.

NM277

Multiport TTY communications controller, with an internal modem, used to link lockboxes.

NM602

Multiport TTY communications controller used to link lockboxes.

NPCP (NORAND Portable Communications Protocol)

NPCP provides session, network, and datalink services for NORAND HHCs in the NORAND LAN environment used with printers and data communications.

Physical Port

Equates to port connector. The 4980 controller has four internal physical ports (“A”, “B”, “C”, and “D”). It also has six connectors (“A”, “B”, “C”, “D”, “LAN1”, and “LAN2”). Ports “B”, “C”, and “D” are permanently attached to the 15-pin connectors labeled “B”, “C”, and “D” respectively on the back of the controller. Port “A” is attached to either the 15-pin RS-232 connector labeled “A” or to both of the two 9-pin RS-485 connectors labeled “LAN1” and “LAN2”. Port “A” is attached to the RS-485 connectors when it is configured as a LAN port, otherwise it is attached to the RS-232 connector labeled “A.”

Port

This guide uses “port” to refer to a hardware communications port.

Primary ADCCP

Used on a remote port to connect to 121/141 terminals and secondary ADCCP remote controllers.

Remote Controller

The controller which is logically farthest away from the host computer when two controllers are connected.

Remote Port

An ADCCP, TTY, or NPCP port that can connect to hand-held computers or remote controllers. Data channels on remote ports are multiplexed onto the host port.

Secondary ADCCP

Used on the host port of a remote controller and can connect to a primary ADCCP remote port on another controller.

TCOM or Telecom

Telecommunications.

Terminal

Circuit terminating device such as a hand-held computer.

TTY

NORAND 2-way TTY asynchronous data link protocol.

INDEX

NOTE:

This index covers all topics. Page numbers in italics are figures, those in bold are table titles. Index entries in mixed case letters are case sensitive commands.

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