H297IP NetEx/IP® Requester

for Bull GCOS 8 Systems

Release 5.0

Software Reference Manual

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Preface

This manual describes the Network Executive Software (“NetEx Software”) H297IP NetEx/IP Requester for the Bull GCOS8 operating system.

This document contains the following sections:

“Introduction” on page 1 of this manual is intended for all readers.

“Diagnostics” on page 25 describes methods for collecting debug information to be delivered to Network Systems for analysis.

“Installation” on page 17 describes NETEX installation and is intended for the systems programmer installing NetEx.

Appendices include a list and description of the error messages and codes issued by NetEx.

Readers are not expected to be familiar with NetEx before using this manual. However, an understanding of programming and using the host operating system is required.

Reference Material

The following manuals contain related information.

Number	Title and Description
man-cnet-conf-mgr	*"C" Configuration Manager and NetEx Alternate Path Retry (APR) User Guide*

Notice to the Reader

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The diagnostic tools and programs described in this manual are **not** part of the products described.

Notice to the Customer

The installation information supplied in this document is intended for use by experienced System Programmers.

Document Conventions

The following notational conventions are used in this document.

Format	Description
`displayed information`	Information displayed on a CRT (or printed) is shown in `this font`.
`user entry`	*`This font`* is used to indicate the information to be entered by the user.
UPPERCASE	The exact form of a keyword that is not case-sensitive or is issued in uppercase.
MIXedcase	The exact form of a keyword that is not case-sensitive or is issued in uppercase, with the minimum spelling shown in uppercase.
bold	The exact form of a keyword that is case-sensitive and all or part of it must be issued in lowercase.
lowercase	A user-supplied name or string.
value	Underlined parameters or options are defaults.
<label>	The label of a key appearing on a keyboard. If "label" is in uppercase, it matches the label on the key (for example: <ENTER>). If "label" is in lowercase, it describes the label on the key (for example: <up-arrow>).
<key1><key2>	Two keys to be pressed simultaneously.
No delimiter	Required keyword/parameter.

Glossary

asynchronous: A class of data transmission service whereby all requests for service contend for a pool of dynamically allocated ring bandwidth and response time.

ASCII: Acronym for American National Standard Code for Information Interchange.

buffer: A contiguous block of memory allocated for temporary storage of information in performing I/O operations. Data is saved in a predetermined format. Data may be written into or read from the buffers.

code conversion: An optional feature in the adapter or host DX interface that dynamically converts the host data from one character set to another. An adapter configured with the code conversion has a special 1K RAM that is used for code conversion. This RAM can be loaded with any type of code (for example, ASCII, EBCDIC, et cetera).

Configuration Manager: A utility that parses a text NCT file into a PAM file.

Coprocessor NETwork EXecutive (CP NetEx): Resides on some types of Processor Interface (PI) boards and uses the processing and storage capacity of the board. This allows minicomputer users to use NetEx with minimal impact on host storage and processing.

Data Exchange Unit (DX unit or DXU): A chassis containing a nucleus processor, multiple customer-selectable interfaces, and/or coprocessors.

DX NetEx: A version of NetEx product specifically designed to operate from a DX unit, driven by software running on a host. DX NetEx resides on the P/NDNTx board.

Fiber Distributed Data Interface (FDDI): An American National Standards Institute (ANSI)-specified standard (X T9.5) for fiber optic links with data rates up to 100 Mbps. The standard specifies: multimode fiber; 50/125, 62.5/125, or 85/125 core-cladding specification; an LED or laser light source; and 2 kilometers for unrepeated data transmission at 40 Mbps.

header: A collection of control information transmitted at the beginning of a message, segment, datagram, packet, or block of data.

host: A data processing system that is connected to the network and with which devices on the network communicate. In the context of Internet Protocol (IP), a host is any addressable node on the network; an IP router has more than one host address.

Internet Protocol (IP): A protocol suite operating within the Internet as defined by the *Requests For Comment* (RFC). This may also refer to the network layer (level 3) of this protocol stack (the layer concerned with routing datagrams from network to network).

ISO: Acronym for International Standards Organization.

link: (1) A joining of any kind of DX networks. (2) The communications facility used to interconnect two trunks/busses on a network.

Network Configuration Table (NCT): An internal data structure that is used by the NETEX configuration manager program to store all the information describing the network.

Network Configuration Table Loader (NCTL): An interactive NetEx application program used for configuring local or remote DX NetEx boards, updating their NetEx configuration parameters and/or Network Control Table. The NCT Loader takes a pamfile created by the Configuration Manager and transfers it to the NetEx Coprocessor through a NetEx connection.

NETwork EXecutive (NetEx): A family of software designed to enable two or more application programs on heterogeneous host systems to communicate. NetEx is tailored to each supported operating system, but can communicate with any other supported NetEx, regardless of operating system.

NetEx can reside on the host, on a processor interface board (obsolete), or in a DX unit. The latter two cases use host-resident drivers as interfaces.

NetEx is a registered trademark of Network Executive Software.

Open Systems Interconnection (OSI): A seven-layer protocol stack defining a model for communications among components (computers, devices, people, and et cetera) of a distributed network. OSI was defined by the ISO.

processor interface (PI): A PI interfaces a minicomputer with an adapter. The PI is a board(s) that contains a microprocessor and memory. The processor interface is generally installed in the host. Some types of PIs contain NetEx.

path: A route that can reach a specific host or group of devices.

TCP/IP: An acronym for Transmission Control Protocol/Internet Protocol. These communication protocols provide the mechanism for inter-network communications, especially on the Internet. The protocols are hardware-independent. They are described and updated through *Requests For Comment* (RFC). IP corresponds to the OSI network layer 3, TCP to layers 4 and 5.

Contents

Figures

Introduction

Network Executive Software's NetEx® allows two or more application programs (which may be on different host computers) to communicate with each other at multi-megabit speeds. The NetEx family of software consists of different versions of NetEx for use with different operating systems, such as this version for use with Bull GCOS8 operating system hosts. All of these versions provide a common high-level interface to simplify programming requirements.

Network System has utility programs available for use with NetEx, such as H291 Bulk File Transfer (BFX) utility and H292T Print File Transfer-Transmitter (PFX-T).

The NetEx software resides and executes on the NESiGate-LAN Offload (NESiGate-LO) NetEx/IP adapter. H297IP resides in the Bull host and is the user interface to NetEx in the NESiGate-LO. Within the Bull host, H297IP requires the Bull-supplied TCP Sockets interface. H297IP passes NetEx requests and data to and from a NESiGate-LO via the host/s TCP Socket interface.

The following subsections describe the characteristics of NETEX and how NETEX uses the International Standards Organization guidelines for open systems interconnection.

NetEx Characteristics

The following sections describe the characteristics of the NetEx software.

- External interface
- Internal interaction
- NetEx connections
- Design flow efficiency and flexibility
- Block segmenting
- Alternate Path Retry
- Basic I/O flow
- Remote operator interface

External Interface

The NetEx external interface for the application programmer is common for all versions of NetEx. NetEx provides requests for use in the programs that call NetEx. These calling programs may be written in C or other high-level languages. NetEx programs written in high-level languages may be transported from one host to another, with some changes to account for different word sizes and other machine architecture variations.

NetEx also provides an operator interface that monitors and controls certain NetEx functions.

Internal Interaction

The internal operation of all supported versions of NetEx are consistent and allow the different versions to interact freely. Thus, any program using NetEx may communicate with any other program on the network that is also using NetEx.

To facilitate communication between hosts of different manufacture, NetEx supports code conversion.

NetEx Connections

To communicate using NetEx, two calling programs first form a connection using a handshake protocol. NetEx then allows this pair of programs to communicate.

NetEx can establish multiple connections at one time, and can allow one program to have multiple connections simultaneously.

NetEx also supports communications within a single host. A calling program may connect to another calling program in the same host and exchange information just as if network communications were taking place.

Design Efficiency and Flexibility

The NetEx design enables many applications on the same processor to share the use of the network facility. Programs calling NetEx can be written without regard to the other programs calling NetEx or other Network Executive Software device drivers.

Once NetEx accepts data from the caller, NetEx must deliver the data to its destination. The NetEx subsystem on each host handles flow control, error recovery, and any other special considerations such as satellite links.

NetEx optimizes data transfer throughput using a high degree of parallelism. That is, under normal circumstances, simultaneous adapter I/O, NetEx buffer management, and user file I/O all take place concurrently. This means that the effective data transfer rate is as fast as possible (in the multi-megabit range).

Block Segmenting

NetEx products provide block segmenting at the transport layer. NetEx divides data into segments of a specified size for transmission across the network and reassembles the segments on the remote host before delivering the data to the session layer calling program on the remote NetEx. This segmenting is transparent to the session user but provides control of the transmitted block segment size. This is especially useful for satellite communication.

Alternate Path Retry

Alternate Path Retry (APR) provides the capability for connections to automatically reroute on different network paths when a failure on a path is detected. This rerouting takes place with no loss of data. Alternate path retry is provided as part of the type 2 protocol supplied with current NetEx versions. For more information on APR, refer to the *"C" Configuration Manager and NetEx Alternate Path Retry (APR) User Guide*.

Remote Operator Interface

This version of NetEx provides a remote operator interface that allows users to issue NetEx operator commands to other defined NetEx hosts on the network. Other users may also be the remote operator for this NetEx. See "REMOTE Command" for more information. Security features are provided.

Basic I/O Flow

Figure 1 shows the basic I/O flow between two programs using host based NetEx. The calling program communicates with NetEx through the NetEx user interface. NetEx then uses the available network hardware to communicate with the calling program on the other processor.

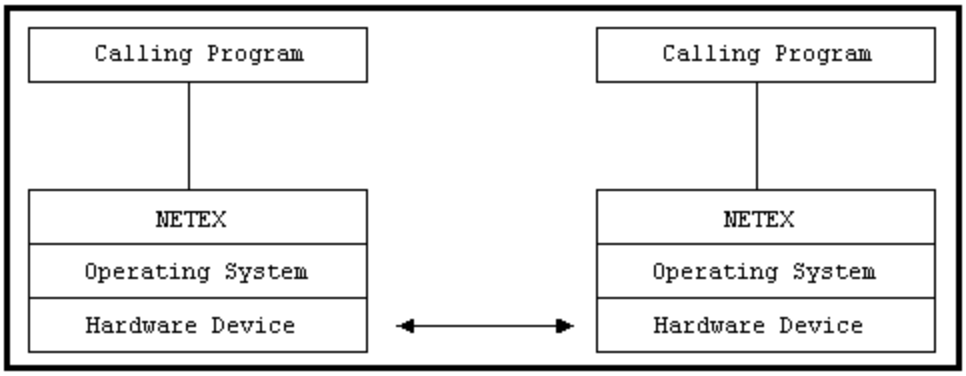

Figure 1. Basic I/O Flow

Host Based NetEx

Host based NetEx is an architecture that is designed for implementation on very large mainframe computers, or on some smaller machines that cannot support the creation of a standard Network Executive Software driver product. Host based NetEx exists on the machine as a subsystem (a separate program residing in a machine that all other users in the machine can call on to perform services). User tasks produce a NetEx request that is delivered to the independent NetEx program using an inter-task communications facility provided by the host operating system. Data is moved so it is present in the NetEx program and the I/O is performed in the NetEx program.

Host based NetEx provides an administrative capability to the system programmers and system managers. Since all I/O is performed by the NetEx program, no data can be introduced on the network without first being checked by NetEx.

Host based NetEx products are implemented in Assembler, PASCAL, and other languages.

NESiGate Offload NetEx

The NetEx program resides as either LAN Offload (LO) or Channel Offload software running in the NESiGate adapter. Only the Hxx7IP NetEx Requester user interface program resides on the host. In this implementation, H297IP and the Bull GCOS8 TCP/IP product is used for transport of NetEx requests and buffers between H297IP and the host and the NESiGate adapter.

Installation

Prerequisites

The following products are required to use H297:

- Bull GCOS8 Software Release SR5.2 or later.

H297IP Implementation Notes

Contact NetEx Software if changes to any of these limitations are required for specific applications.

1. The largest block size handled is 65536 bytes. Using a block size this large requires that the MAXBLOCKIN and MAXBLOCKOUT parameters on NESIGate-LO be set to allow blocks of this size. The values for the NDNT3 MAXBLOCKIN and MAXBLOCKOUT must be 65536 or smaller.
2. No software code conversion is done. There is software packing and unpacking of data blocks when BCD is involved.

Pre-Installation

Before installation of H297 the TCP/IP Socket product unit must be configured to GCOS8. This requires changes to the GCOS Startup configuration to define the channels and devices. Refer to Bull documents for further information on adapter configuration.

Installation

Step 1. Restore Distributed Files

The NETEX save tape contains several subcatalogs. The subcatalogs for the base Release 5.0 of H297 are:

NETEX/NETEX5.0/EXAMPLE	NETEX Example Programs and files – source code and sample configuration files
NETEX/NETEX5.0/LIB	NETEX Subroutine Libraries
NETEX/NETEX5.0/RUN	Executables of NETEX Example Programs

If you currently have NETEX installed, none of your current files will be altered. However, the maximum size of the NETEX userid may need to be increased to accommodate the new files. The space needed for the H297IP Release 5.0 flies is about 300 LINKS.

Installation for NETEX Users

The following JCL should be used by sites which have previously installed H290 or H297. A MODMAS directive is needed if the userid needs more file space. The PRIVITY statement is needed for acceptance of the USERID directive without a password.

```
$   IDENT         Accounting Information (site-supplied)
$   FILSYS
$   PRIVITY
$   TAPE   PR,R,R,NETEX/SAVENTX5
USERID NETEX
RESTORE NETEX/NETEX5.0
$   ENDJOB
```

On completion of the restore, log onto userid NETEX and if not already present, create a valid file NETEX/IDENT based on site IDENT file requirements. This field is referenced in other JCL used during installation and operation.

Step 2. GCOS8 System NETEX Configuration

A configuration file must be created to define the IP address for the NESIGate-LO.

This is an ASCII file, with a default location of NETEX/H297IPCFG. The values required in this file are the IP address and the port number of the NESIGate-LO. The file should have Read permission for any user authorized to use NETEX applications. A sample file is in the EXAMPLE directory.

The TCP Configuration file contains the information NETEX uses to make TCP connections with the NESiGate adapter plus information for controlling diagnostic traces.

The parameters defined in this file for TCP connections include:

1. The NETEX host name.

```
HOSTNAME <NETEX HOST NAME>
```

2. The IP address for the NESiGate adapter.

   ```
   NETEXIP  <IP ADDRESS>
   ```

3. The IP port for the NESiGate adapter (default value 5001). The PORT statement is not required.

   ```
   PORT     <PORT NUMBER>
   ```

4. Detailed event trace options, used for diagnostic purposes when needed.

   ```
   EVENTS   <trace event number, 0-40>
   ```

   See Appendix B for further definition of these EVENTS traces.

The file is fixed-format with the variable information starting in column 10. The default system values are defined in the file NETEX/H297IPCFG. The file is ASCII text, typically with general Read permission. For testing/diagnostic purposes, if a file code "*N" is allocated to an activity, file code "*N" overrides the default system file.

A sample file might consist of:

```
Column
1        10


HOSTNAME gcprim
NETEXIP  182.32.24.82
PORT     5001
```

Step 3. Verification of Operation

BFX or the sample programs NETEXEAT/NETEXGEN can be run to verify system operation. Host names may need to be modified within sample JCL to accomplish this.

Diagnostics

Internal diagnostic information for the H297 product is available through trace routines. The routines are provided primarily for debugging the H297 product itself. That is, they may be used to generate output to be delivered to Network Executive Software for further analysis. They may also be used in a limited fashion to debug a NETEX user application.

User Library Traces

There are several trace events defined. These will write to Report Code 71 if they are invoked.

The typical means to invoke these traces is to create a private copy of the NETEX Configuration file and allocate it using the file code *N. Then define the events you wish traced.

These traces can produce voluminous output and will show the file contents of files being sent or received, though in octal format. Often SYSOUT limits will be exceeded when using these traces.

General Debugging Notes

When debugging NETEX applications, there are several key components to consider. Major software components include the application, the NETEX subroutine library, the NETEX Access Agent (AA), the Channel Connection Entity (CCE), and the .MHYPR channel module.

Information that may be available to persons encountering problems may include:

1. NRB Status
2. Snaps
3. Program dumps
4. Version identifiers for software components
5. Source code for user-written applications
6. Similar information on remote systems

When reporting problems, any of the above pieces of information may be helpful and should be submitted if available.

Utility/Test Programs

NETEXEAT and NETEXGEN

These two test programs are furnished both as C/Pascal source code and as a bound H* file .

These programs can be used with the EAT and GEN programs that exist on other network nodes.

These tests are delivered under directory NETEX/NETEX5.0/EXAMPLE.

This pair of programs provides a one-way data transfer and timing test to/from the corresponding applications on the other NETEX Coprocessor. To use, first start the NETEXEAT program on the receiving system. Two examples for starting the NETEXEAT program are provided below.

- The following command can be entered to start the NETEXEAT program on a GCOS8 system:

```
JRN NETEX/NETEX5.0/EXAMPLE/EAT.J
```

Next, execute the NETEXGEN program on the sending system. To execute the NETEXGEN program, enter the following command:

```
JRN NETEX/NETEX5.0/EXAMPLE/GEN.J
```

The GEN.J JCL includes a string of parameters in fixed format, for example:

bbbbb sssss 11 mmm hhhhhhhh

Where:

bbbbb
: This value specifies the number of blocks.

sssss
: This value specifies the size of each block (in words.)

lll
: This value specifies the number of loops.

mmm
: This value specifies the mode, in decimal (that is, 257 = octet mode = 0101 hexadecimal.)

hhhhhhhh
: This value specifies hostname.

After each completed loop, both programs will print elapsed time and bit rate.

Appendix A. NRBSTAT Error Codes

If a user application receives one of the following status values, the course of action recommended in the description should be followed. If no course of action is given, or the one given does not work, the user should try to retain all dump files and SYSOUT for analysis by Network Systems.

0903* Incorrect version of user library for the running NETEX Access Agent. The user may wish to check with operations to see if the H297 libraries and Access Agent have been updated, then relink the application with the appropriate library.

0904* No available adapter subchannel. The user may wish to consult with operations. Possibly, all subchannels are in use, or all logical devices are allocated, or the DX device may be powered off.

0910* Error in dynamic linking. The name S$NHNA$NETEXAA was not found, indicating a software installation problem. The user may wish to contact operations. Possibly, the H297 NETEX Access Agent was not installed on system boot.

0911* Error on initial dynamic link between the user library and the NETEX Access Agent other than not finding the name. For accommodation-mode programs, a snap with a heading “Dynamic Linking Error” is produced on P* Report Code 71 which contains the specific GCOS8 dynamic linking error in the second and third words of the snap. For native-mode programs, a similar snap to file code NL can be produced by setting the appropriate trace flag.

0912* Error on a climb to the Access Agent following an initial successful dynamic link. For accommodation-mode programs, a snap with a heading “Climb or Access Agent Error” is produced on P* Report Code 71. This snap contains the control areas for the climb to the Access Agent and should be retained for problem diagnosis by Network Systems. For native-mode programs, a similar snap to file code NL can be produced by setting the appropriate trace flag. The NRB has not been processed.

0921 Illegal Access Agent function.

0922 Access Agent unable to access ODATA buffer for read-type NRB. Bad internal ODATA pointer detected.

0923 Access Agent unable to access PDATA buffer for read-type NRB. Bad internal PDATA pointer detected.

0924 Access Agent unable to access ODATA buffer for write-type NRB. Bad internal ODATA pointer detected.

0925 Access Agent unable to access PDATA buffer for write-type NRB. Bad internal PDATA pointer detected.

0930 Octet to Bitstream conversion error for read-type NRB.

0931 Bitstream to Octet conversion error for read-type NRB.

0932 Adapter BCD (Octet format) to BCD conversion error for read-type NRB.

0933 Adapter BCD (Bitstream format) to BCD conversion error for read-type NRB.

0934* Output data for this contains non-ASCII data. The user’s application should assure that data sent with ASCII or Octet mode has a zero in the most significant bit of each 9-bit byte.

0935 BCD to adapter BCD conversion error on write-type NRB.

0936 Illegal data in transmitted NRB.

0937* Illegal data in received NRB.

0938 Read buffer for binary or BCD data does not end on a word boundary.

0940* No memory available within NETEX Access Agent for an SOPEN NRB.

0941* Duplicate Session Control Block detected. Task ID assigned to Session Control Block is already in use. Internal logic error.

0942* Error on call to CCE Open Logical Connection function.

0943* No read buffer found for completed CCE Open Response.

0944* Illegal data in received SOPEN NRB.

0945* Extra read buffer completed on CCE Open Logical Connection call/SOPEN completion.

0946* No output buffer for SOPEN. Internal logic error.

0950 No memory available within NETEX Access Agent for an NRB.

0951* No available write buffer for SOFFER when one should exist.

0952* No busy write buffer found to match CCE offset.

0953 No completed read buffer one should exist.

0954* No busy read buffer found to match CCE offset.

0955* Error in busy write buffer list: Duplicate offsets.

0956* Error on CCE call Receive call.

0957* Error on CCE Send call.

0958* CCE detected I/O error on write.

0959* CCE detected I/O error on read.

0960* No NRB corresponding to completed CCE write.

0961* No NRB corresponding to write-completion data response.

0962* No NRB corresponding to received SOFFER.

0970* SOFFER was not completed within extended timeout period. This suggests a problem with the host channel or the DXU. The user should report this to operations.

0971* Timeout on write or delivery of SOFFER. This suggests a problem with the host channel or delivery of SOFFER. The user should report this to operations.

Appendix B: H297IP Traces

These traces may be enabled using EVENTS statements in the file NETEX/H297IPCFG, or in a copy of the file which is allocated with File Code *N.

The defined trace events are:

Trace Type/Value	Description of trace information
1	SConn start
2	SConnw start
3	SConf start
4	SConfw start
5	SOffer start
6	SOfferw start
7	SRead start
8	SReadw start
9	SWrite start
10	SWritew start
11	SClose start
12	SClosew start
13	SDisc start
14	SDiscw start
15	SWait start
16	TCP Select
20	IFB (module acco)
21	Send data (module acco)
22	Error (module acco)
23	TCP Send Complete

Trace Type/Value	Description of trace information
30	AD (module wait) – voluminous output
31	Completed NRB (module wait)
32	Outstanding NRB (module wait)
33	Receive from TCP (module wait)
34	No Data Received from TCP (module wait)
35	MVC (module wait)