Intermec
Technologies Corporation

6980/6985 Network Manager

PROGRAMMER'S GUIDE

P/N 977-055-002
Revision B
May 2000

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This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Reglèment sur le material boilleur du Canada

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GLOSSARY

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Section 1
Introduction

NOTE: *This publication supersedes the* 4980 Network Controller Programmer's Guide *(P/N: 977-028-001) and the* 4985 Network Controller Programmer's Guide *(P/N: 977-028-006).*

The 6980/6985 Network Manager provides a data communications interface between the host computer and INTERMEC® devices. The network manager is programmable and can be configured many ways. The two functions in this release of the 6980/6985 Network Manager are:

- An asynchronous (async) or IP-based communications gateway to a host computer
- A hand-held computer network manager.

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

In the second function, the network manager is usually located at a remote site and provides an interface between hand-held computers and a host. Section 2 provides illustrations of several possible system configurations.

A host telecommunication program and associated support programs are required to interface to a 6980/6985 Network Manager. This function can be provided by the Norand® 6920 Communications Server or some other host application.

The RS-232 host link can be configured for speeds up to 115,200 bps async or a 10 Mbps TCP/IP interface. See Section 4 for more on developing your host interface.

The network manager initiates the session placing the host in a loop reading data and request records from network managers.

About this Guide

These paragraphs detail topics discussed in each section:

Section 1 — Introduction
Introduces the manual and provides customer support information.

Section 2 — Getting Started
Covers the hardware configuration of the network, the physical port assignments on the network manager, and the logical port assignments.

Section 3 — Host-to-Network Manager Records
Lists host-to-network manager records and other processing information from the host.

Section 4 — Network Manager-to-Host Records
Contains network-to-manager records and other processing information, and status and error codes returned from the network manager.

Section 5 — EM611 Header Information
Defines the EM611 IP framing structure.

The appendixes have several program examples and 4980-to-6980 conversion information.

Related Publications

The following publications have information related to the 6980/6985 Network Manager.

6980/6985 Network Manager User's Guide
P/N: 961-055-003

Norand® 6920 Communications Server Installation Guide
P/N: 962-055-005

Norand® 6920 Communications Server User's Guide
P/N: 961-021-014

Norand® 6920 Communications Server Reference Manual
P/N: 977-021-001

Customer Support

Customer Response Center

The Customer Response Center (technical support) telephone number is 800-755-5505 (U.S.A. or Canada) or 425-356-1799. The facsimile number is 425-356-1688. Email is *support@intermec.com.*

If you email or fax a problem or question include the following information in your message: your name, the company name and address, phone number and email to respond to, and problem description or question (the more specific, the better). If the equipment was purchased through a Value-Added Reseller (VAR), please include that information.

Factory Service

If your unit is faulty, you can ship it to the nearest authorized Service Center for factory-quality service. The addresses and telephone numbers are included in the Warranty Card shipped with your product.

Web Site

The Customer Support File Libraries, including Hot Tips and Product Awareness Bulletins, are available on the Internet. New users start at the Intermec web site: *http://corp.intermec.com*. Choose "Support," then "Product Support," then "Conference Area." Look on the main page for a link to register new customers.

A PDF version of this manual is available at: *http://corp.intermec.com/manuals/english.htm* or choose "products," "manuals," "english" via the home page.

Bulletin Board Service

The Customer Support Bulletin Board (BBS), maintained by the Intermec Technologies Corporation, provides software and documentation:

Phone number:
319-369-3515 (14.4 Kbps modem)
319-369-3516 (28.8 Kbps modem)

Protocol:
Full duplex, ANSI or ANSI-BBS; 300 to 28,800 bps; v.32bis; 8 bits, no parity, 1 stop bit. *For high-speed modems, disable XON/XOFF and enable RTS/CTS.*

This is the same location available via the internet site. If you have high-speed access, the web interface provides a faster response.

Section 2

Getting Started

Modem Support

The 6980/6985 Network Manager supports a number of Hayes-compatible configuration and autodial modem types. Support provided is subject to changes made in the modem interface by the modem vendor.

Error Codes

Error codes via the LED display and Power-Up Self-Test errors are located in the *6980/6985 Network Manager User's Guide* (P/N: 961-055-003).

Enhancements

The network manager provides a number of new features:

File support
The network manager allows the host computer to download a limited number of files that can be stored on the network manager compact flash. These files can include customer data files, which can be forwarded to a hand-held computer 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 upload or delete data or boot file from the network manager.

Line disciplines
The network manager supports a variety of line disciplines, including Norand TTY, Async, and Norand® Portable Communications Protocol (NPCP).

Autodial/Autoanswer *(Future release)*
Ports on the network manager can be toggled as either autodial or autoanswer. A timeout can be specified for autoanswer ports.

Data Record Length
The network manager data record length is 256 bytes for Async or 256 or 1024 for IP, not including channel and record type bytes. The 4980 data record length is 256 bytes.

Booting Hand-Held Computers
Boot files can be downloaded from the host into a "DATA" directory in the 6980 Network Manager CompactFlash flash.

Modifying System and Port Configurations
The network manager system and port configurations can be modified using the 6980 Web Interface. See the *6980/6985 Network Manager User's Guide* for details.

Communication Session

The 6980/6985 Network Manager uses the host-to-hand-held computer communications sessions. The network manager 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 a network manager. All data sent to the host from a network manager is prefixed by a device ID and logical channel identifier.

Table 2-1 summarizes the communication abilities of each of the hand-held computer types in specific environments. Other environments may be possible with special adapters.

Table 2-1
Network Manager Environments

Hand-Held Computer Type	Protocol Option	Environment
4000/6000 Series	TTY	Modem (single dock)
	NPCP	Single or multidock directly-connected to a network manager
601 and 602 (DOS only)	TTY	Modem (single dock)
	NPCP	Single or multidock directly-connected to a network manager

▶ **NOTE:** *The network manager supports only full-duplex modems.*

As an example, Table 2-1 indicates that a 4000 or 6000 Series hand-held computer can communicate using TTY or NPCP. If NPCP is used, the hand-held computer must be in a dock which is directly cabled to a network manager.

The network manager 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" file transfer from hand-held computer to host computer.
- A "download" file transfer from host computer to hand-held computer.
- 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 set of download data files to the unique route or driver assigned to that particular hand-held computer. This download part is optional.

EXAMPLE: The host receives upload records from a hand-held computer, on a device ID and logical channel, until the upload is complete. After the upload is complete, the host receives download data requests, on the same device ID and logical channel, for the hand-held computer. The host responds with download data until finished, then an end-of-data record is sent. The host then receives an end-of-session record with the hand-held computer session status.

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

See the *6980/6985 Network Manager User's Guide* for a table that specifies the possible configurations for network manager ports and the environments to which the ports can connect.

Network Configurations

Each 6980/6985 Network Manager is treated as a unique connection to the host application allowing a single host application to simultaneously communicate with several network managers. The 6980/6985 Network Manager, using NPCP as its main connection protocol, allows the host to make a high speed connection to each network manager.

This type of configuration allows for a simple migration from a 4980 Communications Controller to a 6980 Network Manager. See Section 5 to learn about the 6980 NPCMux application.

See the *6980/6985 Network Manager User's Guide* for sample configurations. Contact your account representative for more detailed information.

Physical Ports

The 6980 Network Manager has five possible physical ports for client connections. The 6985 Network Manager has one physical port.

Table 2-2
Physical Ports for Client Connections

Physical Port	Hardware Type	Supported Client Protocol	Logical Channels
6980 Network Manager			
Port A1	RS-485 Connections	NPCP	1–5
Port A2	RS-485 Connections	NPCP	1–5
Port B1	RS-232 Connections	TTY	1
Port B1	RS-232 Connections	TTY	1
Port C1	PC Card Modem	TTY	1
6985 Network Manager			
Port A1	RS-485 Connection	NPCP	1–5

The 6980 Network Manager configuration connects with a maximum of 13 handheld computer (client) channels simultaneously. The 6985 Network Manager connects with a maximum of 5 channels. Thus, when a network manager is communicating to a host computer, clients will send their upload and receive their download on 1 of 5 or 13 possible logical channels. There is no correlation between what logical channel is assigned to a client and the physical port the client communicates on.

The network manager, pending its configuration, has a "pool" of channels individually assigned to client connections. The client uses its assigned channel to communicate its upload and receive its download. When the client ends its session, the channel is returned to the pool for reuse.

Logical Channels

Records from the network manager specific to a port (such as 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 client is sequential on a logical channel, and the location of the logical channel should not concern the host programmer.

Compact Flash

The 6980 Network Manager stores Windows CE, Web Server, FTP Server, 6980 protocols, and hand-held computer applications on the compact flash within. The compact flash can be viewed using FTP (either command line or through a browser) and has a "cfata" folder.

Removing or editing files on the compact flash can cause the network manager to fail. Under some extreme circumstances, the network manager may not be recoverable. In these extreme cases, the CompactFlash Card must be reimaged.

The compact flash has the following folder structure:

Folder Name	Description
`\cfata\Websrv`	Contains all the Web Server pages and the location of the configuration file for the network manager (6980CE.INI).
`\cfata\6980`	Location of the 6980 application that provides host and client communication protocols.
`\cfata\6980\data`	Location for all locally stored client boot applications and download request data files.
`\cfata\UpdFiles`	Overrides any Kernel resident files. At cold boot, any file in this directory is copied to the "\Windows" folder and the system is warm-booted. Only Kernel-level files reside in this directory.
`\cfata\AppFiles`	Location to store any new applications that may run in the "\Windows" folder (known as the "object store" in Windows CE) once the network manager is started.

Some of the important files which reside on the network manager:

File Location\Name	Description
`\cfata\boot.ini`	A file containing a list of applications to start when the network manager is started.
`cfata\Websrv\6980ce.ini`	Configuration file for the network manager (normally modified using Web Pages (see the *6980/6985 Network Manager User's Guide* for details).
`cfata\Websrv\6980ini.def`	Default configuration file for the network manager (this file returns the network manager to its factory default).

Device Channel Option

Each record from the network manager is preceded by a device ID, a logical channel identifier, and a record type field.

There are eight host-to-network manager record types. Some are request records which require a response from the host computer. Each record from the host computer is preceded by a record type field. There are six host-to-network manager record types.

▶ **NOTE:** *IP-based communications require a 6-byte header prefixed to each record. See Section 5 for EM611 IP Header information.*

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

All records from the 6980 Network Manager are preceded with a device number and channel number.

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

EM311 for 4980 Series Communications Controller:
Position 1 Device channel disabled *(optional)*
Position 2 Hand-held computer channel
Position 3 Record type
Position 4+ Type-dependent

EM311 for 6980/6985 Network Manager:
Device channel enabled:
Position 1 Device channel
Position 2 Hand-held computer channel
Position 3 Record type
Position 4+ Type-dependent

Section 3

Host-to-Network Manager Records

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

This section explains the function of each host-to-network manager record type.

EM311 Protocol Interface

Each record sent from your host must have a record type field. There may be eight record types sent from your host to the network manager.

This explains the function of each record type. Actual record layouts appear after the record description starting on page 3-2.

Each record from an async host must begin with a one-byte beginning-of-record delimiter (a slash "/") and a one-byte command code (ASCII) "0" through "7".

The host sends records in response to requests from the network manager, except for the initialization record. The initialization record is sent to activate an inactive network manager.

The host may also send two special commands to the network manager, a question mark "?" and an asterisk "*". A question mark indicates the host is ready to receive data and serves as an acknowledgement record. The asterisk resets the network manager, although the network manager will reset itself if the host issues an invalid record or fails to respond within the host timeout period.

The record includes an end-of-record delimiter, by default `<CR>`, which is configured in the initialization record.

Data records from the host (not including special commands) must be of the same fixed-length, and may include end-of-line pad bytes. The network manager uses the initialization record sent from the host to determine record size and end-of-line pad lengths. IP-based communications have a 6-byte header prefixed to each record. See Section 5 for EM611 header information.

Record Types

This section specifies the record types for the Async host interface. For IP-based interfaces, an EM611 header *must* prefix all records sent to a 6980 Network Manager.

Table 3-1
Host-to-Network Manager 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 network manager. 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/network manager session to set the system mode parameters and default port activation parameters.
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 network manager processes autoanswer and autodial activate records identically. A hand-held computer port can be defined as TTY. The activate record specifies the protocol type (TTY) to use for the next connection.
5	Deactivate for one minute	Deactivate records can postpone activating a port for one minute. 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 network manager. 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.

Download Data Record (Type 0)

The host sends a download data record in response to a download request. Information obtained from upload data links download data with a specific computer on a logical channel.

Table 3-2
Type 0 — Download Data Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "0"
3	256, 512, 1024, 2048, or 4096 *depending on configuration*	Download data
259 *or 1027*	2	Optional CRC bytes (if enabled)
261+ *or 1028+*		Optional pad (up to 3 bytes)

EXAMPLE: (CR = end of record marker)

```
/0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxx<CRC><CRC>ppp<CR>
```

Beginning delimiter = "/"
Command code = Download Data "0"
Download data = "xxx"
Optional CRC bytes = 2
Optional pad = "ppp"
Optional end-of-record delimiter = <CR>

End-of-Data Record (Type 1)

The host sends an end-of-data record in response to a download request from the network manager. This indicates that no more download data exists for this session or file. The host also sends end-of-data records in response to a file request to terminate file processing.

Table 3-3
Type 1 — End-of-Data Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "1"
3	256, 512, 1024, 2048, or 4096 *depending on configuration*	Download data with required pad bytes if less than 256 *or 1024* bytes of data.
259+ *or 1027+*		Optional pad (up to 5 bytes)

EXAMPLE: (CR = end of record marker)

```
/1xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxppppp<CR>
```

Beginning delimiter = "/"
Command code = End-of-Data "1"
Download data = "xxx"
Optional pad = "ppppp"
Optional end-of-record delimiter = <CR>

Initialization Record (Type 2)

At the beginning of a host-to-network manager session, an initialization record sets the system mode parameters and default port activation parameters.

Table 3-4
Type 2 — Initialization Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "2"
3	256	Initialization parameters list. The parameter list terminates with a slash "/."
259+		Optional pad (up to 5 bytes)

EXAMPLE: (CR = end of record marker)

```
/2xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxx/ppppp<CR>
```

Beginning delimiter = "/"
Command code = Initialization Record "2"
Parameter initialization list = "xxx"
Optional pad = "ppppp"
Optional end-of-record delimiter = <CR>

The host sends the initialization record to the network manager at the beginning of each communication session. The host can activate file processing in the network manager using the system mode parameter (–S) in the initialization record.

EXAMPLE: /2 –S744/
Initialize network manager with the network manager file processing enabled.

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

A slash "/" terminates initialization parameters if the initialization record is padded without spaces. The initialization record size is 258 bytes, minimum.

A parameter list has this general format: `–[type]parm`

[type] One-byte field specifying the parameter type.

"parm" Parameter value.

System Mode Parameters

The network manager configuration can be customized using system parameters. –S[system mode]

The system mode is a 1- to 5-digit numeric (base 10) field adjusting the operational mode for the network manager. Mode parameters have a value and are turned on by *adding in* the values for each specific mode.

These parameters are supported in the initialization record:

```
/* defined bits in "S" record mode */
/* system mode parameters */
/* LABEL       DECIMAL    BINARY   */
  MODE_OFF     0          /* 0000 0000 0000 0000 */
  RMT_ID_ON    64         /* 0000 0000 0100 0000 */
  FILES_ON     128        /* 0000 0000 1000 0000 */
```

Table 3-5
System Mode Parameters

Value	Meaning	Description
8	Boot 4000 Series in a LAN connected to network manager.	Enabled when a LAN port is installed and a list of boot files exists on the network manager's system disk.
32	2-byte channel option.	All records to host are preceded by a 2-byte channel identifier. *(Required)*
64	Remote ID on.	Forward ID from remote controller to host. *(Required)*
128	Network manager file processing.	When added in, the host is prompted with file requests at the beginning of a host-network manager communications session.
512	Local ID on.	Forward ID from remote controller to host. *(Required)*

Host Parameters

The network manager's host parameters can be customized in the initialization record.

Table 3-6
Host Parameters

Parameter	Default	Description
–C[parity]	0	1 digit numeric field setting parity and number of data bits. Valid values are: "0" = No parity/8 data bits(–C0) "1" = Odd parity/7 data bits (–C1) "2" = Even parity/7 data bits (–C2)
–D[stopbits]	1	1 digit numeric field setting stop bits. Valid values are: "1" = One stop bit (–D1) "2" = Two stop bits (–D2) "3" = Three stop bits (–D3)
–E[delimiter]	13	1- to 2-digit numeric field specifying collating sequence number of character marking end of all records sent from network manager to host. A delimiter of "0" specifies no end-of-record delimiter.
–B[block size]	0	Numeric field ranging from 256 to 4906 (multiples of 256 — 256, 512, 1024, 2048, or 4096); specifies the minimum network manager-to-host record block size. Does not include the end-of-record delimiter character. Records shorter than the block size are padded to the block size and the delimiter character is appended. Forces network manager to send fixed-length blocks to the host.
–G[pad char]	32	1- to 3-digit numeric field specifying the characters that pad short blocks when a minimum block size is specified.
–H[ready char]	63	1- to 3-digit field specifying the host "ready" directive.
–I[read timeout]	30	2- or 3-digit numeric field specifying the maximum seconds the network manager waits for a response from host. If no response received within set time, the network manager will reset and await an initialization record from the host. Valid values are 10 to 120.
–J[host-delay]	0	1- or 2-digit numeric field specifying delay in hundredth of seconds before network manager sends next message to host after receiving a ready character from host. Valid values are 0 to 50.
–K[char-gap]	10	1- or 2-digit numeric field specifying maximum intercharacter gap time in whole seconds allowed in a block of data sent from host. Valid values are 9 to 40.
–L[cts-gap]	5	1- to 3-digit numeric field specifying maximum time in tenths of seconds the network manager waits for CTS after RTS. Valid values are 0 to 100.

EXAMPLE: `/2–E0–I60–K30/`

Activate Autoanswer (Type 3)

The host sends an activate record in response to an activate request record. Nonswitched (direct) connections are auto-answer connections.

Table 3-7
Type 3 — Activate (Auto-Answer) Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "3"
3	1	ASCII blank " "
4	255	Optional activation parameters list. This list terminates with a slash "/" and the remaining bytes filled with blanks.
259+		Optional pad up to 5 bytes

EXAMPLE: (CR = end of record marker)

```
/3 xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx/ppppp<CR>
```

Beginning delimiter = "/"
Command code = Activate Record "3"
ASCII blank = " "
Activation parameters list = "xxxx"
Optional pad = "ppppp"
Optional end-of-record delimiter = <CR>

Activate Autodial (Type 4)

▶ **NOTE:** *"Activate Autodial" is not supported in the initial release.*

The host responds to an activate request record with an activate record. Non-switched (direct) connections are auto-answer connections. The network manager processes auto-dial activate records for connections that are dial-out. This is used on the 6980/6985 Network Manager and is presented here for compatibility.

Table 3-8
Type 4 — Activate (Auto-Dial) Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "4"
3	1	ASCII blank " "
4	255	Optional activation parameters list. This list terminates with a slash "/". When used, fill this field with blanks.
259+		Optional pad up to 5 bytes

EXAMPLE: (CR = end of record marker)

```
/4 xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx/ppppp<CR>
```

Beginning delimiter = "/"
Command code = Auto Dial Record "4"
ASCII blank = " "
Activation parameters list = "xxxx"
Optional pad = "ppppp"
Optional end-of-record delimiter = <CR>

Deactivate for One Minute (Type 5)

▶ **NOTE:** *"Deactivate for One Minute" is not supported in the initial release.*

Use deactivate records to postpone activating the port for one minute. The network manager will issue another activation request after one minute.

Table 3-9
Type 5 — Deactivate for One Minute Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "5"
3	256	Required pad bytes
259+		Optional pad up to 5 bytes

EXAMPLE: (CR = end of record marker)

```
/5xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxppppp<CR>
```

Beginning delimiter = "/"
Command code = 5
Filler = "xxxx"
Optional pad = "ppppp"
Optional end-of-record = <CR>

Host Directive (Type 6)

The host sends a directive in response to a special download data request from the network manager. Five subtypes of host directives are available. Types "1", "2", and "3" manage user data files. Type "4" sends download data to a hand-held computer and type "6" cancels file processing.

Table 3-10
Type 6 — Host Directive Record

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "6"
3	1	Directive type: "1" – "4," and "6": "1" = File upload directive "2" = File create or load directive "3" = File delete directive "4" = File download directive "6" = File processing abort
4	256	Directive information. The information required for this field depends on the directive type used.
259+		Optional pad up to 5 bytes

If file processing is enabled using the system mode parameter in the initialization record, the host will receive file requests from the network manager at the beginning of a host-to-network manager session and after the host acknowledges a network manager Directive Status Record. These requests can have one of several host directives.

▶ **NOTE:** *The network manager sends a directive status to the host immediately after completing a host directive.*

The host sends a directive record only during the file processing phase of a communication session. This record requests information from the network manager or file uploads with the network manager.

A host directive may be sent by the host in response to a special request from the network manager. Types "1" to "3" manage user data files (or hand-held computer boot files) stored on the network manager. (If file processing, a system mode parameter is enabled and the host is prompted with file requests at the beginning of a host-to-network manager session.) Type "4" sends a file stored on the network manager to a hand-held computer requiring download data.

▶ **NOTE:** *For all of the following examples, asterisks indicate spaces in commands. Complete commands may not be shown. "6980" is short for "6980 Network Manager."*

File Upload Directive "1"

The host sends an upload directive, in response to a file processing special request, to upload a file stored on the 6980/6985 Network Manager (usually the directory file).

Table 3-11
File Upload Directive "1"

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "6"
3	1	Directive Type: "1"
4	8	DOS compatible filename, left-justified
12	3	DOS compatible filename extension, left-justified
15	245	Filler bytes (ASCII space)

EXAMPLE: /61FILENAMEEXT. . .xxxxxppppp<CR>

Host Computer		6980	Description
	<———	**0161**	File Processing Request
/61FILENAMEEXT..xxxxxppppp<CR>	———>		Upload Directive
	<———	**010xxx...**	File Header Information
?	———>		Host Ready
	<———	**010xxx...**	Upload Data
?	———>		Host Ready
	<———	**010xxx...**	Upload Data
?	———>		Host Ready
	<———	**011**	End Upload Data
?	———>		Host Ready
	<———	**01710**	Status Record
?	———>		Host Ready
	<———	**0161**	Next File Processing Request

▶ **NOTE:** *IP-based structures have length information prefixed to each record between the network manager and the host computer.*
For example: IP/61FILENAMEEXT. . .xxxxxppppp<CR>

File Create or Load Directive "2"

This directive is sent, in response to a file processing special request, to create a data file on the network manager. This must contain a user data file directory entry with filename and user-defined information. The file is saved on the CompactFlash storage card. After the network manager 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 data for the file.

Table 3-12
File Create or Load Directive "2"

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "6"
3	1	Directive type: "2"
4	8	DOS compatible filename *(required)*
12	3	DOS compatible file extension *(required)*
15	6	Date field (YYMMDD)
21	4	24-hour time (HHMM)
25	2	User-defined filler
27	1	User-defined file type "0" or blank indicates a hand-held computer boot file.
28	1	Filler *(should be zero-filled 0x30)*
29	1	File status: "0" = Good "1" = Undefined "2" = Deleted "3" = System
30	6	File size (in ASCII digits) *required*
36		Filler bytes

EXAMPLE: /62FILENAMEEXTddddddttttff000123456ppppp<CR>

Host Computer		6980	Description
	<———	**0161**	File Processing Request
/62FILENAMEEXTddddddttttff000123456ppppp<CR>	———>		Create/Load Directive
	<———	**012**	Download Request
/0<data>	———>		Data Block
	<———	**012**	Download Request
/0<data>	———>		Data Block
	<———	**012**	Download Request
/1	———>		End of Data Record
	<———	**01720**	Status Record
?	———>		Host Ready
	<———	**0161**	Next File Processing Request
/1	———>		End of Data Record

(no more files — end file processing)

File Delete Directive "3"

A file delete directive may be sent in response to a file request to delete a user data file from the network manager user file directory.

▶ **NOTE:** *A directive status record (type 7) goes to the host immediately after a host directive is completed.*

Table 3-13
File Delete Directive "3"

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "6"
3	1	Directive type: "3"
4	8	DOS compatible filename *(required)*
12	3	DOS compatible file extension *(required)*
15	245	Filler bytes

EXAMPLE: /63FILENAMEEXT. . .xxxxxppppp<CR>

Host Computer		6980	Description
	<———	**0161**	File Processing Request
/63FILENAMEEXT..xxxxxppppp<CR>	———>		Delect Directive
	<———	**01730**	Status Record
?	———>		Host Ready
	<———	**0161**	Next File Processing Request

File Download Directive "4"

The host sends this record type in response to a request for download data from a computer. After receiving a download directive, the network manager opens the file specified and downloads it to the computer. The network manager must contain this file (created with File Create).

Table 3-14
File Download Directive "4"

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "6"
3	1	Directive type: "4"
4	8	DOS compatible filename *(required)*
12	3	DOS compatible file extension *(required)*
15	245	Filler bytes

EXAMPLE: /64FILENAMEEXT. . .xxxxxppppp<CR>

Host Computer		6980	Description
	<———	**0161**	File Processing Request
/64FILENAMEEXT. . .xxxxxppppp<CR>	———>		Download Directive
	<———	**012**	Download Request
/0<data>	———>		Data Block
	<———	**012**	Download Request
/0<data>	———>		Data Block
	<———	**012**	Download Request
/1	———>		End of Data Record
	<———	**01720**	Status Record
?	———>		Host Ready
	<———	**0161**	Next File Processing Request
/1	———>		End of Data Record
			(no more files — end file processing)

File Processing Abort "6"

The host sends this directive to inform the network manager that a file error occurred on the host. If currently downloading or creating a file on the network manager, the network manager responds by deleting the current file being created or downloaded. Telecommunications then begins with the hand-held computers. *Hand-held computer cold-starts are not possible in a locked file system.* Files unlock after a successful file processing session.

Table 3-15
File Processing Abort "6"

Position	Bytes	Description
1	1	Beginning delimiter: "/"
2	1	Command code: "6"
3	1	Directive type: "6"
4	256	Filler bytes

EXAMPLE: /66. . .xxxxxppppp<CR>

Host Computer		6980	Description
	<———	**0161**	File Processing Request
/62FILENAMEEXTddddddttttff000123456ppppp<CR>	———>		Create/Load Directive
	<———	**012**	Download Request
/0<data>	———>		Data Block
	<———	**012**	Download Request
/66...xxxxxppppp<CR>	———>		Processing/Abort Directive
	<———	**01760**	Status Record
?	———>		Host Ready
	<———	**0161**	Next File Processing Request

Special Commands

The host may send two special commands to the network manager. Records from the host, except for the special commands, must all be of the same fixed-length, and may include end-of-line pad bytes.

IP-based commands must also have a prefixed record length field attached.

Type ? — Host Ready Command

The host sends this record to the network manager when ready to receive data. This command can be changed to a different value using the –H parameter in the initialization command.

Table 3-16
Type ? — Host Ready Command

Position	Bytes	Description
1	1	Question mark "?"

EXAMPLE: (CR = end of record marker)

```
?<CR>
```

Type * — Reinitialization Command

The host sends this record to reset the network manager when the network manager is expecting a ready command.

Table 3-17
Type * — Reinitialization Command

Position	Bytes	Description
1	1	Asterisk "*"

EXAMPLE: (CR = end of record marker)

```
*<CR>
```

EXAMPLE 1: This is a sample of file processing when the files on the target 6980 Network Manager are up to date with the 6920 Communications Server files.

6920		6980	Description
	<——		Connection Request
	——>		Reply to Socket
	<——	**018CE6980...**	Controller ID Record
/2*–D1*-S744..	——>		Initialization Record
?	——>		Host Ready
	<——	**0161**	File Processing Request
/61NCDIR*NCC**	——>		Upload Directive: NCDIR.NCC
?	——>		Host Ready
	<——	**010NETRPL**LST000124.**	Uploads NCDIR.NCC
?	——>		Host Ready
	<——	**01710**	Host Directive Status Record
?	——>		Host Ready
	<——	**0161**	File Processing Request
/63NETRPLLST**	——>		Delete Directive: NETRPL.LST
?	——>		Host Ready
	<——	**01730**	Host Directive Status Record
?	——>		Host Ready
	<——	**0161**	File Processing Request

With no files to download, 6920 sends down a directive to create the NETRPL.LST file.

/62NETRPLLST0..**	——>		Create Directive: NETRPL.LST
?	——>		Host Ready
	<——	**012**	Download Request
/0APP***EXE**	——>		Data block for NETRPL.LST
?	——>		Host Ready
	<——	**012**	Download Request
/1	——>		End of Data Record
?	——>		Host Ready
	<——	**01720**	File Directive Status
?	——>		Host Ready
	<——	**0161**	File Processing Request
/1	——>		End of Data Record
?	——>		Host Ready
	<——	**014**	Tcom may begin with clients
?	——>		Host Ready

EXAMPLE 2: In this sample, the 6980 Network Manager does not have any files in the Data directory; the 6920 Communications Server must create the necessary files. Note that the NETRPL.LST file has to be created for 4000 boot files, not for 6xxx files.

6920		6980	Description
	<——	**018CE6980**000124105.**	Controller ID Record
/2*–D1*-S744*-...	——>		Initialization Record
?	——>		Host Ready
	<——	**0161**	File Processing Request
/61NCDIR*NCC**	——>		Upload Directive: NCDIR.NCC
?	——>		Host Ready
	<——	**010NETRPL**LST000124.**	Uploads NCDIR.NCC
?	——>		Host Ready
	<——	**01710**	File Directive Status
?	——>		Host Ready
	<——	**0161**	File Processing Request
/62NETRPLLST0..**	——>		Create Directive: NETRPL.LST
?	——>		Host Ready
	<——	**012**	Download Data Request
/0APP***EXE**	——>		Data Block for NETRPL.LST
?	——>		Host Ready
	<——	**012**	Download Data Request
/1	——>		End of Data Record
?	——>		Host Ready
	<——	**01720**	File Directive Status
?	——>		Host Ready
	<——	**0161**	File Processing Request
/62APP***EXE99..**	——>		Create Directive: APP.EXE
?	——>		Host Ready
	<——	**012**	Download Data Request
/0[INI]..Version=1..	——>		Data Block for APP.EXE
?	——>		Host Ready
	<——	**012**	Download Data Request
/1	——>		End of Data Record
?	——>		Host Ready
	<——	**01720**	File Directive Status
?	——>		Host Ready
	<——	**0161**	File Processing Request
/1	——>		End of Data Record
?	——>		Host Ready
	<——	**03C**	Begin of Call (tcom starts)

Section 4

Network Manager-to-Host Records

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

Record Formats with 2-byte Channel ID

Network manager-to-host record types implement the file transfer protocol and status information between the network manager and the host. A 2-byte channel ID is always activated.

There may be nine status and request record types sent from the network manager to your host that require a response from your host.

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

Device channel “0” is reserved for the network manager direct-connected to the host.

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.

Device channels are for remote network managers. The record formats for the 2-byte channel option are the same as the 1-byte channel option except that the device channel ID is prepended to each record from the network manager.

The 2-byte channel ID format, required for the 6980/6985 Network Manager, is shown in Table 4-1.

Table 4-1
2-Byte Channel ID

Position	Bytes	Description
1	1	Device ID (Hex): “0x31”
2	1	Hand-held computer Channel ID (Hex): 0x30–0x3E
3+		Records defined below starting at position 2.

Record Types

This section specifies the record types for Async host interfaces. An EM611 header is prefixed on all records sent from a 6980 Network Manager for IP-based communications. See Section 5 for EM611 header information.

Table 4-2
Network Manager-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 its session ends. See page 4-4.
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	Activation Request	The host activates a port using the activation 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.
6	Special Request	Special request records group a variety of special records into one record type. A subtype field determines the actual request type. There are two subtypes specified, see Table 4-12 on page 4-8.
7	Directive Status	The network manager sends directive status records to the host after completing a host directive (with or without error). See page 4-9.
8	Identification	The network manager sends an ID record to the host at the beginning of each session with a remote network manager. The ID record serves two purposes. It identifies the just connected remote network manager, and it opens a new device channel. See page 4-1.
C	Begin of Call	Sent by the 6980 Network Manager to the host computer when a hand-held computer is about to begin a session.

Upload Data (Type 0)

The hand-held computer sends contiguous upload data records to the host on a logical channel.

Table 4-3
Type 0 — Upload Data Record

Position	Bytes	Description
1	1	Device channel ID
2	1	Hand-held computer channel ID (Hex): 0x30–0x3E
3	1	Record type: "0"
4	256, 512, 1024, 2048, or 4096 *(depending on host configured data block size)*	Upload data
260	2	CRC bytes if CRC checking is enabled *(future release)*
262	3	Optional padding bytes

EXAMPLE: (CR = end of record marker)

```
010xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxx<CRC><CRC><CR>
```

Device channel ID = 0
Hand-held computer channel ID = 0x30h
Record type = upload data
"x's" are uploaded data
<CRC><CRC> = 2 CRC bytes for upload data

End of Session Status (Type 1)

This record indicates the status of a single hand-held computer session. Each hand-held computer sends an end-of-session record when finished communicating.

Table 4-4
Type 1 — End of Session Status Record

Position	Bytes	Description
1	1	Device channel ID: "0"
2	1	Hand-held computer channel ID (Hex): 0x30–0x3E
3	1	Record type: "1"
4	1	End of session status code and meaning are in Table 4-5.
5	4	Hand-held computer application status information
9	1	Local port identifier
10	249	Reserved for diagnostic information

EXAMPLE: (CR = end of record marker)

```
0110G0001xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxx<CR>
```

Device channel ID = 0
Hand-held computer channel ID = 0x30h
Record type = end of session
End of session is good.
Local port identifier is 1
Optional diagnostic data is indicated by "x's".

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 numeric characters and are listed in Table 4-5.

Table 4-5
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.

Data Request (Type 2)

Table 4-6
Type 2 — Data Request Record

Position	Bytes	Description
1	1	Device channel ID: “1”
2	1	Hand-held computer channel ID (Hex): 0x30–0x3E
3	1	Record type = “2”

EXAMPLE: (CR = end of record marker)

```
012<CR>
```

Device channel ID = 0
Hand-held computer channel ID = 0x30h
Record type = data request

Inactive Status (Type 3)

Table 4-7
Type 3 — Inactive Status Record

Position	Bytes	Description
1	1	Device channel ID: “1”
2	1	Hand-held computer channel ID (Hex): 0x30–0x3E
3	1	Record type = “3”

EXAMPLE: (CR = end of record marker)

```
013<CR>
```

Device channel ID = 0
Hand-held computer channel ID = 1
Record type = Inactive Status

Active Status (Type 4)

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 may discard or use these records to maintain real-time status information.

Table 4-8
Type 4 — Active Status Record

Position	Bytes	Description
1	1	Device channel ID: "1"
2	1	Hand-held computer channel ID (Hex): 0x30–0x3E
3	1	Record type = "4"

EXAMPLE: (CR = end of record marker)

```
014<CR>
```

Device channel ID = 0
Hand-held computer channel ID = 0x30h
Record type = Activate Status "4"

Activation Request (Type 5)

Host activates the LAN port in response to activate request records. Network manager sends request to host to activate enabled port after start of session and after each port disconnect. Port's prior connection status is also in request record. Host should respond with record types "3" or "4."

Table 4-9
Type 5 — Activation Request Record

Position	Bytes	Description
1	1	Device channel: "0"
2	1	Hand-held computer channel ID (Hex): 0x30–0x3E
3	1	Record type: "5"
4	1	For previous port activation status code and meaning, see Table 4-10 on the next page.
5	4	Reserved for diagnostic information
9	252	Required padding

EXAMPLE: (CR = end of record marker)

```
015xyyyy<CR>
```

Device channel = 0
Hand-held computer channel ID = 0x30h
Record type = Activation Request "5"
"x" = Previous activation status code
"y" = Diagnostic information

An activation 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 numeric characters and are listed in Table 4-10.

Table 4-10
Activation Request Status Codes

Code	Description
0	Good
1	Abort. Port disconnect due to protocol error. Physical connection was lost.
2	No answer.
3	Modem configuration error or bad modem status.
4	Disconnect, line protocol error.
5	Bad activation parameter error.
6	Error activating port.
7	Autoanswer port 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.
8	Hand-held computer error.
9	Line busy.
: (colon)	Modem reported no dial tone.
; (semicolon)	Modem reported no carrier.
< (less than)	Call collision, modem reported ring

Special Request (Type 6)

Special request records group a variety of special records into one record type. A subtype field determines the actual request type. Currently there is only one subtype defined.

Table 4-11
Type 6 — Special Request Record

Position	Bytes	Description
1	1	Device channel ID: “0”
2	1	Channel ID: “1”
3	1	Record type: “6”
4	1	Special request subtypes and meanings in Table 4-12.

EXAMPLE: (CR = end of record marker)

```
0161<CR>
```

Device channel = 0
Channel ID = 1
Record type = Special request
Special request subtype = File processing request

Table 4-12
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; *not implemented*)	Deactivate requests are enabled using the network manager initialization record. When enabled, the network manager periodically sends a deactivate request to the host for each autoanswer port. The host then responds with a deactivate directive (yes or no).

Directive Status (Type 7)

Network manager sends directive status records to the host after completing a host directive (with or without error).

Table 4-13
Type 7 — Directive Status Record

Position	Bytes	Description
1	1	Device channel ID: “0”
2	1	Channel ID: “1”
3	1	Record type: “7”
4	1	Status type: “1” – “6”: “1” = File upload “2” = File create or load “3” = File delete “4” = File download “5” = Reserved “6” = File processing abort
5	1	Directive status codes and meanings are in Table 4-14 on the next page.
6	3	Reserved for diagnostic information

EXAMPLE:

(CR = end of record marker)

```
01710xxx<CR>
```

Device channel ID = 0
Channel ID = 1
Record type = Directive Status
Status type = File upload
Status = Good
“xxx” is reserved for diagnostic information

Currently, four types of file directives are implemented on the network manager. After a directive is completed, successfully or unsuccessfully, the network manager 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 1-byte characters (in hex) and are listed in Table 4-14.

Table 4-14
Host File Directive Status Codes

Code (Hex)	Description
0x30	Good status
0x31	File open error.
0x32	File read error.
0x33	File write error.
0x34	The maximum number of files exceeded on a create operation.
0x35	The maximum number of open files exceeded on a file open operation.
0x36	File not found error.
0x37	Bad file handle (internal only).
0x38	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.
0x39	File not open error (internal only).
0x3A	File allocation error.
0x3B	End of file (internal only).
0x3C	File directory error.
0x3D	Request aborted.
0x3E	File system locked.

Begin of Call (Type C)

This record is sent by the network manager to the host computer when a hand-held computer is about to begin a session.

Table 4-15
Type C — Begin of Call Record

Position	Bytes	Description
1	1	Device channel ID: “0”
2	1	Channel ID (Hex): 0x30–0x3E
3	1	Record type: “C”

EXAMPLE: (CR = end of record marker)

```
01C<CR>
```

Device channel ID = 0
Channel ID = 0x30h
Record type = Begin of Call

Network Manager-Based File Processing

"File Processing" refers to a method of transferring from the host computer updated application and data files to a local or remote 6980/6985 Network Manager. These files are stored in the network manager's CompactFlash storage card. The new files will overwrite or replace the existing files on the network manager. The total file size area is limited to 4 MB. The data files may contain files to boot hand-held computers, download data, or warm-boot files for hand-held computers using the File Server method.

To successfully implement file processing, you must:

- Understand the network manager disk directory structure and format of the NETRPL.LST control file, which can boot 4000 Series Computer in the LAN environment.

  "Boot" is the industry jargon for bringing a computer to normal operating condition when it has been without power.

  NETRPL.LST resides on the network manager and contains filenames needed for *booting* the hand-held computer. It is composed of 11-byte records with each containing two fields: an 8-byte filename and 3-byte extension. A blank record terminates the list of files.

  When the *boot option* is in effect, the network manager attempts to send all files specified in NETRPL.LST to any hand-held computer trying to boot on the attached LAN.

Table 4-16

NETRPL.LST File

Position	Bytes	Description
1	8	DOS-compatible filename (right-aligned, padded with spaces)
9	3	DOS-compatible filename extension

EXAMPLE: There are three files contained in NETRPL.LST. Asterisks indicate spaces:

```
UPLOAD**DATRECORD**IDXCUSTDATAINF
```

- Implement host directive, special request, and directive status records on your host computer.
- Perform version checking of hand-held computer application software program changes done on the host computer against each hand-held computer for proper version numbers.
- Know how to download to hand-held computers, without a proper version, a "download request" file. The "download request" file must have the proper filenames located on the network manager.

Section 5

EM611 IP Header Information

The 6980 Network Manager communicates over IP to a host 6980 Network Manager or host communications program using a framing called EM611. This is an extension of an older Norand® framing structure called EM311. The new framing structure encapsulates the EM311 packet with a 6-byte header. EM611 is very similar to EM311 allowing 4980 users to modify their host application with minimal effort. EM611 also has an added feature that it can contain up to 8192 bytes of data, whereas the older EM311 record contained a maximum data block of 256 characters.

An EM611 packet has the following structure and definition:

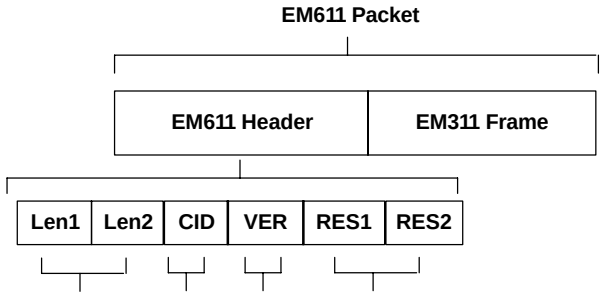

Figure 5-1
EM611 Structure and Definition

Table 5-1
EM611 Packet and Header

Position	Abbreviation	Description
1, 2	LEN1, LEN2	Length of rest of EM611 frame. Length=(LEN1 * 256) + LEN2
3	CID	Controller ID (Virtual Controller channel for multiple 6980 support)
4	EM611	Version of EM611 packet frame. Current version is 0x01.
5, 6	RES1, RES2	Reserved for future use.

EM311 Records:

As defined in Sections 3 and 4.

EM611 Socket Number:

EM611 attempts to contact a host computer or host 6980 Network Manager using Socket Number ***6980***.

NOTE: *The above information was provided for customers building their own interface directly to the 6980 Network Manager. This information is hidden from customer's implementing the Intermec applications.*

Local 6980 Network Manager (NPCMux Functionality)

By putting a local 6980 Network Manager running 6980 Norand Portable Communications Multiplexer program (***NPCMux*** for short), the host can interface to a single 6980 for a tiered architecture.

"6980 NPCMux" provides a common interface to communicate to local and remote 6980 Network Managers using NPCP. "6980 NPCMux" will allow customers and distributors to make minimal host application changes to implement the 6980 Network Manager in a LAN or WAN, obtaining the faster communication speeds without major impact to their current host communication program.

"6980 NPCMux" has three main functions:

- Provides a single interface to multiple 6980 Network Managers, allowing the host application to manage a single connection.
- Manages 6980 socket connections, limiting the quantity of connections for performance.
- Handling EM311 to EM611 packet conversion. This is needed at some level as every packet to multiple 6980s has the same structure, "Socket Manager" handles the mapping of connections to virtual devices for the host program.

To communicate directly to each 6980 Network Manager over IP, develop a host application that would:

- Use the EM611 packet structure.
- Provide multi-6980 functionality.
- Look for 6980 connections on Socket Port Number 6980.

Intermec Technologies Corporation provides a "6980 NPCMux" interface functionality which interfaces to one 6980 device. The *host 6980 Network Manager running "6980 NPCMux"* manages the multiple 6980 connections and provides a single interface to the host system.

In addition, "6980 NPCMux:"

- Provides the host system with EM611 frames with different EM611 Controller IDs and different EM311 Device IDs. Controller and Device IDs assist the host communication system in associating users with devices.
- Handles sending up End-of-Session records for any device that disconnects during active sessions.

Host Interface to "6980 NPCMux"

The host-to-6980 NPCMux interface is done using the EM611 framing. However, the host system now has unique Controller and Device IDs for each connected 6980 device. The host application communicates to "6980 NPCMux" using the EM611 protocol (very similar to EM311 method).

There are a few new initialization commands important to "6980 NPCMux."

Table 5-2
6980 NPCMux Commands

Command	Bytes	Description
–D	nn	Number of remote concurrent 6980 sessions: 1–9
–F	n	File processing pass through enabled: "0" = Disabled (6980 System IDs are not passed to the host. All 6980 Network Managers have the same ID. This is for file processing.) "1" = Enabled (6980 System IDs are passed to the host.)
–B	nnnn	Data Block Size (default 256-data character) Version 1.0 allows 256, 512, 1024, 2048, or 4096 as the block size.

The EM311 records of the EM611 packet uses a 2-byte channel ID containing the device and channel.

- Device 0 is always the local 6980 NPCMux.
- Device 1 through *nn* are the remote 6980 IP connected controllers. Device ID distinguishes each 6980 device connected. Maximum devices are determined by Host Initialization Record. (–Dnn)

EM311 protocol records are outlined in Sections 3 and 4.

EXAMPLE: The initial handshaking between a host application and "6980 NPCMux" shows the EM311 portion of the EM611 packet generated by the NPCMux application to the host application.

Host Computer		NPCMux		6980	Description
/2 –D2 –F0 –B256	——>				Init Record
?	——>				Host Ready
.					
.					Repeats 20-second cycles until first response.
.					
					Listens on configured socket for 6980 connections (default is port 6980).
			<——		*Connect* Request
	——>				Accept
			<——	**018**	Controller ID
	<——	**1018**			
1/2	——>				Answer or Dial Record
		/2	——>		Init Record
			<——	**016**	Special Request
	<——	**1016**			
1/1	——>				Answer or Dial Record
		/1	——>		Init Record
			<——	**015**	Inactive Record
	<——	**1015**			
1/3	——>				Answer or Dial Record
		/3	——>		Init Record
		.			
		.			
		.			

Appendix A

4980-to-6980 Conversion

The 6980 System Architecture is unique to the 6980 Network Manager, and an extension of the 4980 System. The architecture differences require that the host interface change to support the deployment of 6980 Network Managers into an existing 4980 System.

Some differences and their rationale are:

- 4980 Communications Controllers have a single host interface to remote controllers. 6980 Network Managers require an EM611 interface for each 6980 Network Manager. This change allows the AS/400 to communicate with multiple network managers concurrently.
- 4980 Communications Controllers supported Async and Bisync host connections. 6980 Network Managers support Async or TCP/IP connections. This change supports more popular Ethernet interfaces.
- Remote 498x Communications Controllers support required using multiple ADCCP channels through a locally connected 4980 Controller. Remote 6980 Network Managers support requires an IP connection back to a host application (or Host 6980 Network Manager) for each 6980 session. This allows the use of the PPP protocol made popular by remote Internet access users.

One of the major differences in the remote 6980-to-host system implementation is that 6980 Network Managers do not have to use a single host interface to communicate to remote 6980 Network Managers. Each network manager may have a unique host connection. This methodology provides increased flexibility in the 6980 Network Manager system architecture design and improves the efficiency in communicating with the hand-held computers.

However, it is a change that will affect host applications. Intermec Technologies Corporation has designed some interface applications for a local 6980 Network Manager and an AS/400 to assist in migration to the 6980 Network Manager.

This appendix is intended for two different purposes:

- Migration of existing 4980 Host Interface Architecture (primarily AS/400 accounts) to 6980 Architecture using an Intermec Technologies Corporation interface.
- Customization of interface.

Intermec Technologies Corporation has provided a program for all customers to use. This program can reside on a local 6980 Network Manager and is referred to as a “6980 NPCMux” application. This program has functionality which will have to be created in host applications.

Communication and Application Diagram

Figure A-1 on the next page shows the architecture between a 6980 Network Manager and an AS/400. This figure describes each of the components, their functions, and areas addressed to simplify a 4980-to-6980 conversion.

A breakdown of the architecture into each of the areas, starting from the furthest component, is provided.

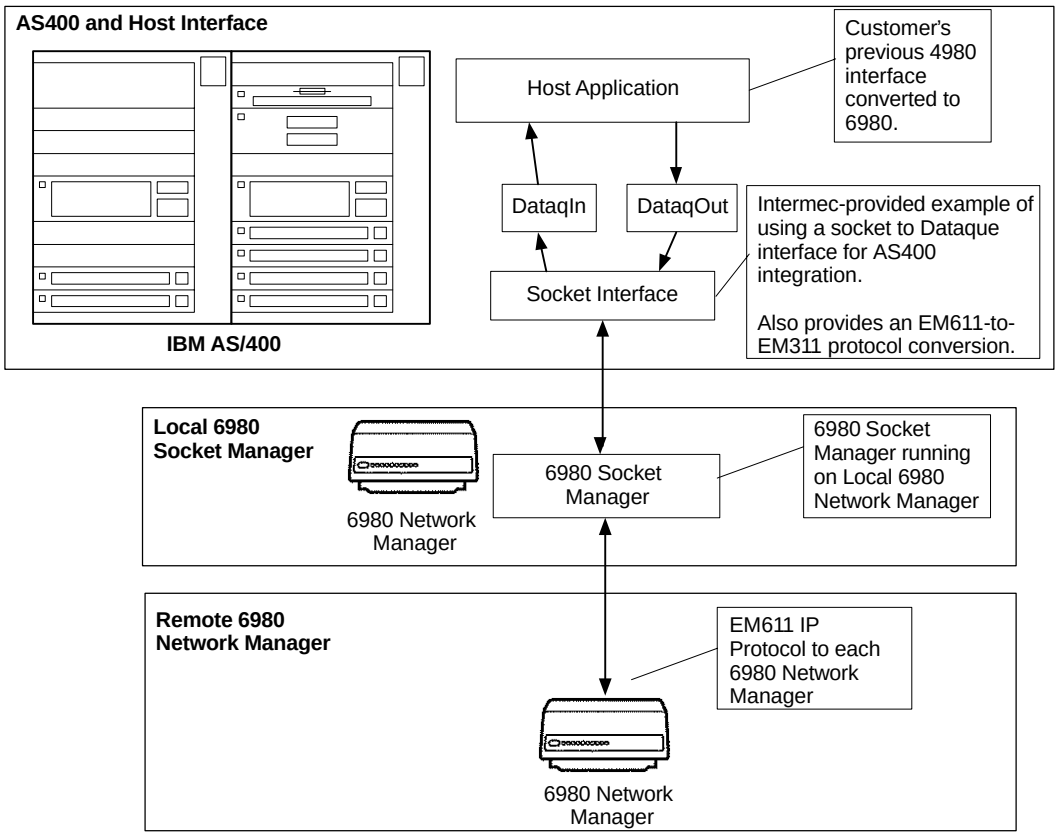

Figure A-1
Architecture between 6980 Socket Manager and AS/400

AS/400 or 4980 Conversion to 6980

The conversion sequence discussed below is done using all the areas discussed above, 6980 Network Manager, NPCMux application on a local 6980 Network Manager, the customer's host application, plus an additional piece of software provided by Intermec Technologies Corporation to take an additional step out of the host conversion.

4980 Interface on an AS/400

The 4980 Communications Controller was used on a Bisync interface on the AS/400. The 4980-to-AS/400 connection used a protocol or framing structure called EM315.

Most AS/400 users also used a single channel for each 4980 record sent to the host. This was referred to as a single channel ID record. This was the easiest and most common installation at AS/400 Systems.

6980 Interface on an AS/400

EM315 is very similar to the 4980 protocol or framing structure called EM311. When moving from the AS/400 Bisync interface (EM315) to a 6980 IP interface (EM611), the protocol or framing structure needs to be moved from EM315 to EM311.

▶ **NOTE:** *An additional AS/400 application referred to as* Socket Interface *provides the EM311-to-EM611 conversion and ASCII-to-EBCDIC conversion.*

Figure A-2 shows the AS/400 programming architecture. Intermec Technologies Corporation provides "Socket Interface" to Local/Remote 6980 communications.

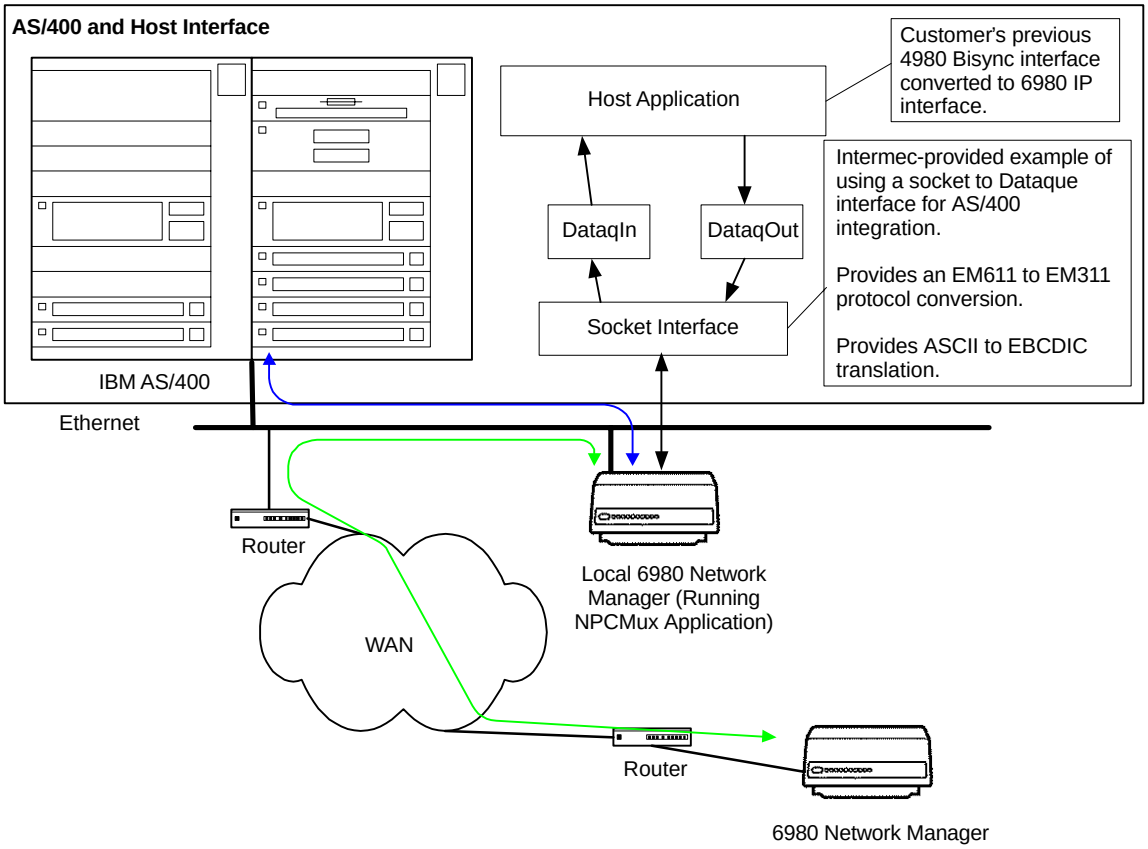

Figure A-2
AS/400 Programming Architecture

The following changes were identified when moving from the 4980 Bisync interface to the 6980 interface using the "Socket Interface:"

- EM315-to-EM311 framing conversion. This means two primary changes:

  A "/" precedes every command going to a 6980 Network Manager, except for the Host Ready character.

  A "?" is sent by the host application after each record sent to the 6980 Network Manager. The "?" tells the network manager that the host is ready for the next read.

- An EM311 "Begin of Call" record type "C" is sent by the network manager to the host computer when a hand-held computer is about to begin a session.
- No double read needed to turn the line around. This was a Bisync protocol specific need.
- Need to move from a single channel ID to a 2-byte channel ID, on reads only. This means each block of data coming from the 6980 Network Manager has two bytes showing the device and channel. (Device 0 is always the local 6980 NPCMux Interface)

  The host application now tracks current active routes by device and channel instead of by channel.

EXAMPLE: When route 1234 starts uploading, you need to know what Device and Channel route 1234 started uploading on, so when Download Requests for the same Device and Channel begin, the correct route is located.

- New Initialization record parameters. These are shown earlier in this section. The Intermec socket currently supports the 256-, 512-, 1024-, 2048-, 4096-, and 8192-character block size.
- The "Socket Interface" example written by Intermec Technologies handles EBCDIC-to-ASCII translations.
- Instead of connecting to a Bisync port on the AS/400 for reads and writes, the host application reads and writes to two Dataques: one for input to the host application from the socket interface and the other for output to the socket interface.
- Host Application startup. When the host application starts up, the dataques should be cleared and initialized. The Intermec socket interface will put a "G" in the ***DataqueIn*** to inform the host application that it is ready to begin.
- Host application ending. If the host application wants to end, it should send an "E" to the ***DataqueOut***.

Appendix B

Adapting Programs Used with the 4980 Protocol Converter

A wide-area communications network based on the INTERMEC® 6980/6985 Network Manager can be configured to be functionally compatible with a network based on a Norand® 4980 protocol converter. Host programs designed to run with a 4980 Converter will require minimum changes, as specified below, to communicate with network managers running in a "compatibility mode."

The required changes generally fall into the following categories:

Record types
The network manager adds a number of new record types and the function of some of the old 4980 record types has changed.

Special commands

Logical channels
The network manager may have up to three logical channels per physical port.

New enhancements
The network manager 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 4980 Controller and 6980/6985 Network Managers are listed in the following paragraphs. Differences (if any) in the way the records are used are noted.

4980 Record Types

Communications Controller-to-Host

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

Host-to-Communications Controller

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

6980/6985 Record Types

Network Manager-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 4980 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 Activation Request

Activation request records obtain the information from the host which is necessary to activate a port. Activation 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 activation request record can be processed exactly like a 4980 phone request record, with the following restrictions:

- No additional parameters are required if the correct default parameters are stored on the network manager 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 4980 end-of-call status.
- Responding to an activation request with an autoanswer activate record corresponds to responding to a 4980 phone number request with a cancel-autodial record. However, the network manager continues to prompt the host with activate requests each time a port disconnects.
- Phone numbers must be formatted.

The following record types are not 4980-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 Network manager Identification

C Begin of Call

Host-to-Network Manager Records

0 Download Data

1 End-of-data

2 Initialization

The initialization record supplies system configuration parameters.

▶ **NOTE:** *To avoid host program changes, store initialization information in an easily-modified file.*

The initialization record determines the host computer's block size which includes a beginning-of-record delimiter, record types, data, and an optional "end-of-line" pad characters, such as a carriage return.

All records sent to the network manager 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 network manager 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 4980 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 4980 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 4980-compatible, and cannot be sent to the network manager 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 network manager. Currently, four subtypes of host directives are specified:

1 File Upload
2 File Create/Load
3 File Delete
4 File Download

Special Commands

The host may send two other commands with the preceding records to the network manager.

- The host must send a question mark ("?") to the network manager to indicate that it is ready to receive data. The question mark can be changed to any other character (such as an XON character) with an initialization record parameter. Optional pad characters following the question mark must be consistent.
- The host may reinitialize the network manager by sending an asterisk (*). This parallels sending a slash and an asterisk (/*) to the 4980 Controller. 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 network manager is expecting a question mark or before sending the initialization record.*

Appendix C

Asynchronous Hosts

The 6980/6985 Network Manager offers several methods to provide flexible options for reading records from the network manager.

- An end-of-record delimiter can be added to the end of each record. The default delimiter is a carriage return (CR).
- The network manager 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 network manager reads the initialization record as 8-bit data, so that the host can set the parity for the host-network manager connection in the initialization record.

If the host is reading transparent data from the network manager, 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 can 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 can 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 network manager.*

EXAMPLE: Asynchronous Host to 6980/6985 Network Manager:

ASYNC Host Computer		6980/6985
Init "/2 –S0/"	———>	
"?"	———>	
	<———	Channel 1 Activation Request
Activation Parms	———>	
"?"	———>	
	<———	Channel 2 Activation Request
Activation Parms	———>	
"?"	———>	
	<———	Channel 3 Activation Request
Activation Parms	———>	

“?”	———>	
	<———	Channel 1 Inactive Status
“?”	———>	
	<———	Channel 1 Begin of Call
“?”	———>	
	<———	Channel 1 Upload Data
“?”	———>	
	<———	Channel 4 Begin of Call
“?”	———>	
	<———	Channel 4 Upload Data
“?”	———>	
	<———	Channel 4 Upload Data
“?”	———>	
	<———	Channel 2 Begin of Call
“?”	———>	
	<———	Channel 2 Upload Data
“?”	———>	
	<———	Channel 2 Active Status
“?”	———>	
	<———	Channel 3 Begin of Call
“?”	———>	
	<———	Channel 3 Upload Data
“?”	———>	
	<———	Channel 2 Upload Data
“?”	———>	
	<———	Channel 1 Download Request
Download Data	———>	
“?”	———>	
	<———	Channel 1 Download Request
Download Data	———>	
“?”	———>	
	<———	Channel 3 Upload Data
“?”	———>	
	<———	Channel 1 Download Request
End of Data	———>	
“?”	———>	
	<———	Channel 2 Upload Data
“?”	———>	
	<———	Channel 1 End Status
“?”	———>	
	<———	Channel 3 Download Request
End of Data	———>	
“?”	———>	
	<———	Channel 2 Download Request
Download Data	———>	
“?”	———>	
	<———	Channel 3 End Status
“?”	———>	
	<———	Channel 3 Activation Request
Activate Delay	———>	
“?”	———>	
	<———	Channel 2 Download Request
End of Data	———>	
“?”	———>	
	<———	Channel 2 End Status
“?”	———>	
	<———	Channel 2 Activation Request

Appendix D

Pseudo Host Communications Program

You configure the 6980/6985 Network Manager 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 6980CE.INI configuration file accessible via a web server.

Configuring the network manager consists of:

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 6980/6985
While Not Finished
   If Async_host
      Send ready character (e.g. "?") to the 6980/6985.
   Perform 4980_Read.
   Determine device ID, logical channel, 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 Network Manager ID
      Perform  Remote_6980/6985_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.
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:
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:
(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:
Display "No special requests are supported."
Send an end-of-data record.
End Special_Request_Routine

Remote_6980/6985_Logon:
Send an initialization record for the remote 6980/6985
End Remote_6980/6985_Logon

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.

AS/400 (Application System/400)

IBM mid-range computer replacing the System/38 and System/36 product lines. Contains an application that converts EM311 to EM611 and ASCII to EBCDIC.

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 (Logical Data Channel)

A port may contain one or more channels. Data for any given wireless station is contiguous on a channel. Each of the remote ports on a controller may contain up to three channels apiece.

Direct Connect

The hand-held computer directly cabled to a port on the network manager.

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.

EM311

An ASCII control or framing structure that consists of six record types sent from the host to the network manager and eight record types sent from the network manager to the host. This framing structure is *only* for asynchronous host connections.

EM611

An ASCII control or framing structure that is an extension of EM311. This structure is an EM311 packet with a 6-byte header and a block size of 1024 bytes of data, as opposed to the EM311 block size of 256 bytes of data. For IP-based interfaces, an EM611 header *must* prefix all records sent to a 6980 Network Manager.

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 the trademark of another company.

Host

A customer's host computer.

A computer that provides services directly to users, such as the user's computer. In TCP/IP, an IP addressed device.

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

Host Computer

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

Host Network Manager

A 6980/6985 Network Manager that is functioning as a host to a secondary network manager.

LAN (Local Area Network)

A group of network devices in which each device can communicate through a wired or wireless link. The wired link may have 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 Network Manager

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

Logical Port

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

NPCP (Norand Portable Communications Protocol)

A Norand proprietary protocol that provides session, network, and datalink services for Norand hand-held computers 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

The physical hardware communication port.

(SNMP) Physically, an access point to a computer, multiplexer device, or network. Logically, a pointer to a TCP/IP application.

Remote Network Manager

The network manager which is logically farthest away from the host computer when two network managers are connected.

Remote Port

A TTY or NPCP port that can connect to hand-held computers or remote network managers. Data channels on remote ports are multiplexed onto the host port.

Remote Subnet

An Ethernet segment other than the distribution LAN. For Enterprise OWL, the remote subnet is the Ethernet link of the access point that attaches to the super root through an IP tunnel.

TCOM or Telecom

Telecommunications.

Terminal

Circuit terminating device such as a hand-held computer.

(ADK) Portable elements in the radio data network. Provide a wireless portability with two-way interactive data communication capabilities.

TTY

Norand two-way TTY asynchronous data link protocol.

General Index

NOTE:

This index covers all topics. Those in italics are figures, those in bold are tables.

NUMBERS

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