z/OS Communications Server

IP CICS Sockets Guide

Version 1 Release 2

SC31-8807-00

z/OS Communications Server

IBM

IP CICS Sockets Guide

Version 1 Release 2

SC31-8807-00

Note:
Before using this information and the product it supports, be sure to read the general information under “Appendix F. Notices” on page 315.

First Edition (October 2001)

This edition applies to Version 1 Release 2 of z/OS (5694-A01) and to all subsequent releases and modifications until otherwise indicated in new editions.

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About This Book

This book contains a description of the TCP/IP Socket Interface for CICS® (referred to as CICS TCP/IP for short). It contains an introduction, a guide to initialization, and a guide and reference to writing application programs. Use this book to set up CICS TCP/IP, write application programs, and diagnose problems.

Who Should Use This Book

This book is aimed at both system programmers and application programmers who perform any of the following tasks with CICS TCP/IP:

- Setting up CICS TCP/IP
- Writing application programs
- Diagnosing problems

The book assumes that the reader is familiar with the MVS™ operating system, and the C or COBOL programming languages. Since the CICS transaction processing system is a prerequisite for CICS TCP/IP, the book assumes the reader is also familiar with CICS.

Where to Find More Information

This section contains:

- Pointers to information available on the Internet
- Information about licensed documentation
- Information about LookAt, the online message tool
- A set of tables that describes the books in the z/OS Communications Server (z/OS CS) library, along with related publications

Where to Find Related Information on the Internet

Home Page	Web address
z/OS	http://www.ibm.com/servers/eserver/zseries/zos/
z/OS Internet Library	http://www.ibm.com/servers/eserver/zseries/zos/bkserv/
IBM Communications Server product	http://www.software.ibm.com/network/commserver/
IBM Communications Server support	http://www.software.ibm.com/network/commserver/support/
IBM Systems Center publications	http://www.redbooks.ibm.com/
IBM Systems Center flashes	http://www-1.ibm.com/support/techdocs/atsmastr.nsf
VTAM and TCP/IP	http://www.software.ibm.com/network/commserver/about/csos390.html
IBM	http://www.ibm.com
RFC	http://www.ietf.org/rfc.html

Information about Web addresses can also be found in informational APAR II11334.

DNS Web Sites

For information about DNS, see the following Web sites:

USENET news groups:
comp.protocols.dns.bind

For BIND mailing lists, see:

- http://www.isc.org/ml-archives/
  - BIND Users
    - Subscribe by sending mail to bind-users-request@isc.org
    - Submit questions or answers to this forum by sending mail to bind-users@isc.org
  - BIND 9 Users (Note: This list may not be maintained indefinitely.)
    - Subscribe by sending mail to bind9-users-request@isc.org
    - Submit questions or answers to this forum by sending mail to bind9-users@isc.org

For definitions of the terms and abbreviations used in this book, you can view or download the latest *IBM Glossary of Computing Terms* at the following Web address:

http://www.ibm.com/ibm/terminology

Note: Any pointers in this publication to Web sites are provided for convenience only and do not in any manner serve as an endorsement of these Web sites.

Licensed Documents

z/OS Communications Server licensed documentation in PDF format is available on the Internet at the IBM Resource Link Web site at http://www.ibm.com/servers/resourcelink. Licensed books are available only to customers with a z/OS Communications Server license. Access to these books requires an IBM Resource Link Web user ID and password, and a key code. With your z/OS Communications Server order, you received a memo that includes this key code. To obtain your IBM Resource Link Web user ID and password, log on to http://www.ibm.com/servers/resourcelink. To register for access to the z/OS licensed books perform the following steps:

1. Log on to Resource Link using your Resource Link user ID and password.
2. Click on **User Profiles** located on the left-hand navigation bar.
3. Click on **Access Profile**.
4. Click on **Request Access to Licensed books.**
5. Supply your key code where requested and click on the **Submit** button.

If you supplied the correct key code, you will receive confirmation that your request is being processed. After your request is processed, you will receive an e-mail confirmation.

You cannot access the z/OS licensed books unless you have registered for access to them and received an e-mail confirmation informing you that your request has been processed. To access the licensed books:

1. Log on to Resource Link using your Resource Link user ID and password.
2. Click on **Library.**
3. Click on **zSeries**.
4. Click on **Software**.
5. Click on **z/OS Communications Server**.
6. Access the licensed book by selecting the appropriate element.

LookAt, an Online Message Help Facility

LookAt is an online facility that allows you to look up explanations for z/OS CS messages and system abends.

Using LookAt to find information is faster than a conventional search because LookAt goes directly to the explanation.

LookAt can be accessed from the Internet or from a TSO command line.

To use LookAt as a TSO command, LookAt must be installed on your host system. You can obtain the LookAt code for TSO from the LookAt Web site by clicking on **News and Help** or from the z/OS V1R2 Collection, SK3T-4269.

To find a message explanation from a TSO command line, simply enter **lookat+message ID**, as in the following example:

```
lookat ezz8477i
```

This results in direct access to the message explanation for message EZZ8477I.

You can use LookAt on the Internet at the following Web site:
www.ibm.com/servers/eserver/zseries/zos/bkserv/lookat/lookat.html

To find a message explanation from the LookAt Web site, simply enter the message ID. You can select the release, if applicable.

How to Contact IBM® Service

For telephone assistance in problem diagnosis and resolution (in the United States or Puerto Rico), call the IBM Software Support Center anytime (1-800-237-5511). You will receive a return call within 8 business hours (Monday – Friday, 8:00 a.m. – 5:00 p.m., local customer time).

Outside of the United States or Puerto Rico, contact your local IBM representative or your authorized IBM supplier.

z/OS Communications Server Information

This section contains descriptions of the books in the z/OS Communications Server library.

z/OS Communications Server publications are available:

- Online at the z/OS Internet Library web page at http://www.ibm.com/servers/eserver/zseries/zos/
- In hardcopy and softcopy
- In softcopy only

Softcopy Information

Softcopy publications are available in the following collections:

Titles	Order Number	Description
z/OS V1R2 Collection	SK3T-4269	This is the CD collection shipped with the z/OS product. It includes the libraries for z/OS V1R2, in both BookManager and PDF formats.

Titles	Order Number	Description
z/OS Software Products Collection	SK3T-4270	This CD includes, in both BookManager and PDF formats, the libraries of z/OS software products that run on z/OS but are not elements and features, as well as the *Getting Started with Parallel Sysplex* bookshelf.
z/OS V1R2 and Software Products DVD Collection	SK3T-4271	This collection includes the libraries of z/OS (the element and feature libraries) and the libraries for z/OS software products in both BookManager and PDF format. This collection combines SK3T-4269 and SK3T-4270.
z/OS Licensed Product Library	SK3T-4307	This CD includes the licensed books in both BookManager and PDF format.
System Center Publication IBM S/390 Redbooks Collection	SK2T-2177	This collection contains over 300 ITSO redbooks that apply to the S/390 platform and to host networking arranged into subject bookshelves.

z/OS Communications Server Library

The following abbreviations follow each order number in the tables below.

HC/SC — Both hardcopy and softcopy are available.

SC — Only softcopy is available. These books are available on the CD Rom accompanying z/OS (SK3T-4269 or SK3T-4307). Unlicensed books can be viewed at the z/OS Internet library site.

Updates to books are available on RETAIN and in the document called *OS/390 DOC APARs and ++HOLD DOC data* which can be found at http://www.s390.ibm.com/os390/bkserv/ new_tech_info.html. See “Appendix E. Information Apars” on page 313 for a list of the books and the informational apars (info apars) associated with them.

Planning and Migration:

Title	Number	Format	Description
z/OS Communications Server: SNA Migration	GC31-8774	HC/SC	This book is intended to help you plan for SNA, whether you are migrating from a previous version or installing SNA for the first time. This book also identifies the optional and required modifications needed to enable you to use the enhanced functions provided with SNA.
z/OS Communications Server: IP Migration	GC31-8773	HC/SC	This book is intended to help you plan for TCP/IP Services, whether you are migrating from a previous version or installing IP for the first time. This book also identifies the optional and required modifications needed to enable you to use the enhanced functions provided with TCP/IP Services.

Resource Definition, Configuration, and Tuning:

Title	Number	Format	Description
z/OS Communications Server: IP Configuration Guide	SC31-8775	HC/SC	This book describes the major concepts involved in understanding and configuring an IP network. Familiarity with the z/OS operating system, IP protocols, z/OS UNIX System Services, and IBM Time Sharing Option (TSO) is recommended. Use this book in conjunction with the *z/OS Communications Server: IP Configuration Reference*.
z/OS Communications Server: IP Configuration Reference	SC31-8776	HC/SC	This book presents information for people who want to administer and maintain IP. Use this book in conjunction with the *z/OS Communications Server: IP Configuration Guide*. The information in this book includes: • TCP/IP configuration data sets • Configuration statements • Translation tables • SMF records • Protocol number and port assignments
z/OS Communications Server: SNA Network Implementation Guide	SC31-8777	HC/SC	This book presents the major concepts involved in implementing an SNA network. Use this book in conjunction with the *z/OS Communications Server: SNA Resource Definition Reference*.
z/OS Communications Server: SNA Resource Definition Reference	SC31-8778	HC/SC	This book describes each SNA definition statement, start option, and macroinstruction for user tables. It also describes NCP definition statements that affect SNA.Use this book in conjunction with the *z/OS Communications Server: SNA Network Implementation Guide*.
z/OS Communications Server: SNA Resource Definition Samples	SC31-8836	SC	This book contains sample definitions to help you implement SNA functions in your networks, and includes sample major node definitions.
z/OS Communications Server: AnyNet SNA over TCP/IP	SC31-8832	SC	This guide provides information to help you install, configure, use, and diagnose SNA over TCP/IP.
z/OS Communications Server: AnyNet Sockets over SNA	SC31-8831	SC	This guide provides information to help you install, configure, use, and diagnose sockets over SNA. It also provides information to help you prepare application programs to use sockets over SNA.

Operation:

Title	Number	Format	Description
z/OS Communications Server: IP User's Guide and Commands	SC31-8780	HC/SC	This book describes how to use TCP/IP applications. It contains requests that allow a user to: log on to a remote host using Telnet, transfer data sets using FTP, send and receive electronic mail, print on remote printers, and authenticate network users.
z/OS Communications Server: IP System Administrator's Commands	SC31-8781	HC/SC	This book describes the functions and commands helpful in configuring or monitoring your system. It contains system administrator's commands, such as NETSTAT, PING, TRACERTE and their UNIX counterparts. It also includes TSO and MVS commands commonly used during the IP configuration process.

Title	Number	Format	Description
z/OS Communications Server: SNA Operation	SC31-8779	HC/SC	This book serves as a reference for programmers and operators requiring detailed information about specific operator commands.
z/OS Communications Server: Quick Reference	SX75-0124	HC/SC	This book contains essential information about SNA and IP commands.

Customization:

Title	Number	Format	Description
z/OS Communications Server: SNA Customization	LY43-0092	SC	This book enables you to customize SNA, and includes the following: • Communication network management (CNM) routing table • Logon-interpret routine requirements • Logon manager installation-wide exit routine for the CLU search exit • TSO/SNA installation-wide exit routines • SNA installation-wide exit routines
z/OS Communications Server: IP Network Print Facility	SC31-8833	SC	This book is for system programmers and network administrators who need to prepare their network to route SNA, JES2, or JES3 printer output to remote printers using TCP/IP Services.

Writing Application Programs:

Title	Number	Format	Description
z/OS Communications Server: IP Application Programming Interface Guide	SC31-8788	SC	This book describes the syntax and semantics of program source code necessary to write your own application programming interface (API) into TCP/IP. You can use this interface as the communication base for writing your own client or server application. You can also use this book to adapt your existing applications to communicate with each other using sockets over TCP/IP.
z/OS Communications Server: IP CICS Sockets Guide	SC31-8807	SC	This book is for people who want to set up, write application programs for, and diagnose problems with the socket interface for CICS using z/OS TCP/IP.
z/OS Communications Server: IP IMS Sockets Guide	SC31-8830	SC	This book is for programmers who want application programs that use the IMS TCP/IP application development services provided by IBM's TCP/IP Services.
z/OS Communications Server: IP Programmer's Reference	SC31-8787	SC	This book describes the syntax and semantics of a set of high-level application functions that you can use to program your own applications in a TCP/IP environment. These functions provide support for application facilities, such as user authentication, distributed databases, distributed processing, network management, and device sharing. Familiarity with the z/OS operating system, TCP/IP protocols, and IBM Time Sharing Option (TSO) is recommended.

Title	Number	Format	Description
z/OS Communications Server: SNA Programming	SC31-8829	SC	This book describes how to use SNA macroinstructions to send data to and receive data from (1) a terminal in either the same or a different domain, or (2) another application program in either the same or a different domain.
z/OS Communications Server: SNA Programmer's LU 6.2 Guide	SC31-8811	SC	This book describes how to use the SNA LU 6.2 application programming interface for host application programs. This book applies to programs that use only LU 6.2 sessions or that use LU 6.2 sessions along with other session types. (Only LU 6.2 sessions are covered in this book.)
z/OS Communications Server: SNA Programmer's LU 6.2 Reference	SC31-8810	SC	This book provides reference material for the SNA LU 6.2 programming interface for host application programs.
z/OS Communications Server: CSM Guide	SC31-8808	SC	This book describes how applications use the communications storage manager.
z/OS Communications Server: CMIP Services and Topology Agent Guide	SC31-8828	SC	This book describes the Common Management Information Protocol (CMIP) programming interface for application programmers to use in coding CMIP application programs. The book provides guide and reference information about CMIP services and the SNA topology agent.

Diagnosis:

Title	Number	Format	Description
z/OS Communications Server: IP Diagnosis	GC31-8782	HC/SC	This book explains how to diagnose TCP/IP problems and how to determine whether a specific problem is in the TCP/IP product code. It explains how to gather information for and describe problems to the IBM Software Support Center.
z/OS Communications Server: SNA Diagnosis Vol 1 Techniques and Procedures and *z/OS Communications Server: SNA Diagnosis Vol 2 FFST Dumps and the VIT*	LY43-0088 LY43-0089	HC/SC	These books help you identify an SNA problem, classify it, and collect information about it before you call the IBM Support Center. The information collected includes traces, dumps, and other problem documentation.
z/OS Communications Server: SNA Data Areas Volume 1 and *z/OS Communications Server: SNA Data Areas Volume 2*	LY43-0090 LY43-0091	SC	These books describe SNA data areas and can be used to read an SNA dump. They are intended for IBM programming service representatives and customer personnel who are diagnosing problems with SNA.

Messages and Codes:

Title	Number	Format	Description
z/OS Communications Server: SNA Messages	SC31-8790	HC/SC	This book describes the ELM, IKT, IST, ISU, IUT, IVT, and USS messages. Other information in this book includes: • Command and RU types in SNA messages • Node and ID types in SNA messages • Supplemental message-related information
z/OS Communications Server: IP Messages Volume 1 (EZA)	SC31-8783	HC/SC	This volume contains TCP/IP messages beginning with EZA.
z/OS Communications Server: IP Messages Volume 2 (EZB)	SC31-8784	HC/SC	This volume contains TCP/IP messages beginning with EZB.
z/OS Communications Server: IP Messages Volume 3 (EZY)	SC31-8785	HC/SC	This volume contains TCP/IP messages beginning with EZY.
z/OS Communications Server: IP Messages Volume 4 (EZZ-SNM)	SC31-8786	HC/SC	This volume contains TCP/IP messages beginning with EZZ and SNM.
z/OS Communications Server: IP and SNA Codes	SC31-8791	HC/SC	This book describes codes and other information that appear in z/OS Communications Server messages.

APPC Application Suite:

Title	Number	Format	Description
z/OS Communications Server: APPC Application Suite User's Guide	GC31-8809	SC	This book documents the end-user interface (concepts, commands, and messages) for the AFTP, ANAME, and APING facilities of the APPC application suite. Although its primary audience is the end user, administrators and application programmers may also find it useful.
z/OS Communications Server: APPC Application Suite Administration	SC31-8835	SC	This book contains the information that administrators need to configure the APPC application suite and to manage the APING, ANAME, AFTP, and A3270 servers.
z/OS Communications Server: APPC Application Suite Programming	SC31-8834	SC	This book provides the information application programmers need to add the functions of the AFTP and ANAME APIs to their application programs.

Redbooks

The following Redbooks may help you as you implement z/OS Communications Server.

Title	Number
TCP/IP Tutorial and Technical Overview	GG24–3376
SNA and TCP/IP Integration	SG24–5291
IBM Communication Server for OS/390 V2R10 TCP/IP Implementation Guide: Volume 1: Configuration and Routing	SG24–5227
IBM Communication Server for OS/390 V2R10 TCP/IP Implementation Guide: Volume 2: UNIX Applications	SG24–5228
IBM Communication Server for OS/390 V2R10 TCP/IP Implementation Guide: Volume 3: MVS Applications	SG24–5229
OS/390 Secureway Communication Server V2R8 TCP/IP Guide to Enhancements	SG24–5631

Title	Number
TCP/IP in a Sysplex	SG24–5235
Managing OS/390 TCP/IP with SNMP	SG24–5866
Security in OS/390–based TCP/IP Networks	SG24–5383
IP Network Design Guide	SG24–2580

Related Information

For information about z/OS products, refer to *z/OS Information Roadmap* (SA22-7500). The Roadmap describes what level of documents are supplied with each release of z/OS Communications Server, as well as describing each z/OS publication.

The table below lists books that may be helpful to readers.

Title	Number
z/OS SecureWay Security Server Firewall Technologies	SC24-5922
S/390: OSA-Express Customer's Guide and Reference	SA22-7403
z/OS MVS Diagnosis: Procedures	GA22-7587
z/OS MVS Diagnosis: Reference	GA22-7588
z/OS MVS Diagnosis: Tools and Service Aids	GA22-7589

Determining If a Publication Is Current

As needed, IBM updates its publications with new and changed information. For a given publication, updates to the hardcopy and associated BookManager softcopy are usually available at the same time. Sometimes, however, the updates to hardcopy and softcopy are available at different times. Here is how to determine if you are looking at the most current copy of a publication:

1. At the end of a publication's order number there is a dash followed by two digits, often referred to as the dash level. A publication with a higher dash level is more current than one with a lower dash level. For example, in the publication order number GC28-1747-07, the dash level 07 means that the publication is more current than previous levels, such as 05 or 04.
2. If a hardcopy publication and a softcopy publication have the same dash level, it is possible that the softcopy publication is more current than the hardcopy publication. Check the dates shown in the Summary of Changes. The softcopy publication might have a more recently dated Summary of Changes than the hardcopy publication.
3. To compare softcopy publications, you can check the last two characters of the publication's filename (also called the book name). The higher the number, the more recent the publication. Also, next to the publication titles in the CD-ROM booklet and the readme files, there is an asterisk (*) that indicates whether a publication is new or changed.

Summary of Changes

Summary of Changes
for SC31-8807-00
z/OS Version 1 Release 2

This book contains information previously presented in *OS/390 V2R8 SecureWay Communications Server: IP CICS Sockets Guide*, SC31-8518.

New Information

- The CICS sockets interface has been updated to allow configuration of an enhanced version of the CICS listener, as well as the standard version previously supplied. For details, see "Chapter 2. Setting Up and Configuring CICS TCP/IP" on page 19.
- The TCP_NODELAY option is now available to disable the Nagle algorithm to improve response time. For details, see "getsockopt(), setsockopt()" on page 123, "GETSOCKOPT" on page 163, and "SETSOCKOPT" on page 201.

This book contains terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Chapter 1. Introduction to CICS TCP/IP

CICS is an online transaction processing system. This means that application programs using CICS can handle large numbers of data transactions from large networks of computers and terminals.

Communication throughout these networks has often been based on the Systems Network Architecture (SNA) family of protocols. CICS TCP/IP offers CICS users an alternative to SNA, the TCP/IP family of protocols for those users whose native communications protocol is TCP/IP.

CICS TCP/IP allows remote users to access CICS client/server applications over TCP/IP internets. Figure 1 shows how these two products give remote users peer-to-peer communication with CICS applications.

It is important to understand that CICS TCP/IP is primarily intended to support ***peer-to-peer*** applications, as opposed to the traditional CICS mainframe interactive applications in which the CICS system contained all program logic and the remote terminal was often referred to as a “dumb” terminal. To connect a TCP/IP host to one of those traditional applications, you should first consider using Telnet. With Telnet, you should be able to access existing 3270-style basic mapping support (BMS) applications without modification and without the need for additional programming. Use CICS TCP/IP when you are developing new peer-to-peer applications in which both ends of the connection are programmable.

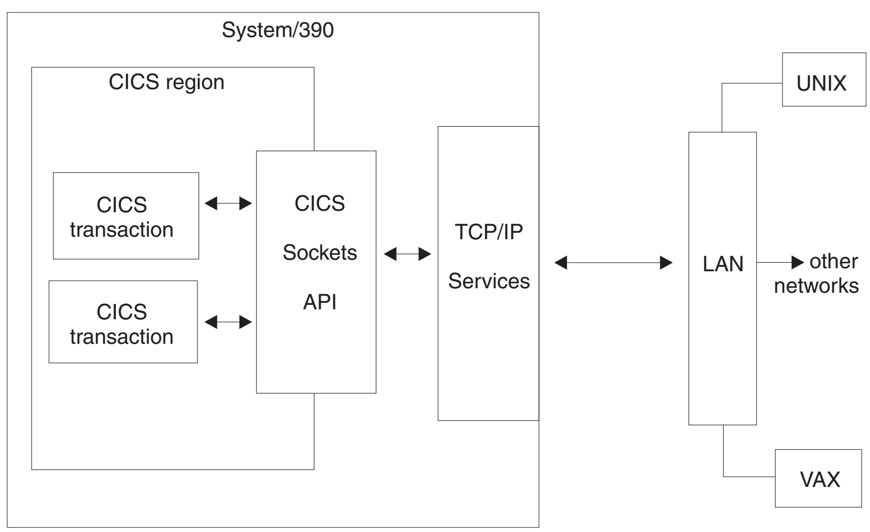


Figure 1. The Use of CICS Sockets

CICS TCP/IP provides a variant of the Berkeley Software Distribution 4.3 Sockets interface, which is widely used in TCP/IP networks and is based on the UNIX® system and other operating systems. The socket interface consists of a set of calls that your CICS application programs can use to set up connections, send and receive data, and perform general communications control functions. The programs can be written in COBOL, PL/I, assembler language, or the C language.

TCP/IP Internets

This section describes some of the basic ideas behind the TCP/IP family of protocols. For more detailed and comprehensive treatments of this subject, refer to the books on TCP/IP listed in “z/OS Communications Server Information” on page xv.

Like SNA, TCP/IP is a communication protocol used between physically separated computer systems. Unlike SNA and most other protocols, TCP/IP is not designed for a particular hardware technology. TCP/IP can be implemented on a wide variety of physical networks, and is specially designed for communicating between systems on different physical networks (local and wide area). This is called *internetworking*.

Telnet

TCP/IP Services supports traditional 3270 mainframe interactive (MFI) applications with an emulator function called Telnet (TN3270). For these applications, all program logic is housed in the mainframe, and the remote host uses only that amount of logic necessary to provide basic communication services. Thus, if your requirement is simply to provide access from a remote TCP/IP host to existing CICS MFI applications, you should probably consider Telnet rather than CICS TCP/IP as the communications vehicle. Telnet 3270-emulation functions allow your TCP/IP host to communicate with traditional applications without modification.

Client/Server Processing

TCP/IP also supports *client/server* processing, where processes are either:

- **Servers** that provide a particular service and respond to requests for that service
- **Clients** that initiate the requests to the servers

With CICS TCP/IP, remote client systems can initiate communications with CICS and cause a CICS transaction to start. It is anticipated that this will be the most common mode of operation. (Alternatively, the remote system can act as a server with CICS initiating the conversation.)

TCP, UDP, and IP

TCP/IP is a large family of protocols that is named after its two most important members. Figure 2 on page 3 shows the TCP/IP protocols used by CICS TCP/IP, in terms of the layered Open Systems Interconnection (OSI) model, which is widely used to describe data communication systems. For CICS users who might be more accustomed to SNA, the left side of Figure 2 shows the SNA layers, which correspond very closely to the OSI layers.

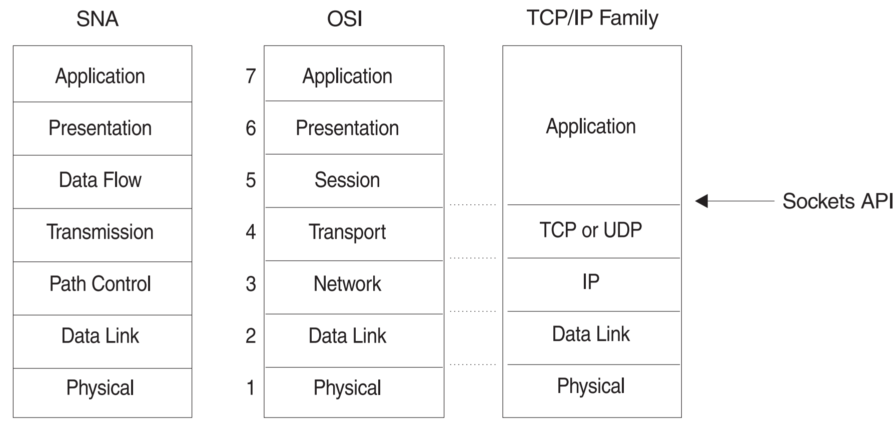


Figure 2. TCP/IP Protocols Compared to the OSI Model and SNA

The protocols implemented by TCP/IP Services and used by CICS TCP/IP are shown in the right hand column in Figure 2:

Transmission Control Protocol (TCP)
In terms of the OSI model, TCP is a transport-layer protocol. It provides a reliable virtual-circuit connection between applications; that is, a connection is established before data transmission begins. Data is sent without errors or duplication and is received in the same order as it is sent. No boundaries are imposed on the data; TCP treats the data as a stream of bytes.

User Datagram Protocol (UDP)
UDP is also a transport-layer protocol and is an alternative to TCP. It provides an unreliable datagram connection between applications. Data is transmitted link by link; there is no end-to-end connection. The service provides no guarantees. Data can be lost or duplicated, and datagrams can arrive out of order.

Internet Protocol (IP)
In terms of the OSI model, IP is a network-layer protocol. It provides a datagram service between applications, supporting both TCP and UDP.

The Socket API

The socket API is a collection of socket calls that enables you to perform the following primary communication functions between application programs:
- Set up and establish connections to other users on the network
- Send and receive data to and from other users
- Close down connections

In addition to these basic functions, the APIs enable you to:
- Interrogate the network system to get names and status of relevant resources
- Perform system and control functions as required

CICS TCP/IP provides three TCP/IP socket application program interfaces (APIs), similar to those used on UNIX systems. One interfaces to C language programs, the other two to COBOL, PL/I, and assembler language programs.
- **C Language**. Historically, TCP/IP has been linked to the C language and the UNIX operating system. Textbook descriptions of socket calls are usually given in C, and most socket programmers are familiar with the C interface to TCP/IP. For these reasons, TCP/IP Services includes a C language API. If you are writing new TCP/IP applications and are familiar with C language programming, you

might prefer to use this interface. See “Chapter 7. C Language Application Programming” on page 109 for the sockets calls provided by TCP/IP Services.

- **Sockets Extended API (COBOL, PL/I, Assembler Language)**. The Sockets Extended API is for those who want to write in COBOL, PL/I, or assembler language, or who have COBOL, PL/I, or assembler language programs that need to be modified to run with TCP/IP. If you are writing new TCP/IP applications in COBOL, PL/I, or assembler language, you might prefer to use the Sockets Extended API. See “Chapter 8. Sockets Extended Application Programming Interface (API)” on page 141 for details of this interface.
- **Version 2.2.1 (COBOL, PL/I, Assembler Language)**. This is the API that was offered to users of the original release of CICS TCP/IP. It is similar in use to the Sockets Extended API. The Version 2.2.1 API is available for those who want to maintain Version 2.2.1 programs. This interface is described in “Appendix A. Original COBOL Application Programming Interface (EZACICAL)” on page 221.

Programming with Sockets

The original UNIX socket interface was designed to hide the physical details of the network. It included the concept of a socket, which would represent the connection to the programmer, yet shield the program (as much as possible) from the details of communication programming. A *socket* is an end-point for communication that can be named and addressed in a network. From an application program perspective, a socket is a resource that is allocated by the TCP/IP address space. A socket is represented to the program by an integer called a *socket descriptor*.

Socket types

The MVS socket APIs provide a standard interface to the transport and internetwork layer interfaces of TCP/IP. They support three socket types: stream, datagram, and raw. Stream and datagram sockets interface to the transport layer protocols, and raw sockets interface to the network layer protocols. All three socket types are discussed here for background purposes. While CICS supports stream and datagram sockets, stream sockets provide the most reliable form of data transfer offered by TCP/IP.

Stream sockets transmit data between TCP/IP hosts that are already connected to one another. Data is transmitted in a continuous stream; in other words, there are no record length or new-line character boundaries between data. Communicating processes [1] must agree on a scheme to ensure that both client and server have received all data. One way of doing this is for the sending process to send the *length* of the data, followed by the data itself. The receiving process reads the length and then loops, accepting data until all of it has been transferred.

In TCP/IP terminology, the stream socket interface defines a ″reliable″ connection-oriented service. In this context, the word *reliable* means that data is sent without error or duplication and is received in the same order as it is sent. Flow control is built in to avoid data overruns.

The *datagram* socket interface defines a connectionless service. Datagrams are sent as independent packets. The service provides no guarantees; data can be lost or duplicated, and datagrams can arrive out of order. The size of a datagram is limited to the size that can be sent in a single transaction (currently the default is 8192 and the maximum is 65507). No disassembly and reassembly of packets is performed by TCP/IP.

1. In TCP/IP terminology, a *process* is essentially the same as an application program.

The *raw* socket interface allows direct access to lower layer protocols, such as IP and Internet Control Message Protocol (ICMP). This interface is often used for testing new protocol implementations.

Addressing TCP/IP hosts

The following section describes how one TCP/IP host addresses another TCP/IP host. [2]

Address Families: An address family defines a specific addressing format. Applications that use the same addressing family have a common scheme for addressing socket endpoints. TCP/IP for CICS supports the AF_INET address family.

Socket Addresses: A socket address in the AF_INET family contains four fields: the name of the address family itself (AF_INET), a port, an Internet address, and an eight-byte reserved field. In COBOL, a socket address looks like this:

```
01 NAME
    03 FAMILY      PIC 9(4) BINARY.
    03 PORT        PIC 9(4) BINARY.
    03 IP_ADDRESS  PIC 9(8) BINARY.
    03 RESERVED    PIC X(8).
```

You will find this structure in every call that addresses another TCP/IP host.

In this structure, FAMILY is a halfword that defines the addressing family being used. In CICS, FAMILY is always set to a value of 2, which specifies the AF_INET Internet address family. [3] The PORT field identifies the application port number; it must be specified in network byte order. The IP_ADDRESS field is the Internet address of the network interface used by the application. It also must be specified in network byte order. The RESERVED field should be set to all zeros.

Internet (IP) Addresses: An Internet address (otherwise known as an IP address) is a 32-bit field that represents a network interface. An IP address is commonly represented in dotted decimal notation, such as *129.5.25.1*. Every Internet address within an administered AF_INET domain must be unique. A common misunderstanding is that a host must have only one Internet address. In fact, a single host may have several Internet addresses, one for each network interface.

Ports: A port is a 16-bit integer that defines a specific application, within an IP address, in which several applications use the same network interface. The port number is a qualifier that TCP/IP uses to route incoming data to a specific application within an IP address. Some port numbers are reserved for particular applications and are called *well-known ports*, such as Port 23, which is the well-known port for Telnet.

As an example, an MVS system with an IP address of 129.9.12.7 might have CICS as port 2000, and Telnet as port 23. In this example, a client desiring connection to CICS would issue a CONNECT call, requesting port 2000 at IP address 129.9.12.7.

Note: It is important to understand the difference between a socket and a port. TCP/IP defines a port to represent a certain process on a certain machine (network interface). A port represents the location of one process in a host that can have many processes. A bound socket represents a specific port

2. In TCP/IP terminology, a host is simply a computer that is running TCP/IP. There is no connotation of ″mainframe″ or large processor within the TCP/IP definition of the word *host*.

3. Note that sockets support many address families, but TCP/IP for CICS, only supports the Internet address family.

and the IP address of its host. In the case of CICS, the Listener has a listening socket that has a port to receive incoming connection requests. When a connection request is received, the Listener creates a new socket representing the endpoint of this connection and passes it to the applications by way of the givesocket/takesocket calls.

Note that multiple sockets can share the same port and, for CICS, all server applications and the Listener share the same port. For client applications, the bind (or connect) socket calls assign a port to the socket that is different than the listener/server port or any other client ports. Normally, client applications do not share ports, but it can be done using the SOREUSADDR option.

Domain Names: Because dotted decimal IP addresses are difficult to remember, TCP/IP also allows you to represent host interfaces on the network as alphabetic names, such as Alana.E04.IBM.COM or CrFre@AOL.COM. Every Domain Name has an equivalent IP address or set of addresses. TCP/IP includes service functions (GETHOSTBYNAME and GETHOSTBYADDR) that will help you convert from one notation to another.

Network Byte Order: In the open environment of TCP/IP, Internet addresses must be defined in terms of the architecture of the machines. Some machine architectures, such as IBM mainframes, define the lowest memory address to be the high-order bit, which is called *big endian*. However, other architectures, such as IBM PCs, define the lowest memory address to be the low-order bit, which is called *little endian*.

Network addresses in a given network must all follow a consistent addressing convention. This convention, known as *Network Byte Order*, defines the bit-order of network addresses as they pass through the network. The TCP/IP standard Network Byte Order is big-endian. In order to participate in a TCP/IP network, little-endian systems usually bear the burden of conversion to Network Byte Order.

Note: The socket interface does not handle application data bit-order differences. Application writers must handle these bit order differences themselves.

A Typical Client Server Program Flow Chart

Stream-oriented socket programs generally follow a prescribed sequence. See Figure 3 on page 7 for a diagram of the logic flow for a typical client and server. As you study this diagram, keep in mind the fact that a concurrent server typically starts before the client does, and waits for the client to request connection at step **3**. It then continues to wait for additional client requests after the client connection is closed.

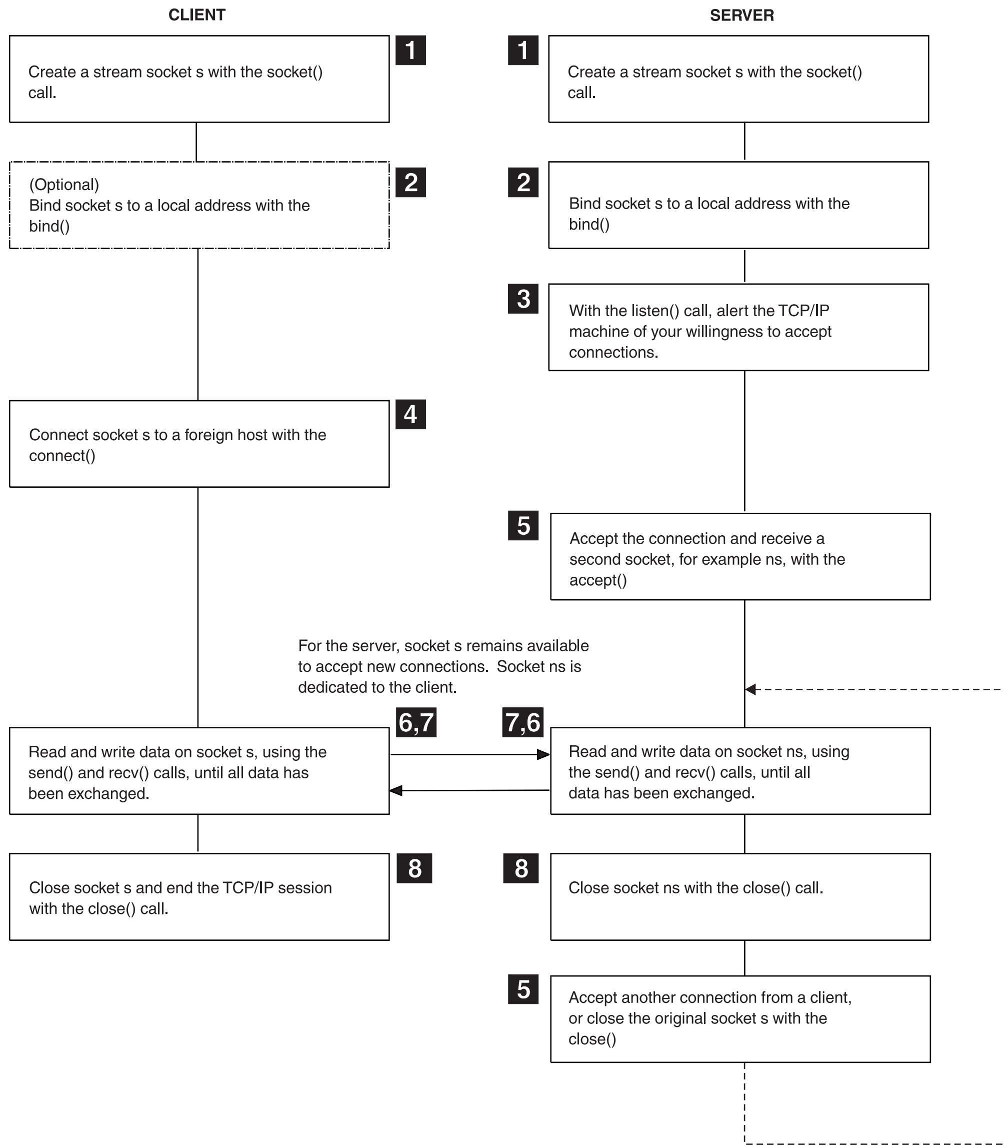


Figure 3. A Typical Client Server Session

Concurrent and Iterative Servers

An *iterative server* handles both the connection request and the transaction involved in the call itself. Iterative servers are fairly simple and are suitable for transactions that do not last long.

However, if the transaction takes more time, queues can build up quickly. In Figure 4 on page 8, once Client A starts a transaction with the server, Client B cannot make a call until A has finished.

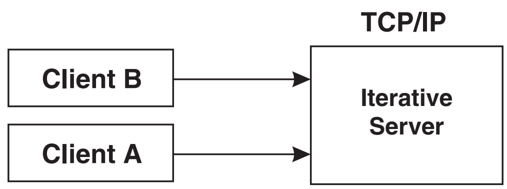


Figure 4. An Iterative Server

So, for lengthy transactions, a different sort of server is needed — the *concurrent server*, as shown in Figure 5. Here, Client A has already established a connection with the server, which has then created a *child server process* to handle the transaction. This allows the server to process Client B's request without waiting for A's transaction to complete. More than one child server can be started in this way.

TCP/IP provides a concurrent server program called the CICS Listener. It is described in "The Listener" on page 101.

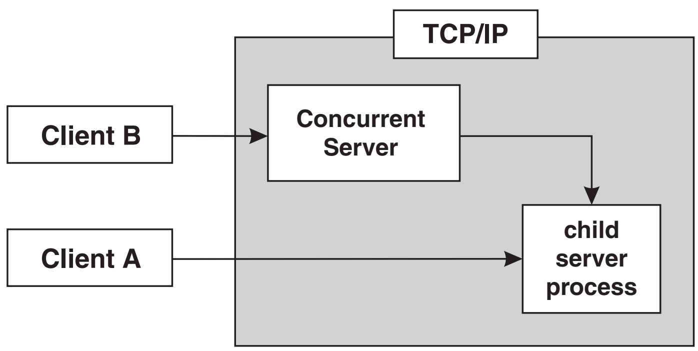


Figure 5. A Concurrent Server

Figure 3 on page 7 illustrates a concurrent server at work.

The Basic Socket Calls

The following is an overview of the basic socket calls.

The following calls are used by the server:

SOCKET
Obtains a socket to read from or write to.

BIND Associates a socket with a port number.

LISTEN
Tells TCP/IP that this process is listening for connections on this socket.

SELECT
Waits for activity on a socket.

ACCEPT
Accepts a connection from a client.

The following calls are used by a concurrent server to pass the socket from the parent server task (Listener) to the child server task (user-written application).

GIVESOCKET
Gives a socket to a child server task.

TAKESOCKET
Accepts a socket from a parent server task.

GETCLIENTID
Optionally used by the parent server task to determine its own address space name (if unknown) prior to issuing the GIVESOCKET.

The following calls are used by the client:

SOCKET
Allocates a socket to read from or write to.

CONNECT
Allows a client to open a connection to a server's port.

The following calls are used by both the client and the server:

WRITE
Sends data to the process on the other host.

READ Receives data from the other host.

CLOSE
Terminates a connection, deallocating the socket.

For full discussion and examples of these calls, see "Chapter 8. Sockets Extended Application Programming Interface (API)" on page 141.

Server TCP/IP calls

To understand Socket programming, the client program and the server program must be considered separately. In this section the call sequence for the *server* is described; the next section discusses the typical call sequence for a *client*. This is the logical presentation sequence because the server is usually already in execution before the client is started. The step numbers (such as **5**) in this section refer to the steps in Figure 3 on page 7.

Socket

The server must first obtain a socket **1**. This socket provides an end-point to which clients can connect.

A socket is actually an index into a table of connections in the TCP/IP address space, so TCP/IP usually assigns socket numbers in ascending order. In COBOL, the programmer uses the SOCKET call to obtain a new socket.

The socket function specifies the address family (AF_INET), the type of socket (STREAM), and the particular networking protocol (PROTO) to use. (When PROTO is set to zero, the TCP/IP address space automatically uses the appropriate protocol for the specified socket type). Upon return, the newly allocated socket's descriptor is returned in RETCODE.

For an example of the SOCKET call, see "SOCKET" on page 206.

Bind

At this point **2**, an entry in the table of communications has been reserved for the application. However, the socket has no port or IP address associated with it until the BIND call is issued. The BIND function requires three parameters:
- The socket descriptor that was just returned by the SOCKET call.
- The number of the port on which the server wishes to provide its service.

- The IP address of the network connection on which the server is listening. If the application wants to receive connection requests from any network interface, the IP address should be set to zeros.

For an example of the BIND call, see "BIND" on page 145.

Listen

After the bind, the server has established a specific IP address and port upon which other TCP/IP hosts can request connection. Now it must notify the TCP/IP address space that it intends to listen for connections on this socket. The server does this with the LISTEN **3** call, which puts the socket into passive open mode. *Passive open mode* describes a socket that can accept connection requests, but cannot be used for communication. A passive open socket is used by a listener program like the CICS Listener to await connection requests. Sockets that are directly used for communication between client and server are known as *active open* sockets. In passive open mode, the socket is open for client contacts; it also establishes a backlog queue of pending connections.

This LISTEN call tells the TCP/IP address space that the server is ready to begin accepting connections. Normally, only the number of requests specified by the BACKLOG parameter will be queued.

For an example of the LISTEN call, see "LISTEN" on page 174.

Accept

At this time **5**, the server has obtained a socket, bound the socket to an IP address and port, and issued a LISTEN to open the socket. The server main task is now ready for a client to request connection **4**. The ACCEPT call temporarily blocks further progress. [4]

The default mode for Accept is blocking. Accept behavior changes when the socket is nonblocking. The FCNTL() or IOCTL() calls can be used to disable blocking for a given socket. When this is done, calls that would normally block continue regardless of whether the I/O call has completed. If a socket is set to nonblocking and an I/O call issued to that socket would otherwise block (because the I/O call has not completed) the call returns with ERRNO 35 (EWOULDBLOCK).

When the ACCEPT call is issued, the server passes its socket descriptor, S, to TCP/IP. When the connection is established, the ACCEPT call returns a new socket descriptor (in RETCODE) that represents the connection with the client. This is the socket upon which the server subtask communicates with the client. Meanwhile, the original socket (S) is still allocated, bound and ready for use by the main task to accept subsequent connection requests from other clients.

To accept another connection, the server calls ACCEPT again. By repeatedly calling ACCEPT, a concurrent server can establish simultaneous sessions with multiple clients.

For an example of the ACCEPT call, see "ACCEPT" on page 144.

GIVESOCKET and TAKESOCKET

A server handling more than one client simultaneously acts like a dispatcher at a messenger service. A messenger dispatcher gets telephone calls from people who

---

4. Blocking is a UNIX concept in which the requesting process is suspended until the request is satisfied. It is roughly analogous to the MVS wait. A socket is blocked while an I/O call waits for an event to complete. If a socket is set to block, the calling program is suspended until the expected event completes.

want items delivered, and the dispatcher sends out messengers to do the work. In a similar manner, the server receives client requests, and then spawns tasks to handle each client.

In UNIX-based servers, the *fork()* system call is used to dispatch a new subtask after the initial connection has been established. When the *fork()* command is used, the new process automatically inherits the socket that is connected to the client.

Because of architectural differences, CICS sockets does not implement the *fork()* system call.Tasks use the GIVESOCKET and TAKESOCKET functions to pass sockets from parent to child. The task passing the socket uses GIVESOCKET, and the task receiving the socket uses TAKESOCKET. See “GIVESOCKET and TAKESOCKET Calls” on page 15 for more information about these calls.

Read and Write

Once a client has been connected with the server, and the socket has been transferred from the main task (parent) to the subtask (child), the client and server exchange application data, using various forms of READ/WRITE calls. See “Read/Write Calls — the Conversation” on page 12 for details about these calls.

Client TCP/IP Calls

The TCP/IP call sequence for a client is simpler than the one for a concurrent server. A client only has to support one connection and one conversation. A concurrent server obtains a socket upon which it can listen for connection requests, and then creates a new socket for each new connection.

The Socket Call

In the same manner as the server, the first call **1** issued by the client is the SOCKET call. This call causes allocation of the socket on which the client will communicate.

```
CALL 'EZASOKET' USING SOCKET-FUNCTION SOCTYPE PROTO ERRNO RETCODE.
```

See “SOCKET” on page 206 for a sample of the SOCKET call.

The Connect Call

Once the SOCKET call has allocated a socket to the client, the client can then request connection on that socket with the server through use of the CONNECT call **4**.

The CONNECT call attempts to connect socket descriptor (S) to the server with an IP address of NAME. The CONNECT call blocks until the connection is accepted by the server. On successful return, the socket descriptor (S) can be used for communication with the server.

This is essentially the same sequence as that of the server; however, the client need not issue a BIND command because the port of a client has little significance. The client need only issue the CONNECT call, which issues an implicit BIND. When the CONNECT call is used to bind the socket to a port, the port number is assigned by the system and discarded when the connection is closed. Such a port is known as an *ephemeral* port because its life is very short as compared with that of a concurrent server, whose port remains available for a prolonged period of time.

See “CONNECT” on page 149 for an example of the CONNECT call.

Read/Write Calls — the Conversation

A variety of I/O calls is available to the programmer. The READ and WRITE, READV and WRITEV, and SEND **6** and RECV **6** calls can be used only on sockets that are in the connected state. The SENDTO and RECVFROM, and SENDMSG and RECVMSG calls can be used regardless of whether a connection exists.

The WRITEV, READV, SENDMSG, and RECVMSG calls provide the additional features of scatter and gather data. Scattered data can be located in multiple data buffers. The WRITEV and SENDMSG calls gather the scattered data and send it. The READV and RECVMSG calls receive data and scatter it into multiple buffers.

The WRITE and READ calls specify the socket S on which to communicate, the address in storage of the buffer that contains, or will contain, the data (BUF), and the amount of data transferred (NBYTE). The server uses the socket that is returned from the ACCEPT call.

These functions return the amount of data that was either sent or received. Because stream sockets send and receive information in streams of data, it can take more than one call to WRITE or READ to transfer all of the data. It is up to the client and server to agree on some mechanism of signaling that all of the data has been transferred.

- For an example of the READ call, see "READ" on page 176.
- For an example of the WRITE call, see "WRITE" on page 210.

The Close Call

When the conversation is over, both the client and server call CLOSE to end the connection. The CLOSE call also deallocates the socket, freeing its space in the table of connections. For an example of the CLOSE call, see "CLOSE" on page 147.

Other Socket Calls

Several other calls that are often used, particularly in servers, are the SELECT call, the GIVESOCKET/TAKESOCKET calls, and the IOCTL and FCTL calls.

The SELECT Call

Applications such as concurrent servers often handle multiple sockets at once. In such situations, the SELECT call can be used to simplify the determination of which sockets have data to be read, which are ready for data to be written, and which have pending exceptional conditions. An example of how the SELECT call is used can be found in Figure 6 on page 13.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SELECT'.
    01  MAXSOC          PIC 9(8) BINARY VALUE 50.
    01  TIMEOUT.
        03  TIMEOUT-SECONDS   PIC 9(8) BINARY.
        03  TIMEOUT-MILLISEC  PIC 9(8) BINARY.
    01  RSNDMASK        PIC X(50).
    01  WSNDMASK        PIC X(50).
    01  ESNDMASK        PIC X(50).
    01  RRETMASK        PIC X(50).
    01  WRETMASK        PIC X(50).
    01  ERETMASK        PIC X(50).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION MAXSOC TIMEOUT
                    RSNDMASK WSNDMASK ESNDMASK
                    RRETMASK WRETMASK ERETMASK
                    ERRNO RETCODE.
```

Figure 6. The SELECT Call

In this example, the application *sends* bit sets (the xSNDMASK sets) to indicate which sockets are to be tested for certain conditions, and *receives* another set of bits (the xRETMASK sets) from TCP/IP to indicate which sockets meet the specified conditions.

The example also indicates a timeout. If the timeout parameter is NULL, this is the C language API equivalent of a wait forever. (In Sockets Extended, a negative timeout value is a wait forever.) If the timeout parameter is nonzero, SELECT only waits the timeout amount of time for at least one socket to become ready under the indicated conditions. This is useful for applications servicing multiple connections that cannot afford to wait for data on a single connection. If the xSNDMASK bits are all zero, SELECT acts as a timer.

With the Socket SELECT call, you can define which sockets you want to test (the xSNDMASKs) and then wait (block) until one of the specified sockets is ready to be processed. When the SELECT call returns, the program knows only that some event has occurred, and it must test a set of bit masks (xRETMASKs) to determine which of the sockets had the event, and what the event was.

To maximize performance, a server should only test those sockets that are active. The SELECT call allows an application to select which sockets will be tested, and for what. When the Select call is issued, it blocks until the specified sockets are ready to be serviced (or, optionally) until a timer expires. When the select call returns, the program must check to see which sockets require service, and then process them.

To allow you to test any number of sockets with just one call to SELECT, place the sockets to test into a bit set, passing the bit set to the select call. A bit set is a string of bits where each possible member of the set is represented by a 0 or a 1. If the member's bit is 0, the member is not to be tested. If the member's bit is 1, the member is to be tested. Socket descriptors are actually small integers. If socket 3 is a member of a bit set, then bit 3 is set; otherwise, bit 3 is zero.

Therefore, the server specifies 3 bit sets of sockets in its call to the SELECT function: one bit set for sockets on which to receive data; another for sockets on which to write data; and any sockets with exception conditions. The SELECT call tests each selected socket for activity and returns only those sockets that have completed. On return, if a socket's bit is raised, the socket is ready for reading data or for writing data, or an exceptional condition has occurred.

The format of the bit strings is a bit awkward for an assembler programmer who is accustomed to bit strings that are counted from left to right. Instead, these bit strings are counted from right to left.

The first rule is that the length of a bit string is always expressed as a number of fullwords. If the highest socket descriptor you want to test is socket descriptor 3, you have to pass a 4-byte bit string, because this is the minimum length. If the highest number is 32, you must pass 8 bytes (2 fullwords).

The number of fullwords in each select mask can be calculated as

```
INT(highest socket descriptor / 32) + 1
```

Look at the first fullword you pass in a bit string in Table 1.

Table 1. First Fullword Passed in a Bit String in Select

Socket Descriptor Numbers Represented by Byte	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Byte 0	31	30	29	28	27	26	25	24
Byte 1	23	22	21	20	19	18	17	16
Byte 2	15	14	13	12	11	10	9	8
Byte 3	7	6	5	4	3	2	1	0

In these examples, we use standard assembler numbering notation; the leftmost bit or byte is relative 0.

If you want to test socket descriptor number 5 for pending read activity, you raise bit 2 in byte 3 of the first fullword (X'00000020'). If you want to test both socket descriptor 4 and 5, you raise both bit 2 and bit 3 in byte 3 of the first fullword (X'00000030').

If you want to test socket descriptor number 32, you must pass two fullwords, where the numbering scheme for the second fullword resembles that of the first. Socket descriptor number 32 is bit 7 in byte 3 of the second fullword. If you want to test socket descriptors 5 and 32, you pass two fullwords with the following content: X'0000002000000001'.

The bits in the second fullword represent the socket descriptor numbers shown in Table 2.

Table 2. Second Fullword Passed in a Bit String in Select

Socket Descriptor Numbers Represented by Byte	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Byte 4	63	62	61	60	59	58	57	56

Table 2. Second Fullword Passed in a Bit String in Select (continued)

Socket Descriptor Numbers Represented by Byte	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Byte 5	55	54	53	52	51	50	49	48
Byte 6	47	46	45	44	43	42	41	40
Byte 7	39	38	37	36	35	34	33	32

If you develop your program in COBOL or PL/I, you may find that the EZACIC06 routine, which is provided as part of TCP/IP Services, will make it easier for you to build and test these bit strings. This routine translates between a character string mask (one byte per socket) and a bit string mask (one bit per socket).

In addition to its function of reporting completion on Read/Write events, the SELECT call can also be used to determine completion of events associated with the LISTEN and GIVESOCKET calls.

- When a connection request is pending on the socket for which the main process issued the LISTEN call, it will be reported as a pending read.
- When the parent process has issued a GIVESOCKET, and the child process has taken the socket, the parent's socket descriptor is selected with an exception condition. The parent process is expected to `close` the socket descriptor when this happens.

IOCTL and FCNTL Calls

In addition to SELECT, applications can use the IOCTL or FCNTL calls to help perform asynchronous (nonblocking) socket operations. An example of the use of the IOCTL call is shown in "IOCTL" on page 170.

The IOCTL call has many functions; establishing blocking mode is only one of its functions. The value in COMMAND determines which function IOCTL will perform. The REQARG of 0 specifies nonblocking. (A REQARG of 1 would request that socket S be set to blocking mode.) When this socket is passed as a parameter to a call that would block (such as RECV when data is not present), the call returns with an error code in RETCODE, and ERRNO set to `EWOULDBLOCK`. Setting the mode of the socket to nonblocking allows an application to continue processing without becoming blocked.

GIVESOCKET and TAKESOCKET Calls

Tasks use the GIVESOCKET and TAKESOCKET functions to pass sockets from parent to child.

For programs using TCP/IP Services, each task has its own unique 8-byte name. The main server task passes three arguments to the GIVESOCKET call:

- The socket number it wants to give
- Its own name [5]
- The name of the task to which it wants to give the socket

If the server does not know the name of the subtask that will receive the socket, it blanks out the name of the subtask. The first subtask calling TAKESOCKET with the server's unique name receives the socket.

5. If a task does not know its address space name, it can use the GETCLIENTID function call to determine its unique name.

The subtask that receives the socket must know the main task's unique name and the number of the socket that it is to receive. This information must be passed from main task to subtask in a work area that is common to both tasks.

- In IMS, the parent task name and the number of the socket descriptor are passed from parent (Listener) to child (MPP) through the message queue.
- In CICS, the parent task name and the socket descriptor number are passed from the parent (Listener) to the transaction program by means of the EXEC CICS START and EXEC CICS RETREIVE function.

Because each task has its own socket table, the socket descriptor obtained by the main task is not the socket descriptor that the subtask will use. When TAKESOCKET accepts the socket that has been given, the TAKESOCKET call assigns a new socket number for the subtask to use. This new socket number represents the same connection as the parent's socket. (The transferred socket might be referred to as socket number 54 by the parent task and as socket number 3 by the subtask; however, both socket descriptors represent the same connection.)

Once the socket has successfully been transferred, the TCP/IP address space posts an exceptional condition on the parent's socket. The parent uses the SELECT call to test for this condition. When the parent task SELECT call returns with the exception condition on that socket (indicating that the socket has been successfully passed) the parent issues CLOSE to complete the transfer and deallocate the socket from the main task.

To continue the sequence, when another client request comes in, the concurrent server (Listener) gets another new socket, passes the new socket to the new subtask, dissociates itself from that connection, and so on.

Summary: To summarize, the process of passing the socket is accomplished in the following way:

- After creating a subtask, the server main task issues the GIVESOCKET call to pass the socket to the subtask. If the subtask's address space name and subtask ID are specified in the GIVESOCKET call (as with CICS), only a subtask with a matching address space and subtask ID can take the socket. If this field is set to blanks (as with IMS), any MVS address space requesting a socket can take this socket.
- The server main task then passes the socket descriptor and concurrent server's ID to the subtask using some form of commonly addressable technique such as the CICS START/RETRIEVE commands.
- The concurrent server issues the SELECT call to determine when the GIVESOCKET has successfully completed.
- The subtask calls TAKESOCKET with the concurrent server's ID and socket descriptor and uses the resulting socket descriptor for communication with the client.
- When the GIVESOCKET has successfully completed, the concurrent server issues the CLOSE call to complete the handoff.

An example of a concurrent server is the CICS Listener. It is described in "The Listener" on page 101. Figure 5 on page 8 shows a concurrent server.

What You Must Have to Run CICS TCP/IP

| In order to use the updates described in this book, you must have OS/390® V2R5
| or later.

TCP/IP Services is not described in this book since it is a prerequisite for CICS TCP/IP. However, much material from the TCP/IP library has been repeated in this book in an attempt to make it independent of that library. For more information about TCP/IP Services, see the books listed in “z/OS Communications Server Information” on page xv.

A TCP/IP host can communicate with any remote CICS or non-CICS system that runs TCP/IP. The remote system can, for example, run a UNIX or OS/2® operating system.

CICS TCP/IP Components

In terms of CICS operation, the CICS TCP/IP feature is a task-related user exit (TRUE) mechanism known as an *adapter*. The adapting facility that it provides is between application programs that need to access TCP/IP and the manager of the TCP/IP resource.

CICS TCP/IP has the following main components:

- The **stub program** is link-edited to each application program that wants to use it. It intercepts requests issued by the calling application program and causes CICS to pass control to the TRUE.
- The **TRUE** enables programs to pass calls to the subtask and to the TCP/IP address space.
- The **MVS subtask** translates commands for accessing TCP/IP into a form acceptable to the TCP/IP resource manager and then passes control to the resource manager. It also handles the MVS waits incurred during socket calls.
- The **Administration Routine** contains the EXEC CICS ENABLE and DISABLE commands that are used to install and withdraw the TRUE program.
- The **Configuration System** configures the interface and its listeners.

A Summary of What CICS TCP/IP Provides

Figure 7 on page 18 shows how CICS TCP/IP allows your CICS applications to access the TCP/IP network. It shows that CICS TCP/IP makes the following facilities available to your application programs:

The Socket Calls

Socket calls are shown in Steps 1 and 2 in Figure 7 on page 18.

The socket API is available in the C language and in COBOL, PL/I, or assembler language. It includes the following socket calls:

Basic calls:	***SOCKET,*** ***BIND, CONNECT, LISTEN, ACCEPT, SHUTDOWN, CLOSE***
Read/write calls:	***SEND,*** ***SENDTO, RECVFROM, READ, WRITE***
Advanced calls:	GETHOSTNAME, GETPEERNAME, GETSOCKNAME, GETSOCKOPT, SETSOCKOPT,FCNTL, IOCTL, SELECT, GETHOSTBYNAME, GETHOSTBYADDRESS
IBM-specific calls:	***INITAPI,*** ***GETCLIENTID, GIVESOCKET, TAKESOCKET***

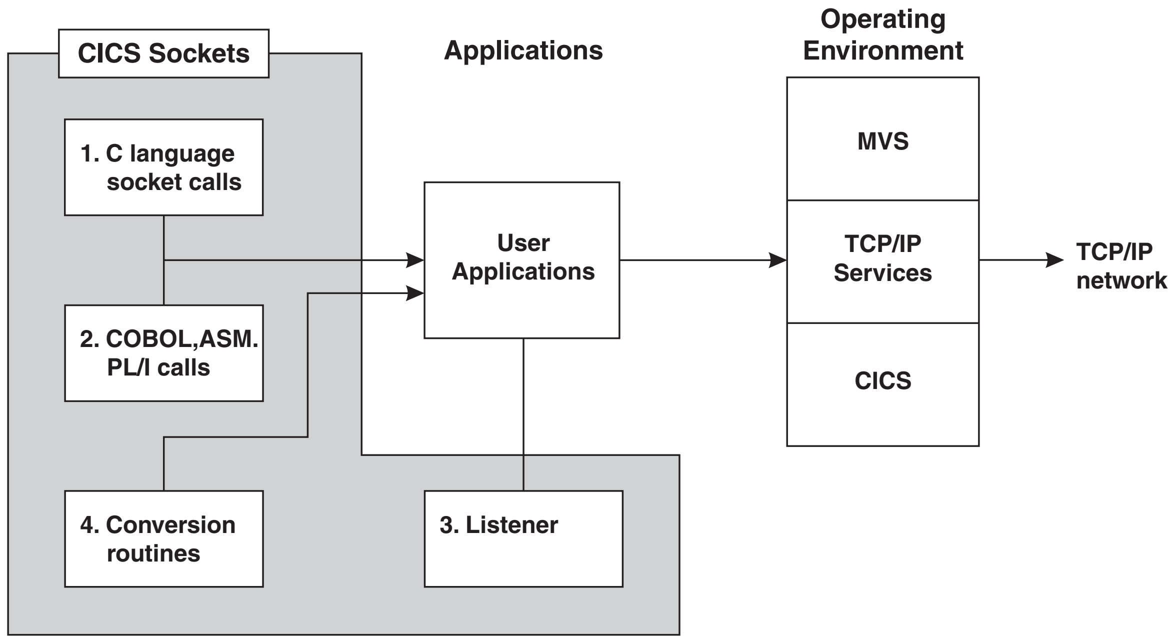


Figure 7. How User Applications Access TCP/IP Networks with CICS TCP/IP (Run-Time Environment)

CICS TCP/IP provides for both connection-oriented and connectionless (datagram) services. CICS does not support the IP (raw socket) protocol.

The Listener

CICS TCP/IP includes a concurrent server application, called the Listener, which is a CICS transaction that uses the EZACIC02 program to perform its function.

The IBM Listener, EZACIC02, allows for WLM registration and deregistration in support of connection balancing. Refer to *z/OS Communications Server: IP Configuration Reference* for information about BIND-based DNS and connection balancing.

Conversion routines

CICS TCP/IP provides the following conversion routines, which are part of the base TCP/IP Services product:

- An EBCDIC-to-ASCII conversion routine, used to convert EBCDIC data within CICS to the ASCII format used in TCP/IP networks and workstations. It is run by calling module EZACIC04.
- A corresponding ASCII-to-EBCDIC conversion routine (EZACIC05).
- A module that converts COBOL character arrays into bit-mask arrays used in TCP/IP. This module, which is run by calling EZACIC06, is used with the socket SELECT call.
- A special routine that decodes the indirectly addressed, variable-length list (*hostent* structure) returned by the GETHOSTBYADDR and GETHOSTBYNAME calls. This function is provided by calling module EZACIC08.

Chapter 2. Setting Up and Configuring CICS TCP/IP

This chapter describes the steps required to configure CICS TCP/IP.

It is assumed that both CICS and TCP/IP Services are already installed and operating on MVS.

Before you can start CICS TCP/IP, you need to do the following:

Task	See
Modify the CICS/ESA® job stream to enable CICS TCP/IP startup.	“MVS JCL — Modifying CICS Startup”
Define additional files, programs, maps, and transient data to CICS using RDO.	“CICS — Defining CICS TCP/IP Resources” on page 20
Modify TCP/IP Services data sets.	“TCP/IP Services — Modifying Data Sets” on page 42
Use the configuration macro (EZACICD), to build the TCP Configuration data set.	“Building the Configuration Data Set with EZACICD” on page 44
Use the configuration transaction (EZAC) to customize the Configuration data set.	“Customizing the Configuration Data Set” on page 52
Note: You can modify the data set while CICS is running by using EZAC. See “Configuration Transaction (EZAC)” on page 52.	

MVS JCL — Modifying CICS Startup

Figure 8 on page 20 illustrates the modifications required in the CICS startup job stream to enable CICS TCP/IP startup. The modifications are highlighted.

```
//SERVA JOB (999,POK),'JOHN DOE',CLASS=A,MSGCLASS=T,
//       NOTIFY=&SYSUID,MSGLEVEL=(1,1)
//CICS    EXEC PGM=DFHSIP,REGION=32M,TIME=1440,
//       PARM=SYSIN
//SYSIN     DD *
SIT=6$,
START=AUTO,
DCT=IP,
GRPLIST=TCPLIST,
GMTEXT='   WELCOME TO CICS/ESA V3.3.0 WITH TCP/IP SOCKETS INTERFACE',
APPLID=SCMCICSA
.END
//DFHXRCTL  DD DISP=SHR,DSN=CICS330.CNTL.CICS.DFHXRCTL
//STEPLIB   DD DISP=SHR,DSN=CICS330.SDFHAUTH
//          DD DISP=SHR,DSN=SYS1.CSSLIB
//          DD DISP=SHR,DSN=SYS1.COBOL.V1R3M2.COB2CICS
//          DD DISP=SHR,DSN=COBOL.V1R3M2.COB2LIB
//          DD DISP=SHR,DSN=TCPIP.SEZALINK   1
//DFHRPL    DD DISP=SHR,DSN=CICS330.SDFHLOAD
//          DD DISP=SHR,DSN=TCPIP.SEZATCP    2
//          DD DISP=SHR,DSN=SYS1.CSSLIB
//          DD DISP=SHR,DSN=SYS1.COBOL.V1R3M2.COB2CICS
//          DD DISP=SHR,DSN=COBOL.V1R3M2.COB2LIB
//DFHINTRA  DD DISP=SHR,DSN=CICS330.CNTL.CICS.DFHINTRA
//LOGUSR    DD SYSOUT=*,DCB=(DSORG=PS,RECFM=V,BLKSIZE=136)
//MSGUSR    DD SYSOUT=*,DCB=(DSORG=PS,RECFM=V,BLKSIZE=136)
//TCPDATA   DD SYSOUT=*,DCB=(DSORG=PS,RECFM=V,BLKSIZE=136)  3
//SYSTCPD   DD DSN=TCPIP.SEZAINST(TCPDATA),DISP=SHR  4
:
```

Figure 8. JCL for CICS Startup with the TCP/IP Socket Interface

These are the required alterations to the startup of CICS:

1. You must concatenate the data set *hlq*.SEZALINK to STEPLIB. This data set contains CICS TCP/IP module EZACIC03.

   Note: TCP/IP Services data set prefix names might have been modified during installation. When you see the prefix *hlq* in this book, substitute the prefix used in your installation.
2. You must concatenate the data set *hlq*.SEZATCP to DFHRPL. This data set contains all the other CICS TCP/IP modules.

   Note: TCP/IP Services data set prefix names might have been modified during installation. When you see the prefix *hlq* in this book, you should substitute the prefix used in your installation.
3. You can add a TCPDATA entry for the output messages from CICS TCP/IP (see “Transient Data Definition” on page 36).
4. SYSTCPD explicitly identifies which data set is to be used to obtain the parameters defined by TCPIP.DATA, which describes the stack you want to use if there are multiple TCPIP stacks running.

CICS — Defining CICS TCP/IP Resources

The following definitions must be made in CICS:

- Transactions
- Programs (see “Program Definitions” on page 24)
- BMS mapset (EZACICM, shown in Figure 24 on page 30)
- Files (see “File Definitions” on page 32)
- Transient data queues (see “Transient Data Definition” on page 36)

Note: For the enhanced listener, more temporary storage is needed to support passing a larger amount of data to the security/transaction exit and to the child server. Depending upon the size of the data defined in the listener configuration, temporary storage should be adjusted accordingly.

For information on defining transactions, programs, and files to the CICS Resource Definition Online (RDO) facility, refer to *CICS Resource Definition Guide*.

Transaction Definitions

Figures 9, 10, 11, and 12 show the CICS resource definition online (RDO) entries to define the four transactions required to support CICS TCP/IP:

EZAC Configure the socket interface

EZAO Enable the socket interface (replaces CSKE)

EZAP Internal transaction that is invoked during termination of the socket interface

CSKL Listener task

Note: This is a single listener. Each listener in the same CICS region needs a unique transaction ID.

Note: In the following definitions we have suggested priority of 255. This ensures timely transaction dispatching, and (in the case of CSKL) maximizes the connection rate of clients requesting service.

Using Storage Protection

When running with CICS 3.3.0 on a storage-protection-enabled machine, the EZAP, EZAO, and CSKL transactions must be defined with TASKDATAKEY(CICS). If this is not done, EZAO fails with an ASRA abend code indicating an incorrect attempt to overwrite the CDSA by EZACIC01. The *CICS/ESA 3.3 Release Guide* contains more information on storage protection with task-related user exits (TRUEs).

In Figure 10 on page 22, Figure 11 on page 23, and Figure 12 on page 23 note that, if the machine does not support storage protection or is not enabled for storage protection, TASKDATAKEY(CICS) is ignored and does not cause an error.

```
CEDA  DEFine
 TRansaction    : EZAC                              ALIASES
 Group          : TCPIPI                            Alias        ==>
 DEscription  ==> Configure Sockets Interface       TASKReq      ==>
 PROGram      ==> EZACIC23                          XTRanid      ==>
 TWasize      ==> 00000                             TPName       ==>
 PROFile      ==> DFHCICST                                       ==>
 PArtitionset ==>                                   XTPname      ==>
 STatus       ==> Enabled                                        ==>
 PRIMedsize     : 00000                                          ==>
 TASKDATALoc  ==> Any                              RECOVERY
 TASKDATAKey  ==> USER key                          DTimout      ==> No
REMOTE ATTRIBUTES                                   Indoubt      ==> Backout
 DYnamic      ==> No                                RESTart      ==> No
 REMOTESystem ==>                                   RESTart      ==> No
 REMOTEName   ==>                                   SPurge       ==> No
 TRProf       ==>                                   TPUrge       ==> No
 Localq       ==>                                   DUmp         ==> Yes
SCHEDULING                                          TRACe        ==> Yes
 PRIOrity     ==> 001                              SECURITY
 TClass       ==> No                                RESSec       ==> No
                                                    Cmdsec       ==> No
                                                    Extsec         : No
                                                    TRANsec        : 01
                                                    RSl            : 00
```

Figure 9. EZAC, Transaction to Configure the Socket Interface, Definition in RDO

```
CEDA  DEFine
 TRansaction    : EZAO                             ALIASES
 Group          : TCPIPI                            Alias        ==>
 DEscription  ==> Enable Sockets Interface          TASKReq      ==>
 PROGram      ==> EZACIC00                          XTRanid      ==>
 TWasize      ==> 00000                             TPName       ==>
 PROFile      ==> DFHCICST                                       ==>
 PArtitionset ==>                                   XTPname      ==>
 STatus       ==> Enabled                                        ==>
 PRIMedsize     : 00000                                          ==>
 TASKDATALoc  ==> Any                             RECOVERY
 TASKDATAKey  ==> CICS key                          DTimout      ==> No
REMOTE ATTRIBUTES                                   Indoubt      ==> Backout
 DYnamic      ==> No                                RESTart      ==> No
 REMOTESystem ==>                                   RESTart      ==> No
 REMOTEName   ==>                                   SPurge       ==> No
 TRProf       ==>                                   TPUrge       ==> No
 Localq       ==>                                   DUmp         ==> Yes
SCHEDULING                                          TRACe        ==> Yes
 PRIOrity     ==> 255                              SECURITY
 TClass       ==> No                                RESSec       ==> No
                                                    Cmdsec       ==> No
                                                    Extsec         : No
                                                    TRANsec        : 01
                                                    RSl            : 00
```

Figure 10. EZAO, Transaction to Enable the Socket Interface, Definition in RDO

```
CEDA  DEFine
 TRansaction    : EZAP                              ALIASES
 Group          : TCPIPI                             Alias        ==>
 DEscription  ==> Disable Sockets Interface         TASKReq      ==>
 PROGram      ==> EZACIC22                           XTRanid      ==>
 TWasize      ==> 00000                              TPName       ==>
 PROFile      ==> DFHCICST                                        ==>
 PArtitionset ==>                                    XTPname      ==>
 STatus       ==> Enabled                                         ==>
 PRIMedsize     : 00000                                           ==>
 TASKDATALoc  ==> Any                               RECOVERY
 TASKDATAKey  ==> CICS                               DTimout      ==> No
REMOTE ATTRIBUTES                                    Indoubt      ==> Backout
 DYnamic      ==> No                                 RESTart      ==> No
 REMOTESystem ==>                                    SPurge       ==> No
 REMOTEName   ==>                                    TPUrge       ==> No
 TRProf       ==>                                    DUmp         ==> Yes
 Localq       ==>                                    TRACe        ==> Yes
SCHEDULING                                          SECURITY
 PRIOrity     ==> 255                                RESSec       ==> No
 TClass       ==> No                                 Cmdsec       ==> No
                                                     Extsec         : No
                                                     TRANsec        : 01
                                                     RSl            : 00
```

Figure 11. EZAP, Transaction to Disable the Socket Interface

```
CEDA  DEFine
 TRansaction    : CSKL                          ALIASES
 Group          : TCPIPI                         Alias        ==>
 DEscription  ==> Listener task                  TASKReq      ==>
 PROGram      ==> EZACIC02                       XTRanid      ==>
 TWasize      ==> 00000                          TPName       ==>
 PROFile      ==> DFHCICST                                    ==>
 PArtitionset ==>                                XTPname      ==>
 STatus       ==> Enabled                                     ==>
 PRIMedsize     : 00000                                       ==>
 TASKDATALoc  ==> Any                           RECOVERY
 TASKDATAKey  ==> CICS                           DTimout      ==> No
REMOTE ATTRIBUTES                                Indoubt      ==> Backout
 DYnamic      ==> No                             RESTart      ==> No
 REMOTESystem ==>                                SPurge       ==> No
 REMOTEName   ==>                                TPUrge       ==> No
 TRProf       ==>                                DUmp         ==> Yes
 Localq       ==>                                TRACe        ==> Yes
SCHEDULING                                      SECURITY
 PRIOrity     ==> 255                            RESSec       ==> No
 TClass       ==> No                             Cmdsec       ==> No
                                                 Extsec         : No
                                                 TRANsec        : 01
                                                 RSl            : 00
```

Figure 12. CSKL, Listener Task Transaction, Definition in RDO

Notes:

1. Use of the IBM-supplied Listener is not required.
2. You may use a transaction name other than CSKL.
3. The TASKDATALoc values for EZAO and EZAP and the TASKDATALoc value for CSKL must all be the same.

Program Definitions

Three categories of program are or could be required to support CICS TCP/IP:
- Required programs, CICS definition needed
- Optional programs, CICS definition needed
- Required programs, CICS definition not needed

Required Programs, CICS Definition Needed

You need to define 10 programs and one mapset to run CICS TCP/IP, or to provide supporting functions:

EZACIC00
: The connection manager program. It provides the enabling and disabling of CICS TCP/IP through the transactions EZAO and EZAP.

EZACIC01
: The task related user exit (TRUE).

EZACIC02
: The Listener program that is used by the transaction CSKL. This transaction is started when you enable CICS TCP/IP through the EZAO transaction.

  Note: While you do not need to use the IBM-supplied Listener, you do need to provide a Listener function.

EZACIC12
: The module that performs WLM registration and deregistration functions for CICS sockets.

EZACIC20
: The initialization/termination front-end module for CICS sockets.

EZACIC21
: The initialization module for CICS sockets.

EZACIC22
: The termination module for CICS sockets.

EZACIC23
: The primary module for the configuration transaction (EZAC).

EZACIC24
: The message delivery module for transactions EZAC and EZAO.

EZACIC25
: The Domain Name Server (DNS) cache module.

EZACICME
: The US English text delivery module.

EZACICM
: Has all the maps used by the transactions that enable and disable CICS TCP/IP.

The following figures show sample RDO definitions of these programs.

Using Storage Protection: When running with CICS 3.3.0 on a storage-protection-enabled machine, all the required CICS TCP/IP programs (EZACIC00/01/02) must have EXECKEY=CICS as part of their CEDA definitions. The *CICS/ESA 3.3 Release Guide* contains more information on storage protection with TRUEs.

Figures 13, 14, and 15 show EZACIC00, EZACIC01, and EZACIC02 defined with EXECKEY(CICS). Note that, if the machine does not support storage protection or is not enabled for storage protection, EXECKEY(CICS) is ignored and does not cause an error.

```
CEDA  DEFine
 PROGram        : EZACIC00
 Group          : TCPIPI
 DEscription  ==> Primary program for transaction EZAO
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 DAtalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 13. EZACIC00, Connection Manager Program, Definition in RDO

```
CEDA  DEFine
 Program        : EZACIC01
 Group          : TCPIPI
 DEscription  ==> Task Related User Exit (TRUE)
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> Yes
 USAge        ==> Normal
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 14. EZACIC01, Task Related User Exit Program, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC02
 Group          : TCPIPI
 DEscription  ==> IBM Listener
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> Yes
 USAge        ==> Normal
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 15. EZACIC02, Listener Program, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC20
 Group          : TCPIPI
 DEscription  ==> Initialization/Termination for CICS Sockets
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 16. EZACIC20, Front-End Module for CICS Sockets, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC12
 Group          : TCPIPI
 DEscription  ==> WLM Registration/Deregistration Module
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 17. EZACIC12, WLM Registration and Deregistration Module for CICS Sockets

```
CEDA  DEFine
 PROGram        : EZACIC21
 Group          : TCPIPI
 DEscription  ==> Initialization Module for CICS Sockets
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 18. EZACIC21, Initialization Module for CICS Sockets, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC22
 Group          : TCPIPI
 DEscription  ==> Termination Module for CICS Sockets
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 19. EZACIC22, Termination Module for CICS Sockets, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC23
 Group          : TCPIPI
 DEscription  ==> Primary Module for Transaction EZAC
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> User
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 20. EZACIC23, Primary Module for Transaction EZAC, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC24
 Group          : TCPIPI
 DEscription  ==> Message Delivery Module for CICS Sockets
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 21. EZACIC24, Message Delivery Module for CICS Sockets, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACIC25
 Group          : TCPIPI
 DEscription  ==> Cache Module for the Domain Name Server
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> Yes
 USAge        ==> Normal
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 22. EZACIC25, Domain Name Server Cache Module, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACICME
 Group          : TCPIPI
 DEscription  ==> US English Text Delivery Module
 Language     ==> Assembler
 RELoad       ==> No
 RESident     ==> Yes
 USAge        ==> Normal
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 Datalocation ==> Any
 EXECKey      ==> CICS
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 23. EZACICME, US English Text Delivery Module, Definition in RDO

```
CEDA  DEFine
 Mapset         : EZACICM
 Group          : TCPIPI
 Description  ==> Mapset for CICS Sockets Interface
 REsident     ==> No
 USAge        ==> Transient
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
```

Figure 24. EZACICM, Maps Used by the EZAO Transaction, Definition in RDO

Optional Programs, CICS Definition Needed

The following two programs are optional. They are the supplied samples. They are also in *hlq*.SEZATCP:

EZACICSS
: is a sample iterative server. It establishes the connection between CICS and TCPIP, and receives client request from workstations. See "EZACICSC" on page 289.

EZACICSC
: is sample child server that works with the Listener (EZACIC02). See "EZACICSS" on page 296.

If these sample programs are used, they require RDO definitions as shown in Figures 25 and 26.

```
CEDA  DEFine
 PROGram        : EZACICSS
 Group          : TCPIPI
 DEscription  ==> Sample server
 Language     ==> Cobol
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Normal
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 DAtalocation ==> Below or above
 EXECKey      ==> USER
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 25. EZACICSS, Sample Iterative Server Program, Definition in RDO

```
CEDA  DEFine
 PROGram        : EZACICSC
 Group          : TCPIPI
 DEscription  ==> Sample started server
 Language     ==> Cobol
 RELoad       ==> No
 RESident     ==> No
 USAge        ==> Normal
 USElpacopy   ==> No
 Status       ==> Enabled
 RSl            : 00
 Cedf         ==> Yes
 DAtalocation ==> Below or above
 EXECKey      ==> USER
REMOTE ATTRIBUTES
 REMOTESystem ==>
 REMOTEName   ==>
 Transid      ==>
 EXECUtionset ==> Fullapi
```

Figure 26. EZACICSC, Sample Child Server Program, Definition in RDO

Required Programs, CICS Definition Not Needed

The following programs do not need to be defined to CICS.

EZACICAL
: The application stub that invokes the TRUE and passes on the CICS application's socket call. This program is in *hlq*.SEZATCP.

EZACIC03
: The MVS subtask that passes data between the CICS socket task and the transport interface into TCP/IP for MVS. This program is in *hlq*.SEZALINK.

EZACIC07
: | The application stub that handles the C API for non-reentrant programs. This program is in *hlq*.SEZATCP.

| **EZACIC17**
: | The application stub that handles the C API for reentrant programs. This program is in *hlq*.SEZATCP.

File Definitions

The updates to CICS TCP/IP include two files: EZACONFG, the sockets configuration file, and EZACACHE, which is required if you want to use the Domain Name Server Cache function (EZACIC25).

EZACONFG

Use the following information to define EZACONFG to RDO:

```
File            ==> EZACONFG
Group           ==> ........
DEscription     ==> CICS Sockets Configuration file

VSAM PARAMETERS
  DSNAme        ==> 1
  Password      ==>                   PASSWORD NOT SPECIFIED
  Lsrpoolid     ==>1                  1-8 | None
  DSNSharing    ==> Allreqs           Allreqs | Modifyreqs
  STRings       ==> 001               1 - 255
  Nsrgroup      ==> ........

REMOTE ATTRIBUTES  2  3
  REMOTESystem  ==>....
  REMOTEName    ==>........
  RECORDSize    ==>....               1 - 32767
  Keylength     ==>...                1 - 255

INITIAL STATUS
  STAtus        ==>Enabled            Enabled | Disabled | Unenabled
  Opentime      ==>Startup            Firstref | Startup
  DIsposition   ==>Share              Share | Old

BUFFERS
  DAtabuffers   ==>00002              2 - 32767
  Indexbuffers  ==>00001              1 - 32767

DATATABLE PARAMETERS
  Table         ==> No                No | Cics | User
  Maxnumrecs    ==>........           16 - 16777215

DATA FORMAT
  RECORDFormat  ==>V                  V | F

OPERATIONS
  Add           ==>No                 No | Yes
  BRowse        ==>Yes                No | Yes
  DELete        ==>No                 No | Yes
  REAd          ==>Yes                Yes | No
  Update        ==>No                 No | Yes

AUTO JOURNALING
  JOurnal       ==>No                 No | 1-99
  JNLRead       ==>None               None | Updatedonly | Readonly | All
  JNLSYNCRead   ==>No                 No | Yes
  JNLUpdate     ==>No                 No | Yes
  JNLAdd        ==>None               None | Before | AFter | AL1
  JNLSYNCWrite  ==>No                 Yes | No

RECOVERY PARAMETERS
  RECOVery      ==>No                 No | Backoutonly | All
  Fwdrecovlog   ==>No                 No | 1-99
  BAckuptype    ==>STAtic             STAtic | DYNamic

SECURITY
  RESsecnum     ==>00                 0-24 | Public
```

Figure 27. EZACONFG, defining to RDO

Notes:

1. Choose a DSName to fit installation standards.
2. If it is desired to have EZACONFG reside in a file owning region (FOR) and be accessed indirectly from an application owning region (AOR), the systems programmer must assure that no CICS socket modules can execute directly in

the FOR. That is, do not install any CICS TCP/IP resources other than EZACONFG in the FOR. Otherwise, EZACONFG can become disabled and will not be accessible from the AOR.

3. If it is desired to have the EZAC transaction residing in an AOR and indirectly accessing EZACONFG in the FOR, the ADD, DELETE, and UPDATE parameters in the FOR's file definition must be YES. The FOR will therefore be the only CICS region that can open EZACONFG. Thus, no sharing of EZACONFG between different CICS regions will be possible.

EZACACHE

If you want to use the Domain Name Server Cache function (EZACIC25), this definition is required.

Notes:

1. Do not attempt to share a cache file.
2. If the server intends to use WLM connection balancing, it is recommended that the client does not cache DNS names. Connection balancing relies on up-to-date information about current capacity of hosts in the sysplex. If DNS names are retrieved from a cache instead of the DNS/WLM name server, connections will be made without regard for current host capacity, degrading the effectiveness of connection balancing. Of course, not caching names can mean more IP traffic, which in some cases may outweigh the benefits of connection balancing.

   Refer to *z/OS Communications Server: IP Configuration Reference* for information on caching issues.

Use the following information to define EZACACHE to RDO:

```
File            ==> EZACACHE
Group           ==> ........
DEscription     ==> Domain Name Server Cache Configuration file

VSAM PARAMETERS
  DSNAme        ==>  1
  Password      ==>                   PASSWORD NOT SPECIFIED
  Lsrpoolid     ==>1                  1-8 | None
  DSNSharing    ==> Allreqs           Allreqs | Modifyreqs
  STRings       ==>  2                 1 - 255
  Nsrgroup      ==> ........

REMOTE ATTRIBUTES
  REMOTESystem  ==>....
  REMOTEName    ==>........
  RECORDSize    ==>....               1 - 32767
  Keylength     ==>...                1 - 255

INITIAL STATUS
  STAtus        ==>Enabled            Enabled | Disabled | Unenabled
  Opentime      ==>Startup            Firstref | Startup
  DIsposition   ==>Old                Share | Old

BUFFERS
  DAtabuffers   ==> 3                  2 - 32767
  Indexbuffers  ==> 4                  1 - 32767

DATATABLE PARAMETERS
5  Table          ==> User             No | Cics | User
  Maxnumrecs    ==> 6                  16 - 16777215

DATA FORMAT
  RECORDFormat  ==>V                  V | F

OPERATIONS
  Add           ==>Yes                No | Yes
  BRowse        ==>Yes                No | Yes
  DELete        ==>Yes                No | Yes
  REAd          ==>Yes                No | Yes
  Update        ==>Yes                No | Yes

AUTO JOURNALING
  JOurnal       ==>No                 No | 1-99
  JNLRead       ==>None               None | Updatedonly | Readonly | All
  JNLSYNCRead   ==>No                 No | Yes
  JNLUpdate     ==>No                 No | Yes
  JNLAdd        ==>None               None | Before | AFter | AL1
  JNLSYNCWrite  ==>No                 Yes | No

RECOVERY PARAMETERS
  RECOVery      ==>No                 No | Backoutonly | All
  Fwdrecovlog   ==>No                 No | 1-99
  BAckuptype    ==>STAtic             STAtic | DYNamic

SECURITY
  RESsecnum     ==>00                 0-24 | Public
```

Figure 28. EZACACHE, defining to RDO

Notes:

1. Choose a DSName to fit installation standards.
2. For strings, specify the maximum number of concurrent users.
3. Databuffers should equal strings multiplied by two.
4. Indexbuffers equals the number of records in the index set.

5. Although it is optional, we recommend specifying Table=User because it makes the process run faster. For more information on datatables, see *CICS Resource Definition Guide*.
6. Maxnumrecs equals the maximum number of destinations queried.

Transient Data Definition

Figure 29 shows the entries required in the CICS destination control table (DCT) to define the TCPM transient data queue for CICS TCP/IP. For more information on the DCT, refer to *CICS Resource Definition Guide*.

Note that, in **2** below, the destination TCPM may be changed. If so, it must match the name specified in the ERRORTD parameter of the EZAC DEFINE CICS and/or the EZACICD TYPE=CICS (refer to “Configuration Macro” on page 44).

```
DFHDCT TYPE=SDSCI,                                      X
      BLKSIZE=136,                                      X
      DSCNAME=TCPDATA,              1                   X
      RECFORM=VARUNB,                                   X
      RECSIZE=132,                                      X
      TYPEFLE=OUTPUT
                 ...
                 ...
DFHDCT TYPE=EXTRA,                                      X
      DESTID=TCPM,                  2                   X
      DSCNAME=TCPDATA
                 ...
                 ...
DFHDCT TYPE=INTRA,                                      X
      DESTID=TRAA,                                      X
      DESTFAC=FILE,                 3                   X
      TRIGLEV=1,                                        X
      TRANSID=TRAA
                 ...
                 ...
```

Figure 29. Addition to the DCT Required by CICS TCP/IP

The Listener writes to the TCPM queue while CICS TCP/IP is enabled. In addition to this, your own sockets applications can write to this queue using EXEC CICS WRITEQ TD commands. It is recommended that an extrapartition transient data queue be defined, as shown by **1** and **2** in Figure 29.

The CICS startup JCL must include a DD statement for this extrapartition transient data queue (as in Figure 8 on page 20, line **3**).

The Listener transaction can start a server using a transient data queue, as described in “Listener Input Format” on page 102. Entry **3** in Figure 29 shows an entry for an application that is started using the trigger-level mechanism of the DCT.

CICS Monitoring

The CICS Sockets Feature uses the CICS Monitoring Facility to collect data about its operation. There are two collection points: the Task Related User Exit (TRUE) and the Listener. This data is collected as Performance Class Data. The TRUE uses Event Monitoring Points (EMPs) with the identifier ’EZA01’ and the Listener uses Event Monitoring Points (EMPs) with the identifier ’EZA02’.

Event Monitoring Points for the TRUE

The TRUE monitors call activity plus use of reusable or attached tasks. The call activity is monitored by the following classes of calls:

- Initialization (INITAPI or other first call)
- Read (inbound data transfer) calls
- Write (outbound data transfer) calls
- Select calls
- All other calls

There are counters and clocks for each of these classes. In addition, there are counters for use of Reusable Tasks and use of Attached tasks.

- Counter/Clock 1 - Initialization Call
- Counter/Clock 2 - Read Call
- Counter/Clock 3 - Write Call
- Counter/Clock 4 - Select Call
- Counter/Clock 5 - Other Call
- Counter 6 - Use of a reusable task
- Counter 7 - Use of an attached task

The following Monitor Control Table (MCT) entries make use of the event-monitoring points in the performance class used by the TRUE.

```
DFHMCT TYPE=EMP,ID=(EZA01.01),CLASS=PERFORM,                          X
       PERFORM=(SCLOCK(1))
DFHMCT TYPE=EMP,ID=(EZA01.02),CLASS=PERFORM,                          X
       PERFORM=PCLOCK(1)
DFHMCT TYPE=EMP,ID=(EZA01.03),CLASS=PERFORM,                          X
       PERFORM=(SCLOCK(2))
DFHMCT TYPE=EMP,ID=(EZA01.04),CLASS=PERFORM,                          X
       PERFORM=PCLOCK(2)
DFHMCT TYPE=EMP,ID=(EZA01.05),CLASS=PERFORM,                          X
       PERFORM=(SCLOCK(3))
DFHMCT TYPE=EMP,ID=(EZA01.06),CLASS=PERFORM,                          X
       PERFORM=PCLOCK(3)
DFHMCT TYPE=EMP,ID=(EZA01.07),CLASS=PERFORM,                          X
       PERFORM=(SCLOCK(4))
DFHMCT TYPE=EMP,ID=(EZA01.08),CLASS=PERFORM,                          X
       PERFORM=PCLOCK(4)
DFHMCT TYPE=EMP,ID=(EZA01.09),CLASS=PERFORM,                          X
       PERFORM=(SCLOCK(5))
DFHMCT TYPE=EMP,ID=(EZA01.10),CLASS=PERFORM,                          X
       PERFORM=PCLOCK(5)
DFHMCT TYPE=EMP,ID=(EZA01.11),CLASS=PERFORM,                          X
       PERFORM=ADDCNT(6,1)
DFHMCT TYPE=EMP,ID=(EZA01.12),CLASS=PERFORM,                          X
       PERFORM=ADDCNT(7,1)
DFHMCT TYPE=EMP,ID=(EZA01.13),CLASS=PERFORM,                          X
       PERFORM=(MLTCNT(1,5)),                                         X
       CLOCK=(1,'INIT','READ','WRITE','SELECT','OTHER')
DFHMCT TYPE=EMP,ID=(EZA01.14),CLASS=PERFORM,                          X
       PERFORM=(MLTCNT(6,7)),                                         X
       COUNT=(6,REUSABLE,ATTACHED)
```

Figure 30. The Monitor Control Table (MCT) for TRUE

In the ID parameter, the following specifications are used:

(EZA01.01)
Start of Initialization Call

(EZA01.02)
End of Initialization Call

(EZA01.03)
Start of Read Call

(EZA01.04)
End of Read Call

(EZA01.05)
Start of Write Call

(EZA01.06)
End of Write Call

(EZA01.07)
Start of Select Call

(EZA01.08)
End of Select Call

(EZA01.09)
Start of Other Call

(EZA01.10)
End of Other Call

(EZA01.11)
First call to Interface Using Reusable Task

(EZA01.12)
First call to Interface Using Attached Task

(EZA01.13)
CICS Task Termination

(EZA01.14)
CICS Sockets Interface Termination

Event Monitoring Points for the Listener

The Listener monitors the activities associated with connection acceptance and server task startup. Since it uses the TRUE, the data collected by the TRUE can be used to evaluate Listener performance.

The listener counts the following events:

- Number of Connection Requested Accepted
- Number of Transactions Started
- Number of Transactions Rejected Due To Invalid Transaction ID
- Number of Transactions Rejected Due To Disabled Transaction
- Number of Transactions Rejected Due To Disabled Program
- Number of Transactions Rejected Due To Givesocket Failure
- Number of Transactions Rejected Due To Negative Response from Security Exit
- Number of Transactions Not Authorized to Run
- Number of Transactions Rejected Due to I/O Error
- Number of Transactions Rejected Due to No Space
- Number of Transactions Rejected Due to TD Length Error

The following Monitor Control Table (MCT) entries make use of the event-monitoring points in the performance class used by the Listener.

```
DFHMCT TYPE=EMP,ID=(EZA02.01),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(1,1)
DFHMCT TYPE=EMP,ID=(EZA02.02),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(2,1)
DFHMCT TYPE=EMP,ID=(EZA02.03),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(3,1)
DFHMCT TYPE=EMP,ID=(EZA02.04),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(4,1)
DFHMCT TYPE=EMP,ID=(EZA02.05),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(5,1)
DFHMCT TYPE=EMP,ID=(EZA02.06),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(6,1)
DFHMCT TYPE=EMP,ID=(EZA02.07),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(7,1)
DFHMCT TYPE=EMP,ID=(EZA02.08),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(8,1)
DFHMCT TYPE=EMP,ID=(EZA02.09),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(9,1)
DFHMCT TYPE=EMP,ID=(EZA02.10),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(10,1)
DFHMCT TYPE=EMP,ID=(EZA02.11),CLASS=PERFORM,                                   X
       PERFORM=ADDCNT(11,1)
DFHMCT TYPE=EMP,ID=(EZA02.12),CLASS=PERFORM,                                   X
       PERFORM=(MLTCNT(1,11)),                                                 X
       COUNT=(1,CONN,STARTED,INVALID,DISTRAN,DISPROG,GIVESOKT,SECEXIT)
```

Figure 31. The Monitor Control Table (MCT) for Listener

In the ID parameter, the following specifications are used:

(EZA02.01)
Completion of ACCEPT call

(EZA02.02)
Completion of CICS transaction initiation

(EZA02.03)
Detection of Invalid Transaction ID

(EZA02.04)
Detection of Disabled Transaction

(EZA02.05)
Detection of Disabled Program

(EZA02.06)
Detection of Givesocket Failure

(EZA02.07)
Transaction Rejection by Security Exit

(EZA02.08)
Transaction Not Authorized

(EZA02.09)
I/O Error on Transaction Start

(EZA02.10)
No Space Available for TD Start Message

(EZA02.11)
TD Length Error

(EZA02.12)
Program Termination

CICS Program List Table (PLT)

You can allow automatic startup/shutdown of the CICS Sockets Interface through updates to the PLT. This is achieved through placing the EZACIC20 module in the appropriate PLT.

To start the CICS Sockets interface automatically, make the following entry in PLTPI *after* the DFHDELIM entry:

```
DFHPLT TYPE=ENTRY,PROGRAM=EZACIC20
```

To shut down CICS Sockets interface automatically, make the following entry in the PLTSD *before* the DFHDELIM entry:

```
DFHPLT TYPE=ENTRY,PROGRAM=EZACIC20
```

System Recovery Table

The system recovery table (SRT) contains a list of codes for abends that CICS intercepts. After intercepting one, CICS attempts to remain operational by causing the offending task to abend.

You can modify the default recovery action by writing your own recovery program. You do this using the XSRAB global user exit point within the system recovery program (SRP). For programming information about the XSRAB exit, refer to the *CICS Customization Guide*.

Note: Recovery is attempted only if a user task (not a system task) is in control at the time the abend occurs.

DFHSRT Macroinstruction Types

The following macroinstructions can be coded in a system recovery table:

- DFHSRT TYPE=INITIAL establishes the control section.
- DFHSRT TYPE=SYSTEM or DFHSRT TYPE=USER specifies the abend codes that are to be handled.
- DFHSRT TYPE=FINAL concludes the SRT. For details about the TYPE=FINAL macroinstruction, refer to the *CICS Resource Definition Guide*.

Control Section: The DFHSRT TYPE=INITIAL macroinstruction generates the system recovery table control section.

```
►►──DFHSRT──TYPE=INITIAL──┬──────────────────┬──────────────────────────►◄
                          └─,──SUFFIX=──xx───┘
```

For general information about TYPE=INITIAL macroinstructions, including the use of the SUFFIX operand, refer to the *CICS Resource Definition Guide*.

Abend Codes: The DFHSRT TYPE=SYSTEM and DFHSRT TYPE=USER macroinstructions indicate the type of abend codes to be intercepted.

```
►►──DFHSRT──TYPE=──┬─SYSTEM─┬──,──ABCODE=──(codes)──┬──────────────────────────┬──────►◄
                   └─USER───┘                       │              ┌─NO──┐     │
                                                    └─,──RECOVER=──┴─YES─┴─────┘
```

SYSTEM
The abend code is an operating system abend code corresponding to an MVS S*xxx* abend code. The abend code must be three hexadecimal digits (*xxx*) representing the MVS system abend code S*xxx*.

USER
The abend code is a user (including CICS) abend code corresponding to an MVS U*nnnn* abend code. The abend code must be a decimal number (*nnnn*) representing the user part of the MVS abend code U*nnnn*. This is usually the same number as the CICS message that is issued before CICS tries to terminate abnormally (refer to *CICS Messages and Codes*).

ABCODE=(*codes*)
ABCODE includes the abend code (or codes) to be intercepted. If you specify a single abend code, parentheses are not required. To specify multiple abend codes, separate the codes with commas.

RECOVER
Specifies whether codes are to be added or removed from the SRT. Code YES to add the specified codes to the SRT. Code NO to remove the specified codes from the SRT.

CICS intercepts the following abend codes automatically and tries to recover:

```
001,002,013,020,025,026,030,032,033,034,035,
036,037,03A,03B,03D,0F3,100,113,137,213,214,
237,283,285,313,314,337,400,413,437,513,514,
613,614,637,713,714,737,813,837,913,A13,A14,
B13,B14,B37,D23,D37,E37
```

Abend code 0F3 covers various machine check conditions. It also covers the Alternate Processor Retry condition that can occur only when running on a multiprocessor. CICS-supplied recovery code attempts to recover from instruction-failure machine checks on the assumption that they are not permanent. It also attempts to recover from Alternate Processor Retry conditions.

CICS will try to recover from the standard abend codes above if you code the system recovery table simply as follows. There is no need to list the standard codes individually.

```
DFHSRT  TYPE=INITIAL
DFHSRT  TYPE=FINAL
END
```

If you want CICS to handle other errors, you can code the SRT as follows:

```
DFHSRT  TYPE=INITIAL
DFHSRT  TYPE=SYSTEM,or USER,
        ABCODE=(user or system codes),
        RECOVER=YES
DFHSRT  TYPE=FINAL
END
```

If you do not want CICS to try to recover after one or more of the above standard abend codes occurs, specify the codes with RECOVER=NO (or without the RECOVER parameter).

Note: Recovery is attempted only if a user task (not a system task) is in control at the time the abend occurs.

DFHSRT Example

Following is an example of the coding required to generate a SRT:

```
DFHSRT TYPE=INITIAL,            *
       SUFFIX=K1
DFHSRT TYPE=SYSTEM,             *
       ABCODE=777,              *
       RECOVER=YES
DFHSRT TYPE=USER,
       ABCODE=(888,999),        *
       RECOVER=YES
DFHSRT TYPE=USER,               *
       ABCODE=020
DFHSRT TYPE=FINAL
END
```

TCP/IP Services — Modifying Data Sets

To run CICS TCP/IP, you need to make entries in the *hlq*.PROFILE.TCPIP configuration data set. [6]

The hlq.PROFILE.TCPIP Data Set

You define the CICS region to TCP/IP on MVS in the *hlq*.PROFILE.TCPIP data set (described in *z/OS Communications Server: IP Configuration Reference* and *z/OS Communications Server: IP Configuration Guide*). In it, you must provide entries for the CICS region in the PORT statement, as shown in Figure 32 on page 43.

The format for the PORT statement is:

```
port_number TCP CICS_jobname
```

Write an entry for each port that you want to reserve for an application. Figure 32 on page 43 shows two entries, allocating port number 3000 for SERVA, and port number 3001 for SERVB. SERVA and SERVB are the job names of our CICS regions.

These two entries reserve port 3000 for exclusive use by SERVA and port 3001 for exclusive use by SERVB. The Listener transactions for SERVA and SERVB should be bound to ports 3000 and 3001 respectively. Other applications that want to access TCP/IP on MVS are prevented from using these ports.

Ports that are not defined in the PORT statement can be used by any application, including SERVA and SERVB if they need other ports.

6. Note that in this book, the abbreviation *hlq* stands for 'high level qualifier'. This qualifier is installation dependent.

```
;
; hlq.PROFILE.TCPIP
; ===================
;
; This is a sample configuration file for the TCPIP address space.
; For more information about this file, see "Configuring the TCPIP
; Address Space" and "Configuring the Telnet Server" in the
; Customization and Administration Manual.
       ..........
       ..........
; ----------------------------------------------------------------------
; Reserve PORTs for the following servers.
;
; NOTE:  A port that is not reserved in this list can be used by
;        any user.  If you have TCP/IP hosts in your network that
;        reserve ports in the range 1-1023 for privileged
;        applications, you should reserve them here to prevent users
;        from using them.
PORT
       ..........
       ..........
  3000 TCP SERVA            ; CICS Port for SERVA             1
  3001 TCP SERVB            ; CICS Port for SERVB
```

Figure 32. Definition of the hlq.TCP/IP Profile

Two different CICS listeners running on the same host can share a port. Refer to the discussion on port descriptions in *z/OS Communications Server: IP Configuration Reference* for more information on ports.

The hlq.TCPIP.DATA Data Set

For CICS TCP/IP, you do not have to make any extra entries in *hlq*.TCPIP.DATA. However, you need to check the TCPIPJOBNAME parameter that was entered during TCP/IP Services setup. This parameter is the name of the started procedure used to start the TCP/IP Services address space.

You will need it when you initialize CICS TCP/IP (see “Chapter 4. Starting and Stopping CICS Sockets” on page 79). In the example below, TCPIPJOBNAME is set to TCPV3. The default name is TCPIP.

```
;**********************************************************************
;                                                                     *
;  Name of Data Set:     hlq.TCPIP.DATA                               *
;                                                                     *
;  This data, TCPIP.DATA, is used to specify configuration            *
;  information required by TCP/IP client programs.                    *
;                                                                     *
;**********************************************************************
; TCPIPJOBNAME specifies the name of the started procedure which was
; used to start the TCP/IP address space.    TCPIP is the default.
;
TCPIPJOBNAME TCPV3
       ..........
       ..........
       ..........
```

Figure 33. The TCPIPJOBNAME Parameter in the hlq.TCPIP.DATA Data Set

Configuring the CICS TCP/IP Environment

The Configuration File contains information about the CICS Sockets environment. The file is organized by two types of objects—CICS instances and listeners within those instances. The creation of this data set is done in three stages:

1. Create the empty data set using VSAM IDCAMS (Access Method Services).
2. Initialize the data set using the program generated by the EZACICD macro.

The first two steps are described in “JCL for the Configuration Macro” on page 50.

3. Add to or modify the data set using the configuration transaction EZAC. This step is described in “Customizing the Configuration Data Set” on page 52.[7]

Building the Configuration Data Set with EZACICD

Configuration Macro

The configuration macro (EZACICD) is used to build the configuration data set. This data set can then be incorporated into CICS using RDO and modified using the configuration transactions (see “Configuration Transaction (EZAC)” on page 52). The macro is keyword-driven with the TYPE keyword controlling the specific function request. The data set contains one record for each instance of CICS it supports, and one record for each listener. The following is an example of the macros required to create a configuration file for one instance of the CICS/Sockets interface using one listener:

```
EZACICD TYPE=INITIAL,   Start of macro assembly input        X
      FILNAME=EZACICDF, DD name for configuration file       X
      PRGNAME=EZACICDF  Name of batch program to run
EZACICD TYPE=CICS,      CICS record definition               X
      APPLID=CICSPROD,  APPLID of CICS region                X
      TCPADDR=TCPIP,    Job/Step name for TCP/IP             X
      NTASKS=20,        Number of subtasks                   X
      DPRTY=0,          Subtask dispatch priority difference  X
      CACHMIN=15,       Minimum refresh time for cache       X
      CACHMAX=30,       Maximum refresh time for cache       X
      CACHRES=10,       Maximum number of resident resolvers  X
      ERRORTD=CSMT,     Transient data queue for error msgs   X
      SMSGSUP=NO        STARTED Messages Suppressed?
EZACICD TYPE=LISTENER,  Listener record definition           X
      FORMAT=STANDARD,  Standard listener                    X
      APPLID=CICSPROD,  Applid of CICS region                X
      TRANID=CSKL,      Transaction name for listener        X
      PORT=3010,        Port number for listener             X
      IMMED=YES,        Listener starts up at initialization? X
      BACKLOG=20,       Backlog value for listener           X
      NUMSOCK=50,       # of sockets supported by listener    X
      MINMSGL=4,        Minimum input message length         X
      ACCTIME=30,       Timeout value for Accept             X
      GIVTIME=30,       Timeout value for Givesocket         X
      REATIME=30,       Timeout value for Read               X
      TRANTRN=YES,      Is TRANUSR=YES conditional?          X
      TRANUSR=YES,      Translate user data?                 X
      SECEXIT=EZACICSE, Name of security exit program        X
      WLMGN1=WLMGRP01,  WLM group name 1                     X
      WLMGN2=WLMGRP02,  WLM group name 2                     X
      WLMGN3=WLMGRP03   WLM group name 3
EZACICD TYPE=LISTENER,  Listener record definition           X
      FORMAT=ENHANCED,  Enhanced listener                    X
      APPLID=CICSPROD,  Applid of CICS region                X
      TRANID=CSKM,      Transaction name for listener        X
      PORT=3011,        Port number for listener             X
```

7. The EZAC transaction is modeled after the CEDA transaction used by CICS Resource Definition Online (RDO).

```
      IMMED=YES,        Listener starts up at initialization? X
      BACKLOG=20,       Backlog value for listener            X
      NUMSOCK=50,       # of sockets supported by listener    X
      ACCTIME=30,       Timeout value for Accept              X
      GIVTIME=30,       Timeout value for Givesocket          X
      REATIME=30,       Timeout value for Read                X
      CSTRAN=TRN1,      Name of child server transaction      X
      CSSTTYP=KC,       Child server startup type             X
      CSDELAY=000000,   Child server delay interval           X
      MSGLEN=0,         Length of input message               X
      PEEKDAT=NO,       Peek option                           X
      MSGFORM=ASCII,    Output message format                 X
      SECEXIT=EZACICSE, Name of security exit program         X
      WLMGN1=WLMGRP04,  WLM group name 1                      X
      WLMGN2=WLMGRP05,  WLM group name 2                      X
      WLMGN3=WLMGRP06   WLM group name 3
EZACICD TYPE=FINAL      End of assembly input
```

TYPE Parameter: The TYPE parameter controls the function requests. It may have the following values:

Value **Meaning**

INITIAL
Initialize the generation environment. This value should only be used once per generation and it should be in the first invocation of the macro. For subparameters, refer to "TYPE=INITIAL".

CICS Identify a CICS object. This corresponds to a specific instance of CICS and will create a configuration record. For subparameters, refer to "TYPE=CICS".

LISTENER
Identify a Listener object. This will create a listener record. For subparameters, refer to "TYPE=LISTENER" on page 46.

FINAL Indicates the end of the generation. There are no subparameters.

TYPE=INITIAL: When TYPE=INITIAL is specified, the following parameters apply:

Value **Meaning**

PRGNAME
The name of the generated initialization program. The default value is EZACICDF.

FILNAME
The DDNAME used for the Configuration File in the execution of the initialization program. The default value is EZACICDF.

TYPE=CICS: When TYPE=CICS is specified, the following parameters apply:

Value **Meaning**

APPLID
The APPLID of the CICS address space in which this instance of CICS/Sockets is to run. This field is mandatory.

TCPADDR
The name of the TCP/IP address space.

NTASKS
The number of reusable MVS subtasks that will be allocated for this

execution. This number should approximate the highest number of concurrent CICS transactions using the TCP/Sockets interface excluding listeners. The default value is 20.

DPRTY
The difference between the dispatching priority of the subtasks and the attaching CICS task. Use this parameter to balance the CPU demand between CICS and the sockets interface subtasks. Specifying a nonzero value causes the subtasks to be dispatched at a lower priority than CICS. Use the default value of 0 unless tuning data indicates that CICS is CPU-constrained.

CACHMIN
The minimum refresh time for the Domain Name Server cache in minutes. This value depends on the stability of your network, that is, the time you would expect a domain name to have the same internet address. Higher values improve performance but increase the risk of getting an incorrect (expired) address when resolving a name. The value must be less than CACHMAX. The default value is 15.

CACHMAX
The maximum refresh time for the Domain Name Server cache in minutes. This value depends on the stability of your network, that is, the time you would expect a domain name to have the same internet address. Higher values improve performance but increase the risk of getting an incorrect (expired) address when resolving a name. The value must be greater than CACHMIN. The default value is 30.

CACHRES
The maximum number of concurrent resolvers desired. If the number of concurrent resolvers is equal to or greater than this value, refresh of cache records will not happen unless their age is greater than the CACHMAX value. The default value is 10.

ERRORTD
The name of a Transient Data destination to which error messages will be written. The default value is CSMT.

SMSGSUP
The value for SMSGSUP is either YES or NO (the default). A value of YES causes messages EZY1318E, EZY1325I, and EZY1330I to be suppressed. A value of NO allows these messages to be issued.

TYPE=LISTENER: When TYPE=LISTENER is specified the following parameters apply:

Value Meaning

APPLID
The APPLID value of the CICS object for which this listener is being defined. If this is omitted, the APPLID from the previous TYPE=CICS macro is used.

TRANID
The transaction name for this listener. The default is CSKL.

FORMAT
The default value of STANDARD indicates that this is the original CICS listener that requires the client to send the standard header. The value of ENHANCED indicates that this is the enhanced CICS listener that does not expect the standard header from the client.

PORT The port number this listener will use for accepting connections. This parameter is mandatory. The value should be between 2049 and 65535. The ports may be shared. See *z/OS Communications Server: IP Configuration Reference* for more information on port sharing.

BACKLOG
The number of unaccepted connections that can be queued to this listener. The default value is 20.

ACCTIME
The time in seconds this listener will wait for a connection request before checking for a CICS/Sockets shutdown or CICS shutdown. The default value is 60. Setting this value high will minimize CPU consumption on a lightly loaded system but will lengthen shutdown processing. Setting this value low will use more CPU but facilitate shutdown processing.

GIVTIME
The time in seconds this listener will wait for a response to a GIVESOCKET. If this time expires, the listener will assume that either the server transaction did not start or the TAKESOCKET failed. At this time, the listener will send the client a message indicating the server failed to start and close the socket (connection). If this parameter is not specified, the ACCTIME value is used.

REATIME
The time in seconds this listener will wait for a response to a READ request. If this time expires, the listener will assume that the client has failed and will terminate the connection by closing the socket. If this parameter is not specified, no checking for read timeout is done.

CSTRANID
This parameter is specific to the enhanced version of the listener and specifies the default child server transaction that the listener starts. This can be overridden by the security/transaction exit.

CSSTTYPE
This parameter is specific to the enhanced version of the listener and specifies the default start method for the child server task. This can be overridden by the security/transaction exit. Possible values are IC, KC, and TD.

IC Indicates that the child server task is started using EXEC CICS START with the value specified by CSDLYINT (or an overriding value from the security/transaction exit) as the delay interval.

KC Indicates that the child server task is started using EXEC CICS START with no delay interval.

TD Indicates that the child server task is started using the EXEC CICS WRITEQ TD command, which uses transient data to trigger the child server task.

CSDLYINT
This parameter is specific to the enhanced version of the listener and is applicable only if CSSTTYPE is IC. It specifies the delay interval to be used on the EXEC CICS START command, in the form hhmmss (hours/minutes/seconds).

MSGFORM
This parameter is specific to the enhanced version of the listener and

indicates whether an error message returned to the client should be in ASCII or EBCDIC. ASCII is the default. MSGFORM is displayed as MSGFORMat on the EZAC screens.

MSGLENTH
This parameter is specific to the enhanced version of the listener and specifies the length of the data to be received from the client. The valid range is 0 to 999. If the value is 0, the listener does not read in any data from the client.

PEEKDATA
This parameter is specific to the enhanced version of the listener and applies only if MSGLENTH is not 0. A value of NO indicates that the listener performs a normal read of the client data. The child server application accesses this data in the *data area-2* portion of the transaction input message (TIM). A value of YES indicates that the listener reads the data using the peek option; the data remains queued in TCP/IP and the child server applications actually read it in rather than accessing it through the TIM.

NUMSOCK
The number of sockets supported by this listener. One socket is the listening socket. The others are used to pass connections to the servers using the GIVESOCKET call so, in effect, one less than this number is the maximum number of concurrent GIVESOCKET requests that can be active. The default value is 50.

The number of CICS transactions must be less than what is specified on the MAXFILEPROC parameter on the BPXPRMxx parmlib member. For more detail on setting the MAXFILEPROC parameter, see *z/OS UNIX System Services Planning*.

WLMGN1
The group name this listener will use to participate in workload connection balancing. The group name is used to register the CICS listener with Workload Manager (WLM) so that a BIND-based Domain Name System (DNS) can be used to balance requests across multiple MVS hosts in a sysplex.

The group name may be from 1 to 12 characters. The name is padded to the right with blanks to meet the 18 character name required by the Workload Manager.

The default is no registration.

Refer to *z/OS Communications Server: IP Configuration Reference* for information on connection balancing and BIND-based DNS.

WLMGN2
See WLMGN1 for information.

WLMGN3
See WLMGN1 for information.

MINMSGL
This parameter is specific to the standard version of the listener. The minimum length of the Transaction Initial Message from the client to the listener. The default value is 4. The listener will continue to read on the connection until this length of data has been received. FASTRD handles blocking.

IMMED
: Specify YES or NO. YES indicates this listener is to be started when the interface starts. No indicates this Listener is to be started independently using the EZAO transaction. The default is YES.

FASTRD
: This parameter is obsolete and has been removed from the EZAC screens. If specified in the EZACICD macro, it is ignored and a warning note is generated. The listener always issues a SELECT between ACCEPT and READ.

TRANTRN
: This parameter is specific to the standard version of the listener. Specify YES or NO. YES indicates that the translation of the user data is based on the character format of the transaction code. That is, with YES specified for TRANTRN, the user data is translated if and only if TRANUSR is YES and the transaction code is not uppercase EBCDIC. With NO specified for TRANTRN, the user data is translated if and only if TRANUSR is YES. The default value for TRANTRN is YES.

Note: Regardless of how TRANTRN is specified, translation of the transaction code occurs if and only if the first character is not uppercase EBCDIC.

TRANUSR
: This parameter is specific to the standard version of the listener. Specify YES or NO. NO indicates that the user data from the Transaction Initial Message should not be translated from ASCII to EBCDIC. YES indicates that the user data may be translated depending on TRANTRN and whether the transaction code is uppercase EBCDIC. The default value for TRANUSR is YES.

Note: Previous implementations functioned as if TRANTRN and TRANUSR were both set to YES. Normally, data on the internet is ASCII and should be translated. The exceptions are data coming from an EBCDIC client or binary data in the user fields. In those cases, you should set these values accordingly. If you are operating in a mixed environment, use of multiple listeners on multiple ports is recommended.

Table 3 shows how the listener handles translation with different combinations of TRANTRN, TRANSUSR, and character format of the transaction code:

Table 3. Conditions for Translation of Tranid and User Data

TRANTRN	TRANUSR	Tranid format	Translate tranid?	Translate user data?
YES	YES	EBCDIC	NO	NO
YES	NO	EBCDIC	NO	NO
NO	YES	EBCDIC	NO	YES
NO	NO	EBCDIC	NO	NO
YES	YES	ASCII	YES	YES
YES	NO	ASCII	YES	NO
NO	YES	ASCII	YES	YES
NO	NO	ASCII	YES	NO

SECEXIT
: The name of the security exit used by this listener. The default is no security exit.

JCL for the Configuration Macro: The configuration macro is used as part of a job stream to create and initialize the configuration file. The job stream consists of IDCAMS steps to create the file, the assembly of the initialization module generated by the configuration macro, linking of the initialization module, and execution of the initialization module that initializes the file.

Figure 34 illustrates a job stream used to define a configuration file.

```
//*********************************************************//
//*   THE FOLLOWING JOB DEFINES AND THEN LOADS THE VSAM    *//
//*   FILE USED FOR CICS/TCP CONFIGURATION. THE JOBSTREAM  *//
//*   CONSISTS OF THE FOLLOWING STEPS.                     *//
//*    1). DELETE A CONFIGURATION FILE IF ONE EXISTS       *//
//*    2). DEFINE THE CONFIGURATION FILE TO VSAM           *//
//*    3). ASSEMBLE THE INITIALIZATION PROGRAM             *//
//*    4). LINK THE INITIALIZATION PROGRAM                 *//
//*    5). EXECUTE THE INITIALIZATION PROGRAM TO LOAD THE  *//
//*        FILE                                            *//
//*********************************************************//
//CONFIG    JOB  MSGLEVEL=(1,1)
//*
//* THIS STEP DELETES AN OLD COPY OF THE FILE
//* IF ONE IS THERE.
//*
//DEL    EXEC  PGM=IDCAMS
//SYSPRINT DD  SYSOUT=*
//SYSIN    DD  *
   DELETE -
      CICS.TCP.CONFIG -
      PURGE -
      ERASE
//*
//*  THIS STEP DEFINES THE NEW FILE
//*
//DEFILE EXEC  PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN    DD *
  DEFINE CLUSTER (NAME(CICS.TCP.CONFIG) VOLUMES(CICSVOL) -
      CYL(1 1) -
      IMBED -
      RECORDSIZE(150 150) FREESPACE(0 15) -
      INDEXED ) -
      DATA ( -
        NAME(CICS.TCP.CONFIG.DATA) -
        KEYS (16 0) ) -
      INDEX ( -
        NAME(CICS.TCP.CONFIG.INDEX) )
 /*
//*
```

Figure 34. Example of JCL to Define a Configuration File (Part 1 of 3)

```
//* THIS STEP ASSEMBLES THE INITIALIZATION PROGRAM
//*
//PRGDEF  EXEC PGM=ASMA90,PARM='OBJECT,TERM',REGION=1024K
//SYSLIB    DD DISP=SHR,DSNAME=SYS1.MACLIB
//            DD DISP=SHR,DSNAME=TCPIP.SEZACMAC
//SYSUT1    DD UNIT=SYSDA,SPACE=(CYL,(5,1))
//SYSUT2    DD UNIT=SYSDA,SPACE=(CYL,(2,1))
//SYSUT3    DD UNIT=SYSDA,SPACE=(CYL,(2,1))
//SYSPUNCH  DD DISP=SHR,DSNAME=NULLFILE
//SYSLIN    DD DSNAME=&&OBJSET,DISP=(MOD,PASS),UNIT=SYSDA,
//             SPACE=(400,(500,50)),
//             DCB=(RECFM=FB,BLKSIZE=400,LRECL=80)
//SYSTERM   DD SYSOUT=*
//SYSPRINT  DD SYSOUT=*
//SYSIN     DD *
         EZACICD TYPE=INITIAL,   Start of macro assembly input         X
               FILNAME=EZACICDF, DD name for configuration file        X
               PRGNAME=EZACICDF  Name of batch program to run
         EZACICD TYPE=CICS,      CICS record definition                X
               APPLID=CICSPROD,  APPLID of CICS region                 X
               TCPADDR=TCPIP,    Job/Step name for TCP/IP              X
               NTASKS=20,        Number of subtasks                    X
               DPRTY=0,          Subtask dispatch priority difference  X
               CACHMIN=15,       Minimum refresh time for cache        X
               CACHMAX=30,       Maximum refresh time for cache        X
               CACHRES=10,       Maximum number of resident resolvers  X
               ERRORTD=CSMT,     Transient data queue for error msgs   X
               SMSGSUP=NO        STARTED Messages Suppressed?
         EZACICD TYPE=LISTENER,  Listener record definition            X
               FORMAT=STANDARD,  Standard listener                     X
               APPLID=CICSPROD,  Applid of CICS region                 X
               TRANID=CSKL,      Transaction name for listener         X
               PORT=3010,        Port number for listener              X
               IMMED=YES,        Listener starts up at initialization? X
               BACKLOG=20,       Backlog value for listener            X
               NUMSOCK=50,       # of sockets supported by listener    X
               MINMSGL=4,        Minimum input message length          X
               ACCTIME=30,       Timeout value for Accept              X
               GIVTIME=30,       Timeout value for Givesocket          X
               REATIME=30,       Timeout value for Read                X
               TRANTRN=YES,      Is TRANUSR=YES conditional?           X
               TRANUSR=YES,      Translate user data?                  X
               SECEXIT=EZACICSE, Name of security exit program         X
               WLMGN1=WLMGRP01,  WLM group name 1                      X
               WLMGN2=WLMGRP02,  WLM group name 2                      X
               WLMGN3=WLMGRP03   WLM group name 3
         EZACICD TYPE=LISTENER,  Listener record definition            X
               FORMAT=ENHANCED,  Enhanced listener                     X
               APPLID=CICSPROD,  Applid of CICS region                 X
               TRANID=CSKM,      Transaction name for listener         X
               PORT=3011,        Port number for listener              X
               IMMED=YES,        Listener starts up at initialization? X
               BACKLOG=20,       Backlog value for listener            X
               NUMSOCK=50,       # of sockets supported by listener    X
```

Figure 34. Example of JCL to Define a Configuration File (Part 2 of 3)

```
                  ACCTIME=30,       Timeout value for Accept             X
                  GIVTIME=30,       Timeout value for Givesocket         X
                  REATIME=30,       Timeout value for Read               X
                  CSTRAN=TRN1,      Name of child server transaction     X
                  CSSTTYP=KC,       Child server startup type            X
                  CSDELAY=000000,   Child server delay interval          X
                  MSGLEN=0,         Length of input message              X
                  PEEKDAT=NO,       Peek option                          X
                  MSGFORM=ASCII,    Output message format                X
                  SECEXIT=EZACICSE, Name of security exit program        X
                  WLMGN1=WLMGRP04,  WLM group name 1                     X
                  WLMGN2=WLMGRP05,  WLM group name 2                     X
                  WLMGN3=WLMGRP06   WLM group name 3
            EZACICD TYPE=FINAL      End of assembly input
/*
//*
//* THIS STEP LINKS THE INITIALIZATION PROGRAM
//*
//LINK    EXEC PGM=IEWL,PARM='LIST,MAP,XREF',
//             REGION=512K,COND=(4,LT)
//SYSPRINT  DD SYSOUT=*
//SYSUT1    DD SPACE=(CYL,(5,1)),DISP=(NEW,PASS),UNIT=SYSDA
//SYSLMOD   DD DSNAME=&&LOADSET(EZACICDF),DISP=(MOD,PASS),UNIT=SYSDA,
//             SPACE=(TRK,(1,1,1)),
//             DCB=(DSORG=PO,RECFM=U,BLKSIZE=32760)
//SYSLIN    DD DSNAME=&&OBJSET,DISP=(MOD,PASS)
  NAME EZACICDF(R)
//*
//* THIS STEP EXECUTES THE INITIALIZATION PROGRAM
//*
//FILELOAD EXEC PGM=EZACICDF,COND=(4,LT)
//STEPLIB  DD  DSN=&&LOADSET,DISP=(MOD,PASS)
//EZACONFG DD  DSNAME=ADTOCICS.EZACONFG,DISP=OLD
```

Figure 34. Example of JCL to Define a Configuration File (Part 3 of 3)

Customizing the Configuration Data Set

There is a CICS object for each CICS that uses the TCP/IP Sockets Interface and is controlled by the configuration file. The CICS object is identified by the APPLID of the CICS it references.

There is a Listener object for each Listener defined for a CICS. It is possible that a CICS may have no Listener, but this is not common practice. A CICS may have multiple listeners that are either multiple instances of the supplied Listener with different specifications, multiple user-written listeners, or some combination.

Configuration Transaction (EZAC)

The EZAC transaction is a panel-driven interface that lets you add, delete, or modify the configuration file. The following table lists and describes the functions supported by the EZAC transaction.

Modifying data sets: You can use EZAC to modify a data set while CICS is running, as long as the data set has been run at least once before being loaded.

Command	*Object*	*Function*
ALTER	CICS/Listener	Modifies the attributes of an existing resource definition
CONVERT	CICS/Listener	Converts CICS/Listener from the standard listener that requires the standard header to the enhanced listener that does not require the header.
COPY	CICS/Listener	• CICS - Copies the CICS object and its associated listeners to create another CICS object. COPY will fail if the new CICS object already exists. • Listener - Copies the Listener object to create another Listener object. COPY will fail if the new Listener object already exists.
DEFINE	CICS/Listener	Creates a new resource definition
DELETE	CICS/Listener	• CICS - Deletes the CICS object and all of its associated listeners. • Listener - Deletes the Listener object.
DISPLAY	CICS/Listener	Shows the parameters specified for the CICS/Listener object.
RENAME	CICS/Listener	Performs a COPY followed by a DELETE of the original object.

If you enter EZAC, the following screen is displayed:

```
EZAC                                                              APPLID=........
 ENTER ONE OF THE FOLLOWING
ALter
CONvert
COpy
DEFine
DELete
DISplay
REName




PF              3 END                                 9 MSG              12 CNCL
```

Figure 35. EZAC Initial Screen

ALTER Function: The ALTER function is used to change CICS objects or their Listener objects. If you specify ALter on the EZAC Initial Screen or enter EZAC,AL on a blank screen, the following screen is displayed:

```
EZAC,ALTER                                                     APPLID=........
 ENTER ONE OF THE FOLLOWING

CICS         ===>                          Enter Yes|No
LIStener     ===>                          Enter Yes|No




















PF              3 END                                9 MSG            12 CNCL
```

Figure 36. EZAC,ALTER Screen

Note: You can skip this screen by entering either EZAC,ALTER,CICS or EZAC,ALTER,LISTENER.

ALTER,CICS: For alteration of a CICS object, the following screen is displayed:

```
EZAC,ALTER,CICS                                                APPLID=........
 ENTER ALL FIELDS

APPLID       ===>                          APPLID of CICS System





















PF              3 END                                9 MSG            12 CNCL
```

Figure 37. EZAC,ALTER,CICS Screen

After the APPLID is entered, the following screen is displayed.

```
EZAC,ALTER,CICS                                                APPLID=........
  OVERTYPE TO ENTER

 APPLID       ===> ........           APPLID of CICS System
 TCPAddr      ===> ........           Name of TCP/IP Address Space
 NTAsks       ===> ...                Number of Reusable Tasks
 DPRty        ===> ...                (CICS-Subtask) dispatch priority
 CACHMIN      ===> ...                Minimum Refresh Time for Cache
 CACHMAX      ===> ...                Maximum Refresh Time for Cache
 CACHRES      ===> ..                 Maximum Number of Resolvers
 ERRortd      ===> ....               TD queue for Error Messages
 SMSGSUP      ===> ..                 Suppress Task Start Msgs  Y|N

 PRESS ENTER TO CONFIRM ALter       FUNCTION











  PF              3 END                                 9 MSG           12 CNCL
```

Figure 38. EZAC,ALTER,CICS Detail Screen

The system will request a confirmation of the values displayed. After the changes are confirmed, the changed values will be in effect for the next initialization of the CICS sockets interface.

ALTER,LISTENER: For alteration of a Listener, the following screen is displayed:

```
EZAC,ALTER,LISTENER                                            APPLID=........
  ENTER ALL FIELDS

 APPLID       ===>                         APPLID of CICS System
 NAME         ===>                         Transaction Name of Listener


















 PF              3 END                                 9 MSG           12 CNCL
```

Figure 39. ALTER,LISTENER Screen

After the names are entered, one of the following two screens is displayed. The first screen is displayed for the standard version:

```
EZAC,ALTER,LISTENER (standard format)                          APPLID=........
  OVERTYPE TO ENTER




 APPLID       ===> ........            APPLID of CICS System
 TRANID       ===> ........            Transaction Name of Listener
 PORT         ===> .....               Port Number of Listener
 IMMEDIATE    ===> ...                 Immediate Startup        Yes|No
 BACKLOG      ===> ...                 Backlog Value for Listener
 NUMSOCK      ===> ..                  Number of Sockets in Listener
 MINMSGL      ===> ..                  Minimum Message Length
 ACCTIME      ===> ..                  Timeout Value for Accept
 GIVTIME      ===> ..                  Timeout Value for Givesocket
 REATIME      ===> ..                  Timeout Value for Read
 TRANTRN      ===> ...                 Translate TRNID          Yes|No
 TRANUSR      ===> ...                 Translate User Data      Yes|No
 USEREXIT     ===> ........            Name of User/Security Exit
 WLM groups   ===>           ===>           ===>

 PRESS ENTER TO CONFIRM ALter       FUNCTION


 PF             3 END                                9 MSG           12 CNCL
```

Figure 40. EZAC,ALTER,LISTENER Detail Screen - Standard Version

The following screen is displayed for the enhanced version:

```
EZAC,ALTER,LISTENER (enhanced format)                          APPLID=........
  OVERTYPE TO ENTER

 APPLID       ===> ........            APPLID of CICS System
 TRANID       ===> ........            Transaction Name of Listener
 PORT         ===> .....               Port Number of Listener
 IMMEDIATE    ===> ...                 Immediate Startup        Yes|No
 BACKLOG      ===> ...                 Backlog Value for Listener
 NUMSOCK      ===> ..                  Number of Sockets in Listener
 MSGLENTH     ===> ..                  Minimum Message Length
 ACCTIME      ===> ..                  Timeout Value for Accept
 GIVTIME      ===> ..                  Timeout Value for Givesocket
 REATIME      ===> ..                  Timeout Value for Read
 CSTRANID     ===> ..                  Transaction Name of Child Server
 CSSTTYPE     ===> ..                  Startup Method         IC|KC|TD
 CSDLYINT     ===> ..                  Delay Interval for Child Server Task
 MSGFORMAT    ===> ..                  Output Message Format  ASCII|EBCDIC
 PEEKDATA     ===> ..                  Peek Data Only Option
 SECEXIT      ===> ........            Name of User/Security Exit
 WLM groups   ===>           ===>           ===>

 PRESS ENTER TO CONFIRM ALter       FUNCTION

 PF             3 END                                9 MSG           12 CNCL
```

Figure 41. EZAC,ALTER,LISTENER Detail Screen - Enhanced Version

The system will request a confirmation of the values displayed. After the changes are confirmed, the changed values will be in effect for the next initialization of the CICS sockets interface.

CONVERT Function: The CONVERT function is used to convert between standard and enhanced versions of the listener. If you specify CONvert on the

EZAC Initial Screen or enter EZAC,CON on a blank screen, the following screen is displayed:

```
EZAC,CONVERT,LISTENER                                          APPLID=........
  ENTER ALL FIELDS

 APPLID       ===>                         APPLID of CICS System
 NAME         ===>                         Transaction Name of Listener
 FORMAT       ===> STANDARD                STANDARD or ENHANCED version of Listener?




















 PF             3 END                               9 MSG            12 CNCL
```

Figure 42. EZAC,CONVERT,LISTENER Screen

After the names and format type are entered, one of the following two screens is displayed. The first screen is displayed for the standard version:

```
EZAC,CONVERT,LISTENER (standard format)                        APPLID=........
  OVERTYPE TO ENTER




 APPLID       ===> ........           APPLID of CICS System
 TRANID       ===> ........           Transaction Name of Listener
 PORT         ===> .....              Port Number of Listener
 IMMEDIATE    ===> ...                Immediate Startup        Yes|No
 BACKLOG      ===> ...                Backlog Value for Listener
 NUMSOCK      ===> ..                 Number of Sockets in Listener
 MINMSGL      ===> ..                 Minimum Message Length
 ACCTIME      ===> ..                 Timeout Value for Accept
 GIVTIME      ===> ..                 Timeout Value for Givesocket
 REATIME      ===> ..                 Timeout Value for Read
 TRANTRN      ===> ...                Translate TRNID          Yes|No
 TRANUSR      ===> ...                Translate User Data      Yes|No
 USEREXIT     ===> ........           Name of User/Security Exit
 WLM groups   ===>             ===>             ===>

 PRESS ENTER TO CONFIRM CONvert     FUNCTION


 PF             3 END                               9 MSG            12 CNCL
```

Figure 43. EZAC,CONVERT,LISTENER Detail Screen - Standard Version

The following screen is displayed for the enhanced version:

```
EZAC,CONVERT,LISTENER (enhanced format)                       APPLID=........
  OVERTYPE TO ENTER

 APPLID       ===> ........           APPLID of CICS System
 TRANID       ===> ........           Transaction Name of Listener
 PORT         ===> .....              Port Number of Listener
 IMMEDIATE    ===> ...                Immediate Startup       Yes|No
 BACKLOG      ===> ...                Backlog Value for Listener
 NUMSOCK      ===> ..                 Number of Sockets in Listener
 MSGLENTH     ===> ..                 Minimum Message Length
 ACCTIME      ===> ..                 Timeout Value for Accept
 GIVTIME      ===> ..                 Timeout Value for Givesocket
 REATIME      ===> ..                 Timeout Value for Read
 CSTRANID     ===> ..                 Transaction Name of Child Server
 CSSTTYPE     ===> ..                 Startup Method        IC|KC|TD
 CSDLYINT     ===> ..                 Delay Interval for Child Server Task
 MSGFORMAT    ===> ..                 Output Message Format  ASCII|EBCDIC
 PEEKDATA     ===> ..                 Peek Data Only Option
 SECEXIT      ===> ........           Name of User/Security Exit
 WLM groups   ===>             ===>              ===>

 PRESS ENTER TO CONFIRM CONvert     FUNCTION

 PF            3 END                               9 MSG           12 CNCL
```

Figure 44. EZAC,CONVERT,LISTENER Detail Screen - Enhanced Version

The system will request a confirmation of the values displayed. After the changes are confirmed, the changed values will be in effect for the next initialization of the CICS sockets interface.

COPY Function: The COPY function is used to copy an object into a new object. If you specify COpy on the EZAC Initial Screen or enter EZAC,CO on a blank screen, the following screen is displayed:

```
EZAC,COPY                                                     APPLID=........
  ENTER ONE OF THE FOLLOWING

 CICS         ===>                         Enter Yes|No
 LIStener     ===>                         Enter Yes|No

 PF            3 END                               9 MSG           12 CNCL
```

Figure 45. EZAC,COPY Screen

Note: You can skip this screen by entering either EZAC,COPY,CICS or EZAC,COPY,LISTENER.

COPY,CICS: If you specify CICS on the previous screen, the following screen is displayed:

```
EZAC,COPY                                                       APPLID=........
  ENTER ALL FIELDS
 SCICS       ===> ........           APPLID of Source CICS
 TCICS       ===> ........           APPLID of Target CICS













 PF              3 END                                 9 MSG            12 CNCL
```

Figure 46. EZAC,COPY,CICS Screen

After the APPLIDs of the source CICS object and the target CICS object are entered, confirmation is requested. When confirmation is entered, the copy is performed.

COPY,LISTENER: If you specify COPY,LISTENER, the following screen is displayed:

```
EZAC,COPY                                                    APPLID=........
  ENTER ALL FIELDS
 SCICS        ===> ........           APPLID of Source CICS
 SLISTener    ===> ....               Transaction Name of Source Listener
 TCICS        ===> ........           APPLID of Target CICS
 TLISTener    ===> ....               Transaction Name of Target Listener




 PF              3 END                                    9 MSG            12 CNCL
```

Figure 47. EZAC,COPY,LISTENER Screen

After the APPLIDs of the source and target CICS objects and the names of the source and target listeners are entered, confirmation is requested. When the confirmation is entered, the copy is performed.

DEFINE Function: The DEFINE function is used to create CICS objects and their Listener objects. If you specify DEFine on the EZAC Initial Screen or enter EZAC,DEF on a blank screen, the following screen is displayed:

```
EZAC,DEFINE                                                  APPLID=........
  ENTER ONE OF THE FOLLOWING

 CICS         ===>                         Enter Yes|No
 LIStener     ===>                         Enter Yes|No




 PF              3 END                                    9 MSG            12 CNCL
```

Figure 48. EZAC,DEFINE Screen

Note: You can skip this screen by entering either EZAC,DEFINE,CICS or EZAC,DEFINE,LISTENER.

DEFINE,CICS: For definition of a CICS object, the following screen is displayed:

```
EZAC,DEFINE,CICS                                                APPLID=........
  ENTER ALL FIELDS

 APPLID       ===>                          APPLID of CICS System




















 PF              3 END                                9 MSG             12 CNCL
```

Figure 49. EZAC,DEFINE,CICS Screen

After the APPLID is entered, the following screen is displayed.

```
EZAC,DEFINE,CICS                                                APPLID=........
  OVERTYPE TO ENTER

 APPLID       ===> ........           APPLID of CICS System
 TCPAddr      ===> ........           Name of TCP/IP Address Space
 NTAsks       ===> ...                Number of Reusable Tasks
 DPRty        ===> ...                (CICS-Subtask) dispatch priority
 CACHMIN      ===> ...                Minimum Refresh Time for Cache
 CACHMAX      ===> ...                Maximum Refresh Time for Cache
 CACHRES      ===> ..                 Maximum Number of Resolvers
 ERRortd      ===> ....               TD queue for Error Messages
 SMSGSUP      ===> ..                 Suppress Task Start Msgs  Y|N

 PRESS ENTER TO CONFIRM DEFine      FUNCTION









 PF              3 END                                9 MSG             12 CNCL
```

Figure 50. EZAC,DEFINE,CICS Detail Screen

After the definition is entered, confirmation is requested. When confirmation is entered, the object is created on the configuration file.

DEFINE,LISTENER: For definition of a Listener, the following screen is displayed:

```
EZAC,DEFINE,LISTENER                                        APPLID=........
  ENTER ALL FIELDS

 APPLID      ===>                         APPLID of CICS System
 NAME        ===>                         Transaction Name of Listener
 FORMAT      ===> STANDARD                STANDARD or ENHANCED version of Listener?

















 PF             3 END                                9 MSG            12 CNCL
```

Figure 51. EZAC,DEFINE,LISTENER Screen

After the names are entered, one of the two following screens is displayed. The first screen is displayed for the standard version:

```
EZAC,DEFINE,LISTENER  (standard format)                     APPLID=........
  OVERTYPE TO ENTER




 APPLID      ===> ........           APPLID of CICS System
 TRANID      ===> ........           Transaction Name of Listener
 PORT        ===> .....              Port Number of Listener
 IMMEDIATE   ===> ...                Immediate Startup        Yes|No
 BACKLOG     ===> ...                Backlog Value for Listener
 NUMSOCK     ===> ..                 Number of Sockets in Listener
 MINMSGL     ===> ..                 Minimum Message Length
 ACCTIME     ===> ..                 Timeout Value for Accept
 GIVTIME     ===> ..                 Timeout Value for Givesocket
 REATIME     ===> ..                 Timeout Value for Read
 TRANTRN     ===> ...                Translate TRNID          Yes|No
 TRANUSR     ===> ...                Translate User Data      Yes|No
 USEREXIT    ===> ........           Name of User/Security Exit
 WLM groups  ===>             ===>              ===>

 PRESS ENTER TO CONFIRM ALter       FUNCTION

 PF             3 END                               9 MSG          12 CNCL
```

Figure 52. EZAC,DEFINE,LISTENER Detail Screen - Standard Version

The following screen is displayed for the enhanced version:

```
EZAC,DEFINE,LISTENER  (enhanced format)                         APPLID=........
  OVERTYPE TO ENTER

 APPLID      ===> ........            APPLID of CICS System
 TRANID      ===> ........            Transaction Name of Listener
 PORT        ===> .....               Port Number of Listener
 IMMEDIATE   ===> ...                 Immediate Startup       Yes|No
 BACKLOG     ===> ...                 Backlog Value for Listener
 NUMSOCK     ===> ..                  Number of Sockets in Listener
 MSGLENTH    ===> ..                  Minimum Message Length
 ACCTIME     ===> ..                  Timeout Value for Accept
 GIVTIME     ===> ..                  Timeout Value for Givesocket
 REATIME     ===> ..                  Timeout Value for Read
 CSTRANID    ===> ..                  Transaction Name of Child Server
 CSSTTYPE    ===> ..                  Startup Method        IC|KC|TD
 CSDLYINT    ===> ..                  Delay Interval for Child Server Task
 MSGFORMAT   ===> ..                  Output Message Format  ASCII|EBCDIC
 PEEKDATA    ===> ..                  Peek Data Only Option
 SECEXIT     ===> ........            Name of User/Security Exit
 WLM groups  ===>             ===>              ===>

 PRESS ENTER TO CONFIRM ALter       FUNCTION

 PF             3 END                                9 MSG            12 CNCL
```

Figure 53. EZAC,DEFINE,LISTENER Detail Screen - Enhanced Version

After the definition is entered, confirmation is requested. When confirmation is entered, the object is created on the configuration file.

| ***DELETE Function:*** The DELETE function is used to delete a CICS object or a
| Listener object. Deleting a CICS object deletes all Listener objects within that CICS
| object. If you specify DELete on the EZAC initial screen or enter EZAC,DEL on a
| blank screen, the following screen is displayed:

```
EZAC,DELETE                                                     APPLID=........
  ENTER ONE OF THE FOLLOWING

 CICS        ===> ...                 Enter Yes|No
 LISTener    ===> ...                 Enter Yes|No

 PF             3 END                                9 MSG            12 CNCL
```

Figure 54. EZAC,DELETE Screen

| *DELETE,CICS:* If you specify DELETE,CICS, the following screen is displayed:

```
EZAC,DELETE,CICS                                                APPLID=........
  ENTER ALL FIELDS

 APPLID      ===>                        APPLID of CICS System




















 PF             3 END                                 9 MSG           12 CNCL
```

Figure 55. EZAC,DELETE,CICS Screen

After the APPLID is entered, confirmation is requested. When the confirmation is entered, the CICS object is deleted.

| *DELETE,LISTENER:* If you specify DELETE,LISTENER, the following screen is
| displayed:

```
EZAC,DELETE,LISTENER                                            APPLID=........
  ENTER ALL FIELDS

 APPLID      ===>                        APPLID of CICS System
 NAME        ===>                        Transaction Name of Listener



















 PF             3 END                                 9 MSG           12 CNCL
```

Figure 56. EZAC,DELETE,LISTENER Screen

After the APPLID and listener name are entered, confirmation is requested. When confirmation is entered, the Listener object is deleted

DISPLAY Function: The DISPLAY function is used to display the specification of an object. If you specify DISplay on the initial EZAC screen or enter EZAC,DIS on a blank screen, the following screen is displayed:

```
EZAC,DISPLAY                                                     APPLID=........
  ENTER ONE OF THE FOLLOWING

 CICS         ===>                          Enter Yes|No
 LIStener     ===>                          Enter Yes|No



















 PF             3 END                                 9 MSG            12 CNCL
```

Figure 57. EZAC,DISPLAY Screen

Note: You can skip this screen by entering either EZAC,DISPLAY,CICS or EZAC,DISPLAY,LISTENER.

DISPLAY,CICS: If you specify DISPLAY,CICS, the following screen is displayed:

```
EZAC,DISPLAY                                                     APPLID=........
  ENTER ALL FIELDS

 APPLID       ===>                          APPLID of CICS System




















 PF             3 END                                 9 MSG            12 CNCL
```

Figure 58. EZAC,DISPLAY,CICS Screen

After the APPLID is entered, the following screen is displayed:

```
EZAC,DISPLAY,CICS                                                APPLID=........


 APPLID      ===> ........           APPLID of CICS System
 TCPAddr     ===> ........           Name of TCP/IP Address Space
 NTAsks      ===> ...                Number of Reusable Tasks
 DPRty       ===> ...                (CICS-Subtask) dispatch priority
 CACHMIN     ===> ...                Minimum Refresh Time for Cache
 CACHMAX     ===> ...                Maximum Refresh Time for Cache
 CACHRES     ===> ..                 Maximum Number of Resolvers
 ERRortd     ===> ....               TD queue for Error Messages











 PF             3 END                                9 MSG            12 CNCL
```

Figure 59. EZAC,DISPLAY,CICS Detail Screen

| *DISPLAY,LISTENER:* If you specify DISPLAY,LISTENER, the following screen is
| displayed:

```
EZAC,DISPLAY                                                     APPLID=........
  ENTER ALL FIELDS

 APPLID      ===>                         APPLID of CICS System
 NAME        ===>                         Transaction Name of Listener

















 PF             3 END                                9 MSG            12 CNCL
```

Figure 60. EZAC,DISPLAY,LISTENER Screen

| After the APPLID and name are entered, one of the two following screens is
| displayed. The first screen is displayed for the standard version:

```
EZAC,DISPLAY,LISTENER  (standard format)                        APPLID=........
  OVERTYPE TO ENTER




 APPLID       ===> ........            APPLID of CICS System
 TRANID       ===> ........            Transaction Name of Listener
 PORT         ===> .....               Port Number of Listener
 IMMEDIATE    ===> ...                 Immediate Startup        Yes|No
 BACKLOG      ===> ...                 Backlog Value for Listener
 NUMSOCK      ===> ..                  Number of Sockets in Listener
 MINMSGL      ===> ..                  Minimum Message Length
 ACCTIME      ===> ..                  Timeout Value for Accept
 GIVTIME      ===> ..                  Timeout Value for Givesocket
 REATIME      ===> ..                  Timeout Value for Read
 TRANTRN      ===> ...                 Translate TRNID          Yes|No
 TRANUSR      ===> ...                 Translate User Data      Yes|No
 USEREXIT     ===> ........            Name of User/Security Exit
 WLM groups   ===>              ===>              ===>

 PRESS ENTER TO CONFIRM ALter       FUNCTION

 PF             3 END                              9 MSG         12 CNCL
```

Figure 61. EZAC,DISPLAY,LISTENER Detail Screen - Standard Version

| The following screen is displayed for the enhanced version:

```
EZAC,DISPLAY,LISTENER  (enhanced format)                        APPLID=........
  OVERTYPE TO ENTER

 APPLID       ===> ........            APPLID of CICS System
 TRANID       ===> ........            Transaction Name of Listener
 PORT         ===> .....               Port Number of Listener
 IMMEDIATE    ===> ...                 Immediate Startup        Yes|No
 BACKLOG      ===> ...                 Backlog Value for Listener
 NUMSOCK      ===> ..                  Number of Sockets in Listener
 MSGLENTH     ===> ..                  Minimum Message Length
 ACCTIME      ===> ..                  Timeout Value for Accept
 GIVTIME      ===> ..                  Timeout Value for Givesocket
 REATIME      ===> ..                  Timeout Value for Read
 CSTRANID     ===> ..                  Transaction Name of Child Server
 CSSTTYPE     ===> ..                  Startup Method         IC|KC|TD
 CSDLYINT     ===> ..                  Delay Interval for Child Server Task
 MSGFORMAT    ===> ..                  Output Message Format  ASCII|EBCDIC
 PEEKDATA     ===> ..                  Peek Data Only Option
 SECEXIT      ===> ........            Name of User/Security Exit
 WLM groups   ===>              ===>              ===>

 PRESS ENTER TO CONFIRM ALter       FUNCTION

 PF             3 END                                9 MSG            12 CNCL
```

Figure 62. EZAC,DISPLAY,LISTENER Detail Screen - Enhanced Version

RENAME Function: The RENAME function is used to rename a CICS or Listener object. It consists of a COPY followed by a DELETE of the source object. For a CICS object, the object and all of its associated listeners are renamed. For a listener object, only that listener is renamed.

If you specify REName on the initial EZAC screen or enter EZAC,REN on a blank screen, the following screen is displayed:

```
EZAC,RENAME                                                    APPLID=........
  ENTER ONE OF THE FOLLOWING

 CICS         ===>                        Enter Yes|No
 LIStener     ===>                        Enter Yes|No






















 PF              3 END                              9 MSG            12 CNCL
```

Figure 63. EZAC,RENAME Screen

Note: You can skip this screen by entering either EZAC,RENAME,CICS or EZAC,RENAME,LISTENER.

RENAME,CICS: If you specify CICS on the previous screen, the following screen is displayed:

```
EZAC,RENAME                                                    APPLID=........
  ENTER ALL FIELDS

 SCICS        ===> ........           APPLID of Source CICS
 TCICS        ===> ........           APPLID of Target CICS






















 PF              3 END                              9 MSG            12 CNCL
```

Figure 64. EZAC,RENAME,CICS Screen

After the APPLIDs of the source CICS object and the target CICS object are entered, confirmation is requested. When confirmation is entered, the rename is performed.

RENAME,LISTENER: If you specify RENAME,LISTENER, the following screen is displayed:

```
EZAC,RENAME                                                    APPLID=........
  ENTER ALL FIELDS

 SCICS        ===> ........            APPLID of Source CICS
 SLISTener    ===> ....                Transaction Name of Source Listener
 TCICS        ===> ........            APPLID of Target CICS
 TLISTener    ===> ....                Transaction Name of Target Listener

 PF              3 END                                  9 MSG            12 CNCL
```

Figure 65. EZAC,RENAME,LISTENER Screen

After the APPLIDs of the source and target CICS objects and the names of the source and target listeners are entered, confirmation is requested. When the confirmation is entered, the rename is performed.

Considerations

CICS IP sockets have dependencies on the UNIX MAXFILEPROC parameter of the BPXPRMxx parmlib member. For more information on how MAXFILEPROC affects tuning applications, refer to *z/OS UNIX System Services Planning*. The z/OS configuration tool, called Managed System Infrastructure (msys), contains additional information about the impacts of the UNIX MAXFILEPROC parameter settings.

Chapter 3. Configuring the CICS Domain Name System Cache

The Domain Name System (DNS) is like a telephone book that contains a person's name, address, and telephone number. The name server maps a host name to an IP address, or an IP address to a host name. For each host, the name server can contain IP addresses, nicknames, mailing information, and available well-known services (for example, SMTP, FTP, or Telnet).

Translating host names into IP addresses is just one way of using the DNS. Other types of information related to hosts may also be stored and queried. The different possible types of information are defined through input data to the name server in the resource records.

While the CICS DNS cache function is optional, it is useful in a highly active CICS client environment. It combines the gethostbyname() call supported in CICS Sockets and a cache that saves results from the gethostbyname() for future reference. If your system gets repeated requests for the same set of domain names, using the DNS will improve performance significantly.

If the server intends to use WLM connection balancing, it is recommended that the client does not cache DNS names. Connection balancing relies on up-to-date information about current capacity of hosts in the sysplex. If DNS names are retrieved from a cache instead of the DNS/WLM name server, connections will be made without regard for current host capacity, degrading the effectiveness of connection balancing. Of course, not caching names can mean more IP traffic, which in some cases may outweigh the benefits of connection balancing.

Refer to *z/OS Communications Server: IP Configuration Reference* for information on caching issues.

Function Components

The function consists of three parts.

- A VSAM file which is used for the cache.

  Note: The CICS DATATABLE option may be used with the cache.
- A macro, EZACICR, which is used to initialize the cache file.
- A CICS application program, EZACIC25, which is invoked by the CICS application in place of the gethostbyname socket call.

VSAM Cache File

The cache file is a VSAM KSDS (Key Sequenced Data Set) with a key of the host name padded to the right with binary zeros. The cache records contain a compressed version of the hostent structure returned by the name server plus a time of last refresh field. When a record is retrieved, EZACIC25 determines if it is usable based on the difference between the current time and the time of last refresh.

EZACICR macro

The EZACICR macro builds an initialization module for the cache file, because the cache file must start with at least one record to permit updates by the EZACIC25 module. To optimize performance, you can preload dummy records for the host names which you expect to be used frequently. This results in a more compact file and minimizes the I/O required to use the cache. If you do not specify at least one dummy record, the macro will build a single record of binary zeros. See “Step 1: Create the Initialization Module” on page 73.

EZACIC25 Module

This module is a normal CICS application program which is invoked by an `EXEC CICS LINK` command. The COMMAREA passes information between the invoking CICS program and the DNS Module. If domain name resolves successfully, EZACIC25 obtains storage from CICS and builds a hostent structure in that storage. When finished with the hostent structure, release this storage using the `EXEC CICS FREEMAIN` command.

The EZACIC25 module uses four parameters plus the information passed by the invoking application to manage the cache. These parameters are as follows:

Error Destination
The Transient Data destination to which error messages are sent.

Minimum Refresh Time
The minimum time in minutes between refreshes of a cache record. If a cache record is ’younger’ than this time, it will be used. This value is set to 15 (minutes).

Maximum Refresh Time
The maximum time in minutes between refreshes of a cache record. If a cache record is ’older’ than this time, it will be refreshed. This value is set to 30 (minutes).

Maximum Resolver Requests
The maximum number of concurrent requests to the resolver. It is set at 10. See “How the DNS Cache Handles Requests”.

How the DNS Cache Handles Requests

When a request is received where cache retrieval is specified, the following takes place:

1. Attempt to retrieve this entry from the cache. If not successful, issue gethostbyname unless request specifies cache only.
2. If cache retrieval is successful, calculate the ’age’ of the record (the difference between the current time and the time this record was created or refreshed).
   - If the age is not greater than minimum cache refresh, use the cache information and build the Hostent structure for the requestor. Then return to the requestor.
   - If the age is greater than the maximum cache refresh, go issue the gethostbyname call and refresh the cache record with the results.
   - If the age is between the minimum and maximum cache refresh values, do the following:
     a. Calculate the difference between the maximum and minimum cache refresh times and divide it by the maximum number of concurrent resolver requests. The result is called the time increment.
     b. Multiply the time increment by the number of currently active resolver requests. Add this time to the minimum refresh time giving the adjusted refresh time.
     c. If the age of the record is less than the adjusted refresh time, use the cache record.

d. If the age of the record is greater than the adjusted refresh time, issue the gethostbyname call and refresh the cache record with the results.

- If the gethostbyname is issued and is successful, the cache is updated and the update time for the entry is changed to the current time.

Using the DNS Cache

There are three steps to using the DNS cache.

1. Create the initialization module, which in turn defines and initializes the file and the EZACIC25 module. See “Step 1: Create the Initialization Module”.
2. Define the cache files to CICS. See “Step 2: Define the Cache File to CICS” on page 76.
3. Use EZACIC25 to replace gethostbyname calls in CICS application modules. See “Step 3: Execute EZACIC25” on page 77.

Step 1: Create the Initialization Module

The initialization module is created using the EZACICR macro. A minimum of two invocations of the macro are coded and assembled and the assembly produces the module. An example follows:

```
EZACICR TYPE=INITIAL
EZACICR TYPE=FINAL
```

This produces an initialization module which creates one record of binary zeros. If you wish to preload the file with dummy records for frequently referenced domain names, it would look like this:

```
EZACICR TYPE=INITIAL
EZACICR TYPE=RECORD,NAME=HOSTA
EZACICR TYPE=RECORD,NAME=HOSTB
EZACICR TYPE=RECORD,NAME=HOSTC
EZACICR TYPE=FINAL
```

where HOSTA, HOSTB, AND HOSTC are the host names you want in the dummy records. The names can be specified in any order.

The specifications for the EZACICR macro are as follows:

Operand **Meaning**

TYPE There are three acceptable values:

Value	Meaning
INITIAL	Indicates the beginning of the generation input. This value should only appear once and should be the first entry in the input stream.
RECORD	Indicates a dummy record the user wants to generate. There can be from 0 to 4096 dummy records generated and each of them must have a unique name. Generating dummy records for frequently used host names will improve the performance of the cache file. A TYPE=INITIAL must precede a TYPE=RECORD statement.
FINAL	Indicates the end of the generation input. This value

should only appear once and should be the last entry in the input stream. A TYPE=INITIAL must precede a TYPE=FINAL.

AVGREC
The length of the average cache record. This value is specified on the TYPE=INITIAL macro and has a default value of 500. It is recommend that you use the default value until you have adequate statistics to determine a better value. This parameter is the same as the first subparameter in the RECORDSIZE parameter of the IDCAMS DEFINE statement. Accurate definition of this parameter along with use of dummy records will minimize control interval and control area splits in the cache file.

NAME
Specifies the host name for a dummy record. The name must be from 1 to 255 bytes long. The NAME operand is required for TYPE=RECORD entries.

The macro can be used in conjunction with IDCAMS to define and load the file. Figure 66 on page 75 shows a sample job to define and initialize a cache file:

```
//*******************************************************************//
//*   THE FOLLOWING JOB DEFINES AND THEN LOADS THE VSAM    *//
//*   FILE USED FOR THE CACHE.  THE DEFINITION CONSISTS OF *//
//*   TWO IDCAMS STEPS TO PERFORM THE VSAM DEFINITION      *//
//*   AND A STEP USING EZACICR TO BUILD THE FILE LOAD      *//
//*   PROGRAM. THE FINAL STEP EXECUTES THE FILE LOAD       *//
//*   PROGRAM TO CREATE THE FILE.                          *//
//*******************************************************************//
//CACHEDEF  JOB  MSGLEVEL=(1,1)
//*
//* THIS STEP DELETES AN OLD COPY OF THE FILE
//* IF ONE IS THERE.
//*
//DEL    EXEC  PGM=IDCAMS
//SYSPRINT DD  SYSOUT=*
//SYSIN    DD  *
   DELETE -
      CICS.USER.CACHE -
      PURGE -
      ERASE
//*
//*  THIS STEP DEFINES THE NEW FILE
//*
//DEFILE EXEC  PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN    DD *
  DEFINE CLUSTER (NAME(CICS.USER.CACHE) VOLUMES(CICVOL) -
      CYL(1 1) -
      IMBED -
      RECORDSIZE(500 1000) FREESPACE(0 15) -
      INDEXED ) -
      DATA ( -
        NAME(CICS.USER.CACHE.DATA) -
        KEYS (255 0) ) -
      INDEX ( -
        NAME(CICS.USER.CACHE.INDEX) )
/*
//*
//*  THIS STEP DEFINES THE FILE LOAD PROGRAM
//*
//PRGDEF  EXEC PGM=ASMA90,PARM='OBJECT,TERM',REGION=1024K
//SYSLIB    DD DISP=SHR,DSNAME=SYS1.MACLIB
//            DD DISP=SHR,DSNAME=TCPV34.SEZACMAC
//SYSUT1    DD UNIT=SYSDA,SPACE=(CYL,(5,1))
//SYSUT2    DD UNIT=SYSDA,SPACE=(CYL,(2,1))
//SYSUT3    DD UNIT=SYSDA,SPACE=(CYL,(2,1))
//SYSPUNCH  DD DISP=SHR,DSNAME=NULLFILE
//SYSLIN    DD DSNAME=&&OBJSET,DISP=(MOD,PASS),UNIT=SYSDA,
//             SPACE=(400,(500,50)),
//             DCB=(RECFM=FB,BLKSIZE=400,LRECL=80)
//SYSTERM   DD SYSOUT=*
//SYSPRINT  DD SYSOUT=*
```

Figure 66. Example of Defining and Initializing a DNS Cache File (Part 1 of 2)

```
//SYSIN     DD *
         EZACICR TYPE=INITIAL
         EZACICR TYPE=RECORD,NAME=RALVM12
         EZACICR TYPE=FINAL
/*
//LINK    EXEC PGM=IEWL,PARM='LIST,MAP,XREF',
//             REGION=512K,COND=(4,LT)
//SYSPRINT  DD SYSOUT=*
//SYSUT1    DD SPACE=(CYL,(5,1)),DISP=(NEW,PASS),UNIT=SYSDA
//SYSLMOD   DD DSNAME=&&LOADSET(GO),DISP=(MOD,PASS),UNIT=SYSDA,
//             SPACE=(TRK,(1,1,1)),
//             DCB=(DSORG=PO,RECFM=U,BLKSIZE=32760)
//SYSLIN    DD DSNAME=&&OBJSET,DISP=(OLD,DELETE)
//*
//*  THIS STEP EXECUTES THE FILE LOAD PROGRAM
//*
//LOAD EXEC PGM=*.LINK.SYSLMOD,COND=((4,LT,ASM),(4,LT,LINK))
//EZACICRF DD DSN=CICS.USER.CACHE,DISP=OLD
```

Figure 66. Example of Defining and Initializing a DNS Cache File (Part 2 of 2)

Once the cache file has been created, it has the following layout:

Field Name **Description**

Host Name
A 255-byte character field specifying the host name. This field is the key to the file.

Record Type
A 1-byte binary field specifying the record type. The value is X'00000001'.

Last Refresh Time
An 8-byte packed field specifying the last refresh time. It is expressed in seconds since 0000 hours on January 1, 1990 and is derived by taking the ABSTIME value obtained from an EXEC CICS ASKTIME and subtracting the value for January 1, 1990.

Offset to Alias Pointer List
A halfword binary field specifying the offset in the record to DNSALASA.

Number of INET Addresses
A halfword binary field specifying the number of INET addresses in DNSINETA.

INET Addresses
One or more fullword binary fields specifying INET addresses returned from gethostbyname().

Alias Names
An array of variable length character fields specifying the alias names returned from the name server cache. These fields are delimited by a byte of binary zeros. Each of these fields have a maximum length of 255 bytes.

Step 2: Define the Cache File to CICS

All CICS definitions required to add this function to a CICS system can be done using CICS RDO without disruption to the operation of the CICS system.

Use the following parameters with RDO FILE to define the cache file:

RDO Keyword **Value**

File	EZACACHE
Group	Name of group you are placing this function in.
DSName	Must agree with name defined in the IDCAMS step above (for example, CICS.USER.CACHE).
STRings	Maximum number of concurrent users.
Opentime	Startup
Disposition	Old
DAtabuffers	STRings value X 2
Indexbuffers	Number of records in index set.
Table	User
Maxnumrecs	Maximum number of destinations queried.
RECORDFormat	V

Use the following parameters with RDO PROGRAM to define the EZACIC25 module:

RDO Keyword	Value
PROGram	EZACIC25
Group	Name of group you are placing this function in
Language	Assembler

Step 3: Execute EZACIC25

EZACIC25 replaces the gethostbyname socket call. It is invoked by a EXEC CICS LINK COMMAREA(com-area) where com-area is defined as follows:

Field Name **Description**

Return Code
A fullword binary variable specifying the results of the function:

Value	Meaning
-1	ERRNO value returned from gethostbyname() call. Check ERRNO field.
0	Host name could not be resolved either within the cache or by use of the gethostbyname call. **Note:** In some instances, a 10214 errno will be returned from the resolve which can mean that the host name could not be resolved by use of the gethostbyname call.
1	Host name was resolved using cache.
2	Host name was resolved using gethostbyname call.

ERRNO
A fullword binary field specifying the ERRNO returned from the GETHOSTBYNAME call.

HOSTENT Address
The address of the returned HOSTENT structure.

Command
A 4-byte character field specifying the requested operation.

Value **Meaning**

GHBN gethostbyname. This is the only function supported.

Namelen
A fullword binary variable specifying the actual length of the host name for the query.

Query_Type
A 1-byte character field specifying the type of query:

Value	Meaning
0	Attempt query using cache. If unsuccessful, attempt using gethostbyname() call.
1	Attempt query using gethostbyname() call. This forces a cache refresh for this entry.
2	Attempt query using cache only.

Note: If the cache contains a matching record, the contents of that record will be returned regardless of its age.

Name
A 256-byte character variable specifying the host name for the query.

HOSTENT Structure

The returned HOSTENT structure is shown in Figure 67.

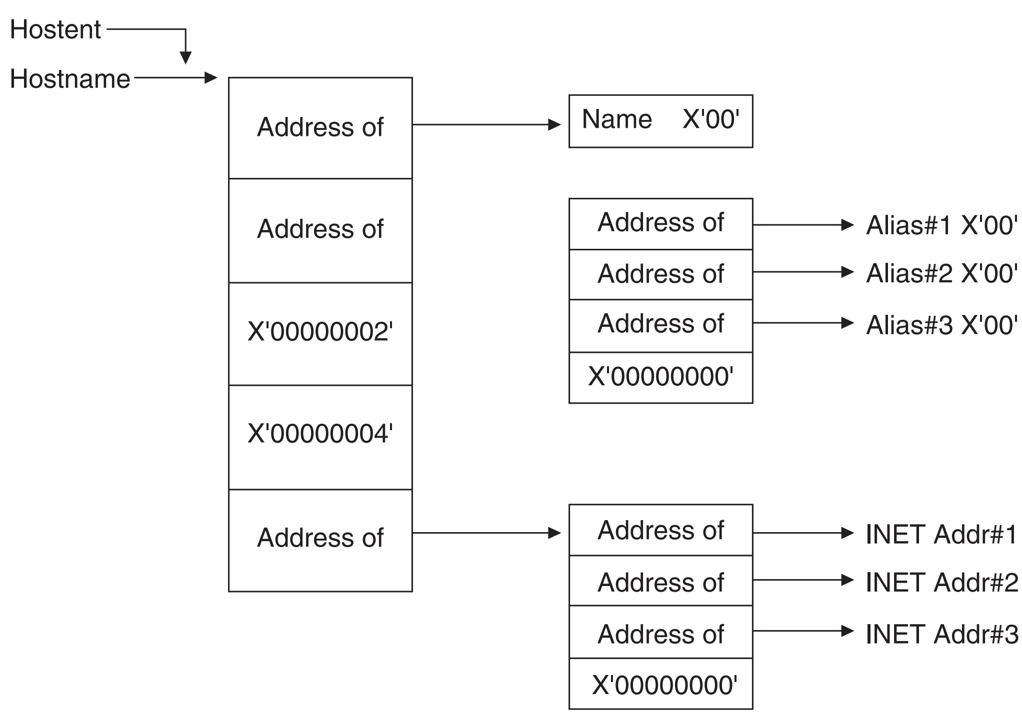


Figure 67. The DNS Hostent

Chapter 4. Starting and Stopping CICS Sockets

This chapter explains how to start and stop (enable and disable) CICS TCP/IP. It describes how:

- You can customize your system so that CICS TCP/IP starts and stops automatically. See “Starting/Stopping CICS TCP/IP Automatically”.
- An operator can also start and stop CICS TCP/IP manually after CICS has been initialized. See “Starting/Stopping CICS TCP/IP Manually”.
- You can also start and stop CICS TCP/IP from a CICS application program. See “Starting/Stopping CICS TCP/IP with Program Link” on page 85.

Starting/Stopping CICS TCP/IP Automatically

You can start and stop the CICS Sockets Interface automatically by modifying the CICS Program List Table (PLT).

- Startup (PLTPI)

  To start the CICS Sockets interface automatically, make the following entry in PLTPI *after* the DFHDELIM entry:

  ```
  DFHPLT TYPE=ENTRY,PROGRAM=EZACIC20
  ```

- Shutdown (PLTSD)

  To shut down CICS Sockets interface automatically, make the following entry in the PLTSD *before* the DFHDELIM entry:

  ```
  DFHPLT TYPE=ENTRY,PROGRAM=EZACIC20
  ```

Starting/Stopping CICS TCP/IP Manually

You can start CICS TCP/IP manually by using the EZAO transaction. This operational transaction has four functions:

Interface Startup
: Starts the interface in a CICS address space and starts all listeners that are identified for immediate start. Replaces part of the CSKE transaction.

  Note: The EZAO transaction *must* be running on the CICS where you want to start the CICS Sockets Interface. You may not start a CICS Sockets Interface from a different CICS.

Interface Shutdown
: Stops the interface in a CICS address space. Replaces part of the CSKD transaction.

Listener Startup
: Starts a Listener in a CICS address space. Replaces part of the CSKE transaction.

Listener Shutdown
: Stops a Listener in a CICS address space. Replaces part of the CSKD transaction.

| **Note:** Since the PLT method is now available, the Card Reader Line Printer
| (CRLP) method of starting the CICS Sockets Interface and Listener is no
| longer supported. If the EZAO transaction is invoked using CARDIN, it will
| fail with abend EZAO because the EZAO transaction should be invoked only
| from a VTAM® terminal. The EZAO abend is issued by the EZAO or EZAC

transaction program when an EXEC CICS SEND MAP or EXEC CICS RECEIVE MAP command fails in trying to send or receive screens to the VTAM terminal.

When you enter EZAO, the following screen is displayed.

```
EZAO
 ENTER ONE OF THE FOLLOWING
STArt
STOp




















                                                                APPLID=DBDCCICS

PF 1 HELP       3 END              6 CRSR              9 MSG              12 CNCL
```

Figure 68. EZAO Initial Screen

START Function

The START function starts either the CICS Sockets Interface or a Listener within the interface. When the interface is started, all Listeners marked for immediate start will be started as well. If you enter `STA` on the previous screen or enter `EZAO STA` on a blank screen, the following screen is displayed.

```
EZAO START
 ENTER ONE OF THE FOLLOWING

 CICS         ===> ...                Enter Yes|No
 LIStener     ===> ...                Enter Yes|No














                                                                APPLID=DBDCCICS

 PF 1 HELP      3 END            6 CRSR            9 MSG            12 CNCL
```

Figure 69. EZAO START Screen

START CICS

If you enter START CICS, the following screen is displayed.

```
EZAO START CICS


 CICS         ===> APPLID             APPLID of CICS System















 RESULT MESSAGE APPEARS HERE

                                                                APPLID=DBDCCICS

 PF 1 HELP      3 END            6 CRSR            9 MSG            12 CNCL
```

Figure 70. EZAO START CICS Response Screen

START LISTENER

If you enter START LISTENER, the following screen is displayed.

```
EZAO START LISTENER
ENTER LISTENER NAME

 CICS         ===> APPLID              APPLID of CICS System
 NAME         ===>                     Transaction Name of Listener




















                                                                APPLID=DBDCCICS

 PF              3 END                                 9 MSG            12 CNCL
```

Figure 71. EZAO START LISTENER Screen

After you enter the listener name, the listener is started. The following screen is displayed; the results appear in the message area.

```
EZAO START LISTENER


 CICS         ===> APPLID              APPLID of CICS system
 NAME         ===> XXXX                Transaction Name of Listener
















 RESULT MESSAGE APPEARS HERE

                                                                APPLID=DBDCCICS

 PF              3 END                                 9 MSG            12 CNCL
```

Figure 72. EZAO START LISTENER Result Screen

STOP Function

The STOP function is used to stop either the CICS Sockets Interface or a Listener within the interface. If the interface is stopped, all Listeners will be stopped before the interface is stopped. If you enter STO on the previous screen or enter EZAO STO on a blank screen, the following screen is displayed.

```
EZAO STOP
 ENTER ONE OF THE FOLLOWING

 CICS        ===> ...               Enter Yes|No
 LIStener    ===> ...               Enter Yes|No




                                                          APPLID=DBDCCICS

 PF 1 HELP      3 END             6 CRSR            9 MSG            12 CNCL
```

Figure 73. EZAO STOP Screen

STOP CICS

If you specify STOP CICS, the following screen is displayed.

```
EZAO STOP CICS
 SPECIFY IMMEIDATE STOP

 CICS        ===> ...               APPLID of CICS
 IMMEDIATE   ===> ...               Enter Yes|No




                                                          APPLID=DBDCCICS

 PF 1 HELP      3 END             6 CRSR            9 MSG            12 CNCL
```

Figure 74. EZAO STOP CICS Screen

Two options are available to stop CICS TCP/IP:

IMMEDIATE=NO

This should be used in most cases, because it causes the graceful termination of the interface. It has the following effects on applications using this API:

- The Listener transaction (CSKL) quiesces after a maximum wait of 3 minutes provided that no other socket applications are active or suspended.
- If there are active or suspended sockets applications, the Listener will allow them to continue processing. When all of these tasks are completed, the Listener terminates.
- This option denies access to this API for all new CICS tasks. Tasks that start after CICS TCP/IP has been stopped END with the CICS abend code AEY9.

IMMEDIATE=YES

This option is reserved for unusual situations and causes the abrupt termination of the interface. It has the following effect on applications using this API:

- It force purges the master server (Listener) CSKL.
- It denies access to the API for all CICS tasks. Tasks that have successfully called the API previously will abend with the AETA abend code on the next socket call. New tasks that have started are denied by the AEY9 abend code.

After you choose an option, the stop will be attempted. The screen redisplays; the results appear in the message line.

STOP LISTENER

If you specify STOP LISTENER, the following screen is displayed.

```
EZAO STOP
  ENTER LISTENER NAME
 CICS        ===> DBDCCICS           APPLID of this CICS
 LIStener    ===> ........           Transaction Name of Listener

















                                                                    APPLID=DBDCCICS

 PF 1 HELP      3 END            6 CRSR            9 MSG            12 CNCL
```

Figure 75. EZAO STOP LISTENER Screen

When you enter the listener named, that listener will be stopped. The screen redisplays; the results appear in the message line.

Starting/Stopping CICS TCP/IP with Program Link

You can start or stop the CICS Sockets Interface by issuing an EXEC CICS LINK to program EZACIC20. Make sure you include the following steps in the LINKing program:

1. Define the COMMAREA for EZACIC20. This can be done by including the following instruction within your DFHEISTG definition:

   ```
   EZACICA AREA=P20,TYPE=CSECT
   ```

   The length of the area is equated to P20PARML and the name of the structure is P20PARMS.
2. Initialize the COMMAREA values as follows:

   P20TYPE

   - **I** Initialization
   - **T** Immediate Termination
   - **D** Deferred Termination

   P20OBJ

   - **C** CICS Sockets Interface
   - **L** Listener

   P20LIST
   Name of listener if this is listener initialization/termination.
3. Issue the EXEC CICS LINK to program EZACIC20. EZACIC20 *will not* return until the function is complete.
4. Check the P20RET field for the response from EZACIC20.

Note: The following user abend codes may be issued by EZACIC20:

- E20L is issued if the CICS Socket Interface is not in startup or termination and no COMMAREA was provided.
- E20T is issued if CICS is not active.

Chapter 5. Writing Your Own Listener

The revised CICS Sockets Interface provides a structure which supports up to 255 listeners. These listeners may be multiple copies of the IBM-supplied listener, user-written listeners, or a combination of the two. You may choose to run without a listener as well.

For each listener (IBM-Supplied or user-written), there are certain basic requirements that enable the interface to manage the listeners correctly, particularly during initialization and termination. They are:

- Each listener instance must have a unique transaction name, even if you are running multiple copies of the same listener.
- Each listener should have an entry in the CICS sockets configuration data set. Even if you don't use automatic initiation for your listener, the lack of an entry would prevent correct termination processing and could prevent CICS from completing a normal shutdown.

For information on the IBM-supplied Listener, see "The Listener" on page 101.

Prerequisites

Some installations may require a customized, user-written listener. Writing your own listener has the following prerequisites:

1. Determine what capability is required that is not supplied by the IBM-supplied listener. Is this capability a part of the listener or a part of the server?
2. Knowledge of the CICS-Assembler environment is required.
3. Knowledge of multi-threading applications is required. A listener must be able to perform multiple functions concurrently to achieve good performance.
4. Knowledge of the CICS Sockets Interface is required.

Using IBM's Environmental Support

A user-written listener may use the environmental support supplied and used by the IBM-Supplied Listener. To employ this support, the user-written listener must do the following in addition to the requirements described above:

- The user-written listener must be written in Assembler.
- The RDO definitions for the listener transaction and program should be identical to those for the IBM-supplied listener with the exception of the transaction/program names.
- In the program, define an input area for configuration file records. If you are going to read the configuration file using MOVE mode, you can define the area by making the following entry in your DFHEISTG area:

  ```
  EZACICA AREA=CFG,TYPE=CSECT
  ```

  If you are going to read the configuration file using LOCATE mode you can define a DSECT for the area as follows:

  ```
  EZACICA AREA=CFG,TYPE=DSECT
  ```

  In either case, the length of the area is represented by the EQUATE label CFGLEN. The name of the area/DSECT is CFG0000.
- In the program, define a DSECT for mapping the Global Work Area (GWA). This is done by issuing the following macro:

```
EZACICA AREA=GWA,TYPE=DSECT
```

The name of the DSECT is GWA0000.

- In the program, define a DSECT for mapping the Task Interface Element (TIE). This is done by issuing the following macro:

  ```
  EZACICA AREA=TIE,TYPE=DSECT
  ```

  The name of the DSECT is TIE0000.
- In the program define a DSECT for mapping the Listener Control Area (LCA). This is done by issuing the following macro:

  ```
  EZACICA AREA=LCA,TYPE=DSECT
  ```

  The name of the DSECT is LCA0000.
- Obtain address of the GWA. This can be done using the following CICS command:

  ```
  EXEC  CICS EXTRACT EXIT PROGRAM(EZACIC01) GASET(ptr) GALEN(len)
  ```

  where *ptr* is a register and *len* is a halfword binary variable. The address of the GWA is returned in *ptr* and the length of the GWA is returned in *len.*
- Read the configuration file during initialization of the listener. The configuration file is identified as EZACONFG in the CICS Configuration file. The record key for the user-written listener is as follows:
  - APPLID

    An 8-byte character field set to the APPLID value for this CICS. This value can be obtained from the field GWACAPPL in the GWA or by using the following CICS command:

    ```
    EXEC  CICS ASSIGN APPLID(applid)
    ```

    where *applid* is an 8-byte character field.
  - Record Type

    A 1-byte character field set to the record type. It must have the value 'L'.
  - Reserved Field

    A 3-byte hex field set to binary zeros.
  - Transaction

    A 4-byte character field containing the transaction name for this listener. It can be obtained from the EIBTRNID field in the Execute Interface Block.

  The configuration record provides the information entered by either the configuration macro or the EZAC transaction. The user-written listener may use this information selectively, but it is highly recommended it uses the port, backlog, and number of sockets data.

  For shared files: If the user-written listener reads the configuration file, it must first issue an EXEC CICS SET command to enable and open the file. When the file operation is complete, the user-written listener must issue an EXEC CICS SET command to disable and close the file. Failure to do so will result in file errors in certain shared-file situations.
- The user-written listener should locate its Listener Control Area (LCA). The LCAs are located contiguously in storage with the first one pointed to by the GWALCAAD field in the GWA. The correct LCA has the transaction name of the listener in the field LCATRAN.

- The user-written listener should monitor either the LCASTAT field in the LCA or the GWATSTAT field in the GWA for shutdown status. If either field shows an immediate shutdown in progress, the user-written listener should terminate by issuing an EXEC CICS RETURN and allow the interface to clean up any socket connections. If either field shows a deferred termination in progress, the user-written listener should do the following:
  1. Accept any pending connections and then close the passive (listen) socket.
  2. Complete processing of any sockets involved in transaction initiation (that is, processing the GIVESOCKET command). When processing is complete, close these sockets.
  3. When all sockets are closed, issue an EXEC CICS RETURN.
- The user-written listener should avoid socket calls which imply blocks dependent on external events such as ACCEPT or READ. These calls should be preceded by a single SELECTEX call that waits on the ECB LCATECB in the LCA. This ECB is posted when an immediate termination is detected, and its posting will cause the SELECTEX to complete with a RETCODE of 0 and an ERRNO of 0. The program should check the ECB when the SELECTEX completes in this way as this is identical to the way SELECTEX completes when a timeout happens. The ECB may be checked by looking for a X'40' in the first byte (post bit).

  This SELECTEX should specify a timeout value. This provides the listener with a way to periodically check for a deferred termination request. Without this, CICS Sockets Deferred Termination or CICS Deferred Termination cannot complete.

WLM Registration and Deregistration for Sysplex Connection Optimization

If you are writing your own listener(s), an interface to EZACIC12 is available and can be used for registration and deregistration. The registration and deregistration should be done at the same times the IBM Listener does it. It is important to deregister for any termination situation since the Workload Manager will not detect the termination of a listener (it does detect CICS termination) and the Domain Name Server could continue to respond to gethostbyname () requests within the address of this listener.

The interface to EZACIC12 is through the EXEC CICS LINK. The linking program (listener) builds a COMMAREA for EZACIC12. The format of this COMMAREA is described below and, for assembler use, issuing the macro EZACICA TYPE={CSECT|DSECT},AREA=P12 will provide a storage definition or DSECT for the area.

The format of the COMMAREA for EZACIC12 is as follows:

Field Name
: **Description**

P12CONFG
: A 4-byte field containing the address of the Configuration Record for this listener.

P12RET
: A 1-byte character field containing the return code from EZACIC12.

  X'00' Registration/Deregistration was successful

  C'A' EZACIC12 Abend. This will happen if registration is not supported on your system.

C'M' MVS error. An error was returned in the registration/deregistration request.

P12TYPE
A 1-byte character field containing the request code for EZACIC12.

C'R' Registration.

C'D' Deregistration.

P12HOST
A 24-character field containing the host name for EZACIC12. It is the Domain Name of the host that the listener is executing on as obtained by the gethostname() socket call. EZACIC12 will pad it to the right with blanks to meet the WLM requirement.

Chapter 6. Application Programming Guide

This chapter describes how to write applications that use the sockets API. It describes typical sequences of calls for client, concurrent server (with associated child server processes), and iterative server programs. The contents of the chapter are:

- Four setups for writing CICS TCP/IP applications:
  - Concurrent server (the supplied Listener transaction) and child server processes run under CICS TCP/IP.
  - The same as 1 but with a user-written concurrent server.
  - An iterative server running under CICS TCP/IP.
  - A client application running under CICS TCP/IP.
- Socket addresses
- MVS address spaces
- GETCLIENTID, GIVESOCKET, and TAKESOCKET commands
- The Listener program

"Chapter 7. C Language Application Programming" on page 109 describes the C language calls that can be used with CICS.

"Chapter 8. Sockets Extended Application Programming Interface (API)" on page 141 provides reference information on the Sockets Extended API for COBOL, PL/I, and Assembler language. The Sockets Extended API is the recommended interface for new application development.

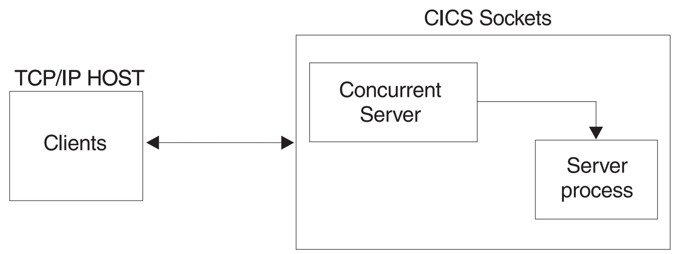
Note: "Appendix A. Original COBOL Application Programming Interface (EZACICAL)" on page 221 provides reference information on the EZACICAL API for COBOL and assembler language. This interface was made available in a prior release of TCP/IP Services and is being retained in the current release for compatibility. For the best results, however, use the Sockets Extended API whenever possible. It is described in "Chapter 8. Sockets Extended Application Programming Interface (API)" on page 141.

Writing CICS TCP/IP Applications

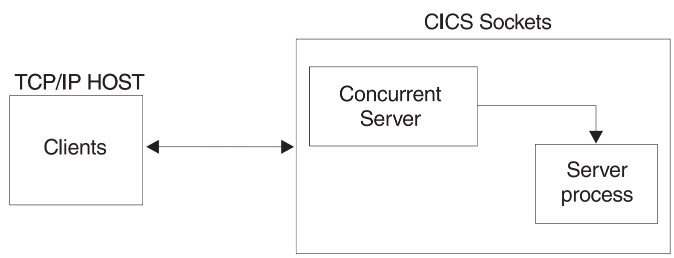
"Chapter 1. Introduction to CICS TCP/IP" on page 1 describes the basics of TCP/IP client/server systems and the two types of server: iterative and concurrent. This chapter considers in detail four TCP/IP setups in which CICS TCP/IP applications are used in various parts of the client/server system.

The setups are:

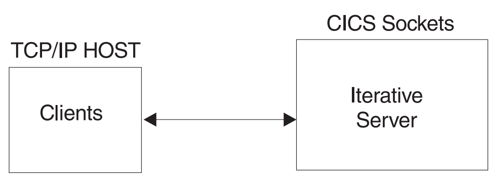
- **The Client-Listener-Child Server Application Set**. The concurrent server and child server processes run under CICS TCP/IP. The concurrent server is the supplied **Listener** transaction. The client might be running TCP/IP under one of the various UNIX operating systems such as AIX®.



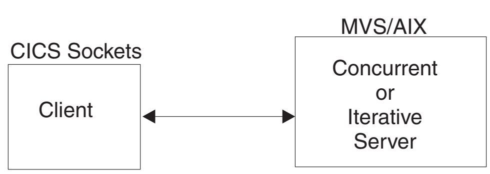
- **Writing Your Own Concurrent Server**. This is the same setup as the first except that a user-written concurrent server is being used instead of the IBM Listener.



- **The Iterative Server CICS TCP/IP Application**. This setup is designed to process one socket at a time.



- **The Client CICS TCP/IP Application**. In this setup, the CICS application is the client and the server is the remote TCP/IP process.



For details of how the CICS TCP/IP calls should be specified, see "Chapter 7. C Language Application Programming" on page 109, "Chapter 8. Sockets Extended Application Programming Interface (API)" on page 141, and "Appendix A. Original COBOL Application Programming Interface (EZACICAL)" on page 221.

1. The Client-Listener-Child-Server Application Set

Figure 76 on page 93 shows the sequence of CICS commands and socket calls involved in this setup. CICS commands are prefixed by EXEC CICS; all other numbered items in the figure are CICS TCP/IP calls.

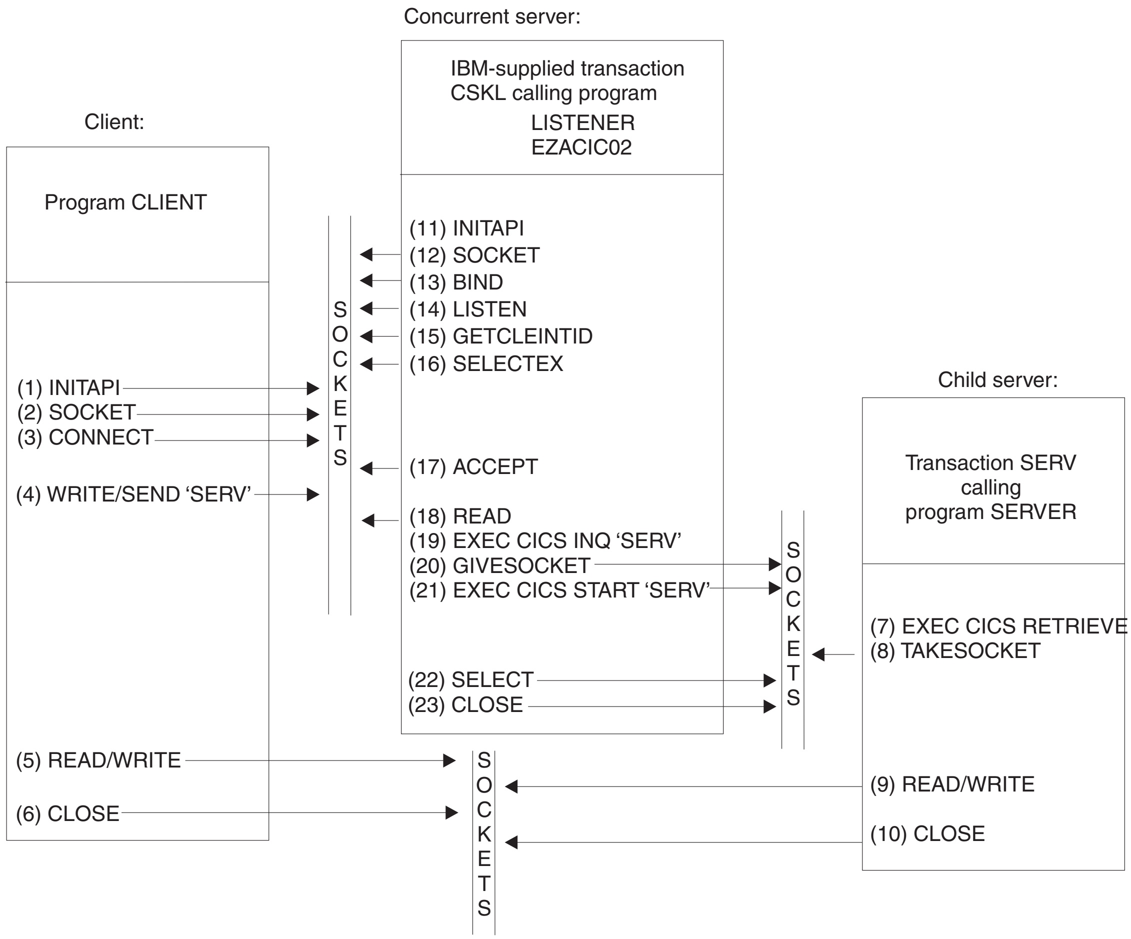


Figure 76. The Sequence of Sockets Calls

Client Call Sequence

Table 4 explains the functions of each of the calls listed in Figure 76.

Table 4. Calls for the Client Application

(1) INITAPI	Connect the CICS application to the TCP/IP interface. (This call is only used by applications written in Sockets Extended or the EZACICAL interface). Use the MAX-SOCK parameter to specify the maximum number of sockets to be used by the application.
(2) SOCKET	This obtains a socket. You define a socket with three parameters: • The domain, or addressing family • The type of socket • The protocol For CICS TCP/IP, the domain can only be the TCP/IP internet domain (2 in COBOL, `AF_INET` in C). The type can be stream sockets (1 in COBOL, `SOCK_STREAM` in C), or datagram sockets (2 in COBOL, `SOCK_DGRAM` in C). The protocol can be either TCP or UDP. Passing 0 for the protocol selects the default protocol. If successful, the SOCKET call returns a socket descriptor, s, which is always a small integer. Notice that the socket obtained is not yet attached to any local or destination address.

Table 4. Calls for the Client Application (continued)

(3) CONNECT	Client applications use this to establish a connection with a remote server. You must define the local socket s (obtained above) to be used in this connection and the address and port number of the remote socket. The system supplies the local address, so on successful return from CONNECT, the socket is completely defined, and is associated with a TCP connection (if stream) or UDP connection (if datagram).
(4) WRITE	This sends the first message to the Listener. The message contains the CICS transaction code as its first four bytes of data. You must also specify the buffer address and length of the data to be sent.
(5) READ/WRITE	These calls continue the conversation with the server until it is complete.
(6) CLOSE	This closes a specified socket and so ends the connection. The socket resources are released for other applications.

Listener Call Sequence

The Listener transaction CSKL is provided as part of CICS TCP/IP. These are the calls issued by the CICS Listener. Your client and server call sequences must be prepared to work with this sequence. These calls are documented in "2. Writing Your Own Concurrent Server", where the Listener calls in Figure 76 are explained.

Child Server Call Sequence

Table 5 explains the functions of each of the calls listed in Figure 76 on page 93.

Table 5. Calls for the Server Application

(7) EXEC CICS RETRIEVE	This retrieves the data passed by the EXEC CICS START command in the concurrent server program. This data includes the socket descriptor and the concurrent server client ID as well as optional additional data from the client.
(8) TAKESOCKET	This acquires the newly created socket from the concurrent server. The TAKESOCKET parameters must specify the socket descriptor to be acquired and the client ID of the concurrent server. This information was obtained by the EXEC CICS RETRIEVE command. **Note:** If TAKESOCKET is the first call, it issues an implicit INITAPI with default values.
(9) READ/WRITE	The conversation with the client continues until complete.
(10) CLOSE	Terminates the connection and releases the socket resources when finished.

2. Writing Your Own Concurrent Server

The overall setup is the same as the first scenario, but your concurrent server application performs many of the functions performed by the Listener. Obviously, the client and child server applications have the same functions.

Concurrent Server Call Sequence

Table 6 explains the functions of each of the steps listed in Figure 76 on page 93.

Table 6. Calls for the Concurrent Server Application

(11) INITAPI	Connects the application to TCP/IP, as in Table 4.
(12) SOCKET	This obtains a socket, as in Table 4.

Table 6. Calls for the Concurrent Server Application (continued)

(13) BIND	Once a socket has been obtained, a concurrent server uses this call to attach itself to a specific port at a specific address so that the clients can connect to it. The socket descriptor and a local address and port number are passed as arguments. On successful return of the BIND call, the socket is *bound* to a port at the local address, but not (yet) to any remote address.
(14) LISTEN	After binding an address to a socket, a concurrent server uses the LISTEN call to indicate its readiness to accept connections from clients. LISTEN tells TCP/IP that all incoming connection requests should be held in a queue until the concurrent server can deal with them. The BACKLOG parameter in this call sets the maximum queue size.
(15) GETCLIENTID	This command returns the identifiers (MVS address space name and subtask name) by which the concurrent server is known by TCP/IP. This information will be needed by the EXEC CICS START call.
(16) SELECTEX	The SELECT call monitors activity on a set of sockets. In this case, it is used to interrogate the queue (created by the LISTEN call) for connections. It will return when an incoming CONNECT call is received or when LCATECB was posted because immediate termination was detected, or else will time out after an interval specified by one of the SELECT parameters.
(17) ACCEPT	The concurrent server uses this call to accept the first incoming connection request in the queue. ACCEPT obtains a new socket descriptor with the same properties as the original. The original socket remains available to accept more connection requests. The new socket is associated with the client that initiated the connection.
(18) READ	A READ is not issued if the FORMAT parameter is ENHANCED and MSGLENTH is 0. If FORMAT is ENHANCED, MSGLENTH is not 0, and PEEKDATA is YES, the listener peeks the number of bytes specified by MSGLENTH. If FORMAT is STANDARD, the listener processes the client data as in earlier releases.
(19) CICS INQ	This checks that the SERV transaction is defined to CICS (else the TRANSIDERR exceptional condition is raised), and, if so, that its status is ENABLED. If either check fails, the Listener does not attempt to start the SERV transaction.
(20) GIVESOCKET	This makes the socket obtained by the ACCEPT call available to a child server program.
(21) CICS START	This initiates the CICS transaction for the child server application and passes the ID of the concurrent server, obtained with GETCLIENTID, to the server. For example, in “Listener Output Format” on page 103, the parameters `LSTN-NAME` and `LSTN-SUBNAME` define the Listener.
(22) SELECT [8]	Again, the SELECT call is used to monitor TCP/IP activity. This time, SELECT returns when the child server issues a TAKESOCKET call.
(23) CLOSE	This releases the new socket to avoid conflicts with the child server.

Passing Sockets

In CICS, a socket belongs to a CICS task. Therefore, sockets can be passed between programs within the same task by passing the descriptor number.

8. This SELECT is the same as the SELECT call in Step 16. They are shown as two calls to clarify the functions being performed.

However, passing a socket between CICS tasks does require a GIVESOCKET/TAKESOCKET sequence of calls.

3. The Iterative Server CICS TCP/IP Application

Figure 77 shows the sequence of socket calls involved in a simple client-iterative server setup.

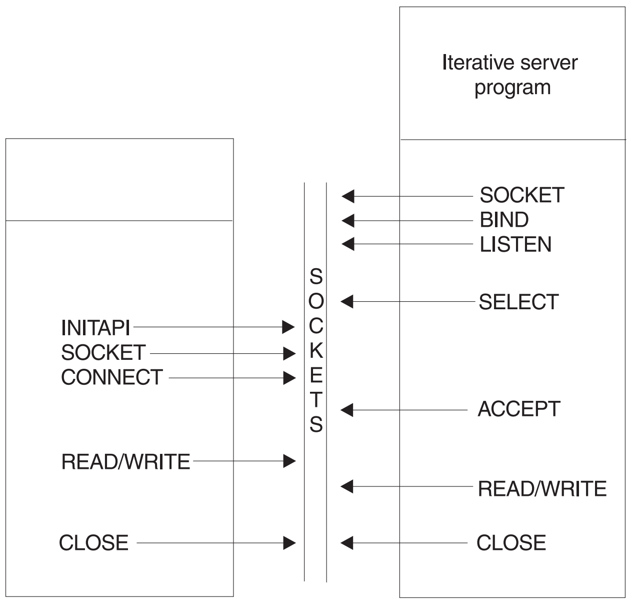


Figure 77. Sequence of Socket Calls with an Iterative Server

The setup with an iterative server is much simpler than the previous cases with concurrent servers.

Iterative Server Use of Sockets

The iterative server need only obtain 2 socket descriptors. The iterative server makes the following calls:

1. As with the concurrent servers, SOCKET, BIND, and LISTEN calls are made to inform TCP/IP that the server is ready for incoming requests, and is listening on socket 0.
2. The SELECT call then returns when a connection request is received. This prompts the issuing of an ACCEPT call.
3. The ACCEPT call obtains a new socket (1). Socket 1 is used to handle the transaction. Once this completed, socket 1 closes.
4. Control returns to the SELECT call, which then waits for the next connection request.

The disadvantage of an iterative server is that it remains blocked for the duration of a transaction, as described in “Chapter 1. Introduction to CICS TCP/IP” on page 1.

4. The Client CICS TCP/IP Application

Figure 78 on page 97 shows the sequence of calls in a CICS client-remote server setup. The calls are similar to the previous examples.

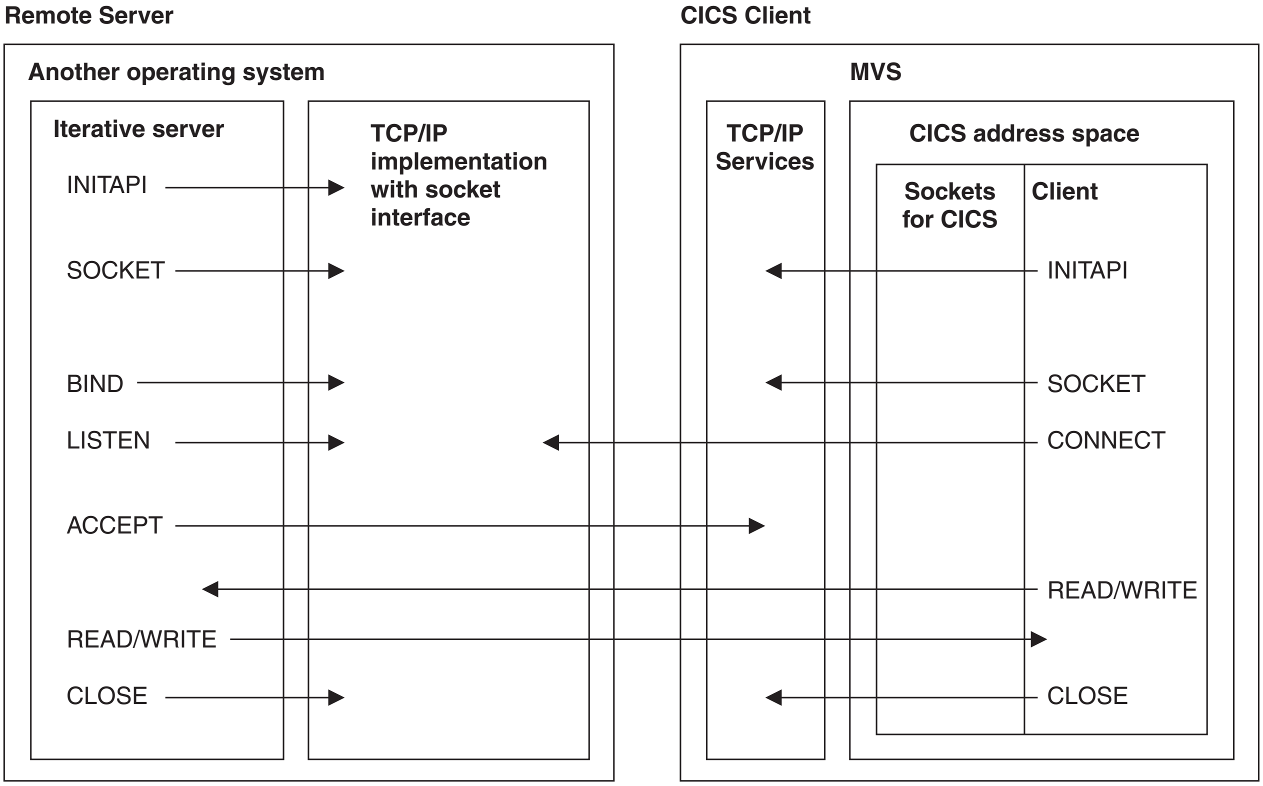


Figure 78. Sequence of Socket Calls between a CICS Client and a Remote Iterative Server

Figure 78 shows that the server can be on any processor and can run under any operating system, provided that the combined software-hardware configuration supports a TCP/IP server.

For simplicity, the figure shows an iterative server. A concurrent server would need a child server in the remote processor and an adjustment to the calls according to the model in Figure 76 on page 93.

A CICS server issues a READ call to read the client's first message, which contains the CICS transaction name of the required child server. When the server is in a non-CICS system, application design must specify how the first message from the CICS client indicates the service required (in Figure 78, the first message is sent by a WRITE call).

If the server is a concurrent server, this indication is typically the name of the child server. If the server is iterative, as in Figure 78, and all client calls require the same service, this indication might not be necessary.

Socket Addresses

Socket addresses are defined by specifying the address family and the address of the socket in the internet. In CICS TCP/IP, the address is specified by the IP address and port number of the socket.

Address Family (Domain)

CICS TCP/IP supports only one TCP/IP addressing family (or domain, as it is called in the UNIX system). This is the internet domain, denoted by AF_INET in C. Many of the socket calls require you to define the domain as one of their parameters.

A socket address is defined by the IP address of the socket and the port number allocated to the socket.

IP Addresses

IP addresses are allocated to each TCP/IP Services address on a TCP/IP internet. Each address is a unique 32-bit quantity defining the host's network and the particular host. A host can have more than one IP address if it is connected to more than one network (a so-called multihomed host).

Ports

A host can maintain several TCP/IP connections at once. One or more applications using TCP/IP on the same host are identified by a port number. The port number is an additional qualifier used by the system software to get data to the correct application. Port numbers are 16-bit integers; some numbers are reserved for particular applications and are called well-known ports (for example, 23 is for TELNET).

Address Structures

A socket address in an IP addressing family comprises four fields: the address family, an IP address, a port, and a character array (zeros), set as follows:

- The family field is set to AF_INET in C, or to 2 in other languages.
- The port field is the port used by the application, in network byte order (which is explained on page 99).
- The address field is the IP address of the network interface used by the application. It is also in network byte order.
- The character array field should always be set to all zeros.

For COBOL and Assembler Language Programs

The address structure of an internet socket address should be defined as follows:

Parameter	Assembler	COBOL
NAME STRUCTURE:		
FAMILY	H	PIC 9(4) BINARY
PORT	H	PIC 9(4) BINARY
ADDRESS	F	PIC 9(8) BINARY
ZEROS	XL8	PIC X(8)

For C Programs

The structure of an internet socket address is defined by the *sockaddr_in* structure, which is found in the IN.H header file. The format of this structure is shown in Table 11 on page 112.

MVS Address Spaces

Figure 79 on page 99 shows the relationship between TCP/IP and CICS in terms of MVS address spaces.

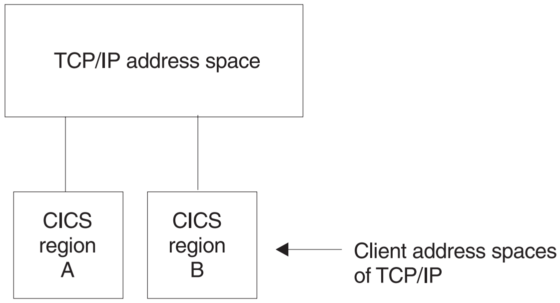


Figure 79. MVS Address Spaces

Within each CICS region, server and client processes will be allocated subtask numbers. TCP/IP treats each CICS region together with its application programs as a *client application*. Because of this, the address space and subtask of each CICS TCP/IP application is called its *CLIENTID*. This applies to CICS TCP/IP servers as well as to clients.

A single task can support up to 2000 sockets. However, the maximum number of sockets that the TCP/IP address space is capable of supporting is determined by the value of MAXSOCKETS. Therefore, using multiple tasks, a single CICS region can support a number of sockets up to the setting of MAXSOCKETS, which has a maximum possible value of 16 777 215.

MAXFILEPROC limits the number of sockets per process. Since CICS is considered a process, MAXFILEPROC can limit the number of files allocated for the CICS region. Ensure that MAXFILEPROC is set to accommodate the total number of sockets used by all tasks running in the region.

The structure of `CLIENTID` is shown in Table 7. With CICS TCP/IP, the domain is always AF_INET, so the name (that is, address space) and subtask are the items of interest.

Table 7. CLIENTID Structures

C structure	COBOL structure

`struct clientid {`
`    int       domain;`
`    char      name[8];`
`    char      subtaskname[8];`
`    char      reserved[20];`
`};`
	`CLIENTID STRUCTURE:`
	`     Domain    PIC 9(8) BINARY`
	`     Name      PIC X(8)`
	`     Task      PIC X(8)`
	`     Reserved  PIC X(20)`

Network Byte Order

Ports and addresses are specified using the TCP/IP network byte ordering convention, which is known as *big endian*.

In a big endian system, the most significant byte comes first. By contrast, in a *little endian* system, the least significant byte comes first. MVS uses the big endian convention; because this is the same as the network convention, CICS TCP/IP applications do not need to use any conversion routines, such as `htonl`, `htons`, `ntohl`, and `ntohs`.

Note: The socket interface does not handle differences in data byte ordering within application data. Sockets application writers must handle these differences themselves.

GETCLIENTID, GIVESOCKET, and TAKESOCKET

The socket calls GETCLIENTID, GIVESOCKET, and TAKESOCKET are unique to IBM's implementation of the socket interface. In CICS TCP/IP, they are used with the EXEC CICS START and EXEC CICS RETRIEVE commands to make a socket available to a new process. This is shown in Figure 80.

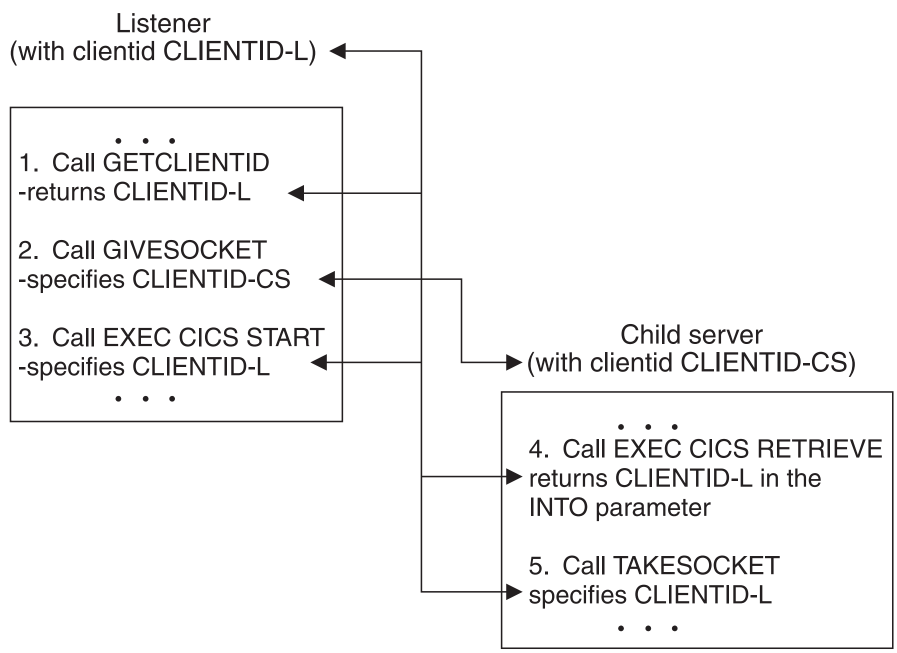


Figure 80. Transfer of CLIENTID Information

Figure 80 shows the calls used to make a Listener socket available to a child server process. It shows the following steps:

1. The Listener calls GETCLIENTID. This returns the Listener's own `CLIENTID` (`CLIENTID-L`), which comprises the MVS address space name and subtask identifier of the Listener. The Listener transaction needs access to its own `CLIENTID` for step 3.
2. The Listener calls GIVESOCKET, specifying a socket descriptor and the `CLIENTID` of the child server.

   If the Listener and child server processes are in the same CICS region (and so in the same address space), the MVS address space identifier in `CLIENTID` can be set to blanks. This means that the Listener's address space is also the child's address space.

   If the Listener and child server processes are in different CICS regions, enter the new address space and subtask.

   In the `CLIENTID` structure, the supplied listener sets the address space name and subtask identifier to blanks. This makes the socket available to a TAKESOCKET command from any task in the same MVS image, but only the child server receives the socket descriptor number, so the exposure is minimal. For total integrity, the child server's subtask identifier should be entered.

3. The Listener performs an EXEC CICS START. In the `FROM` parameter, the `CLIENTID-L`, obtained by the previous GETCLIENTID, is specified. The Listener is telling the new child server where it will get its socket from in step 5.
4. The child server performs an EXEC CICS RETRIEVE. In the `INTO` parameter, `CLIENTID-L` is retrieved.
5. The child server calls TAKESOCKET, specifying `CLIENTID-L` as the process from which it wants to take a socket.

The Listener

In a CICS system based on SNA terminals, the CICS terminal management modules perform the functions of a concurrent server. Because the TCP/IP interface does not use CICS terminal management, CICS TCP/IP provides these functions in the form of a CICS application transaction, the Listener. The CICS transaction ID of the Listener is CSKL.

The Listener performs the following functions:

1. It issues appropriate TCP/IP calls to “listen” on the port specified in the Configuration file and waits for incoming connection requests issued by clients. The port number must be reserved in the *hlq*.TCPIP.PROFILE.
2. It registers and deregisters with WLM for load balancing in a sysplex environment.
   - WLM registration is performed immediately after the listener socket is activated. It is performed by invoking EZACIC12, which checks the Configuration File record for the presense of WLM Group Names and performs registration for those groups specified.
   - WLM deregistration is performed for any of the following conditions:
     – Request of a Listener Quiesce, by either an EZAO STOP or a CEMT PERFORM SHUTDOWN command. In this case, deregistration is done when the listening socket is closed.
     – Request for an Immediate Shutdown using an EZAO STOP. In this case, deregistration is done when the listener detects the request.
     – Abnormal termination of the listener:
       - Fatal error related to the listening socket.
       - Abend of the subtask.
       - CICS immediate termination.
       - CICS Abend.

       In these cases, deregistration is done when the listener detects the error.
3. When an incoming connection request arrives, the Listener accepts it and obtains a new socket to pass to the CICS child server application program.
4. It starts the CICS child server transaction based on information in the first message on the new connection. The format of this information is given in “Listener Input Format” on page 102.
5. It waits for the child server transaction to take the new socket and then issues the close call. When this occurs, the receiving application assumes ownership of the socket and the Listener has no more interest in it.

The Listener program is written so that some of this activity goes on in parallel. For example, while the program is waiting for a new server to accept a new socket, it listens for more incoming connections. The program can be in the process of starting 49 child servers simultaneously. The starting process begins when the Listener accepts the connection and ends when the Listener closes the socket it has given to the child server.

Listener Input Format

The Listener requires the following input format from the client in its first transmission. The client should then wait for a response before sending any subsequent transmissions. Input can be in uppercase or lowercase. The commas are required.

```
►►──tran──,──┬────────────────┬──,──┬────┬──,──┬────────┬──────────────────►◄
             └─client-in-data─┘     ├─IC─┤     └─hhmmss─┘
                                    ├─ic─┤
                                    ├─TD─┤
                                    └─td─┘
```

tran
The CICS transaction ID (in uppercase) that the Listener is going to start. This field can be one to four characters.

client-in-data
Optional. Application data, used by the optional security exit [9] or the server transaction. The maximum length of this field is a 40-byte character (35 bytes, plus one byte filler and 4 bytes for startup type).

IC/TD
Optional. Startup type that can be either `IC` for CICS interval control or `TD` for CICS transient data. These can also be entered in lowercase (`ic` or `td`). If this field is left blank, startup is immediate.

hhmmss
Optional. Hours, minutes, and seconds for interval time if the transaction is started using interval control. All six digits must be given.

Note: TD ignores the timefield.

Examples

The following are examples of client input and the Listener processing that results from them. The data fields referenced can be found in “Listener Output Format” on page 103. Note that parameters are separated by commas.

Example	Listener Response
`TRN1,userdataishere`	It starts the CICS transaction TRN1 using task control, and passes to it the data `userdataishere` in the field CLIENT-IN-DATA.
`TRN2,,IC,000003`	It starts the CICS transaction TRN2 using interval control, without user data. There is a 3-second delay between the initiation request from the Listener and the transaction startup in CICS.

9. See “Writing Your Own Security/Transaction Link Module for the Listener” on page 105

Example	Listener Response
TRN3,userdataishere,TD	It writes a message to the transient data queue named TRN3 in the format described by the structure TCPSOCKET-PARM, described in "Listener Output Format". The data contained in userdataishere is passed to the field CLIENT-IN-DATA. This queue must be an intrapartition queue with trigger-level set to 1. It causes the initiation of transaction TRN3 if it is not already active. This transaction should be written to read the transient data queue and process requests until the queue is empty. This mechanism is provided for those server transactions that are used very frequently and for which the overhead of initiating a separate CICS transaction for each server request could be a performance concern.
TRN3,,TD	It causes data to be placed on transient data queue TRN3, which in turn causes the start or continued processing of the CICS transaction TRN3, as described in the TRN3 previous example. There is no user data passed.
TRN4	It starts the CICS transaction TRN4 using task control. There is no user data passed to the new transaction.

Listener Output Format

There are two different formats for the listener output, one for child server tasks started through a standard listener and one for child server tasks started through the enhanced listener.

Table 8 shows the format of the Listener output data area passed to the child server through a standard listener.

Table 8. Listener Output Format - Standard Listener

Description	Format	Value
Socket descriptor	Fullword binary	The socket descriptor to be used by the child server in the TAKESOCKET command
MVS address space identifier	8-byte character	Name of the Listener's address space
TCP/IP task identifier	8-byte character	Listener's task identifier
Data area	40-byte character (35 bytes, plus one byte filler and 4 bytes for startup type)	Client-in-data from Listener input received from the client
Socket address structure	Sockaddr-in structure containing the next 4 fields	Client's sockaddr-in structure
TCP/IP addressing family	Halfword binary	Must be 2 (AF_INET)
Port descriptor	Halfword binary	The client's port number
32-bit IP address	Fullword binary	IP address of the client's host
Reserved	Doubleword	Reserved for IBM use

For a standard listener, the following COBOL definition is used:

```
01  TCPSOCKET-PARM.
    05  GIVE-TAKE-SOCKET    PIC 9(8) COMP.
    05  LSTN-NAME           PIC X(8).
    05  LSTN-SUBNAME        PIC X(8).
    05  CLIENT-IN-DATA      PIC X(35).
    05  FILLER              PIC X(1).
    05  SOCKADDR-IN-PARM.
        15 SIN-FAMILY       PIC 9(4) COMP.
        15 SIN-PORT         PIC 9(4) COMP.
        15 SIN-ADDRESS      PIC 9(8) COMP.
        15 SIN-ZERO         PIC X(8).
```

Table 9 shows the format of the Listener output data area passed to the child server through the enhanced listener.

Note: With the enhanced listener, no client-in-data is extracted from the initial client data. The child server program must either read the initial client data itself (if PEEKDATA is YES) or obtain it from data area-2 (if PEEKDATA is NO). If a listener is converted from a standard listener to an enhanced listener, its corresponding child server applications must be changed to handle the larger transaction initial message (TIM) by specifying a large enough length on the EXEC CICS RETRIEVE command or on the EXEC CICS READQ TD command. Otherwise, the command fails with a LENGERR response and the child server task could abend.

Table 9. Listener Output Format - Enhanced Listener

Description	Format	Value
Socket descriptor	Fullword binary	The socket descriptor to be used by the child server in the TAKESOCKET command
MVS address space identifier	8-byte character	Name of the Listener's address space
TCP/IP task identifier	8-byte character	Listener's task identifier
Data area	35-byte character	Either the client-in-data from Listener (if FORMAT is STANDARD) or the first 35 bytes of data read by the listener (if FORMAT is ENHANCED)
Filler	1-byte character	Unused byte for fullword alignment
Socket address structure	Sockaddr-in structure containing the next 4 fields	Client's sockaddr-in structure
TCP/IP addressing family	Halfword binary	Must be 2 (AF_INET)
Port descriptor	Halfword binary	The client's port number
32-bit IP address	Fullword binary	IP address of the client's host
Reserved	Doubleword	Reserved for IBM use
Reserved	20 fullwords	Reserved for future use
Data length	Halfword binary	The length of the data received from the client. If PEEKDATA=YES was configured, data length is 0 with no data in data area-2.
Data area-2	Length determined by previous field	The data received from the client starting at position 1

For the enhanced listener, the following COBOL definition is used:

```
01  TCPSOCKET-PARM.
    05  GIVE-TAKE-SOCKET    PIC 9(8) COMP.
    05  LSTN-NAME           PIC X(8).
    05  LSTN-SUBNAME        PIC X(8).
    05  CLIENT-IN-DATA      PIC X(35).
    05  FILLER              PIC X(1).
    05  SOCKADDR-IN-PARM.
        15 SIN-FAMILY       PIC 9(4) COMP.
        15 SIN-PORT         PIC 9(4) COMP.
        15 SIN-ADDRESS      PIC 9(8) COMP.
        15 SIN-ZERO         PIC X(8).
    05  DATA-AREA-2-LEN     PIC 9(4) COMP.
    05  DATA-AREA-2         PIC X(xxx).

where xxx is at least equal to the largest MSGLEN parameter for the listeners that can
start this application.
```

Writing Your Own Security/Transaction Link Module for the Listener

The Listener process provides an exit point for those users who want to write and include a module that performs the following:

- Check to indicate whether the expanded security/transaction input format is used
- Security check before a CICS transaction is initiated

The exit point is implemented so that if a module is not provided, all valid transactions are initiated.

If you write a security/transaction module, you can name it anything you want, as long as you define it in the configuration data set. (In previous releases, you needed to name the module EZACICSE; you can still use that module with this release). You can write this program in COBOL, PL/I, or assembler language and must provide an appropriate entry in the CICS program processing table (PPT).

Specifying in EZAC: Specify the name of the security/transaction module in the SECexit field in Alter or Define. If you do not name the module, CICS will assume you do not have one. See Figure 52 on page 62 for more information.

Just before the task creation process, the Listener invokes the security/transaction module by a conditional CICS LINK passing a COMMAREA. The Listener passes a data area to the module that contains information for the module to use for security checking and a 1-byte switch. Your security/transaction module should perform a security check and set the switch accordingly.

When the security/transaction module returns, the Listener checks the state of the switch and initiates the transaction if the switch indicates security clearance. The module can perform any function that is valid in the CICS environment. Excessive processing, however, could cause performance degradation.

A field is supplied to indicate if the expanded security/transaction input format is used. If used, fields also exist for the listener's IP address and port number, a data length field, and a second data area (up to MSGLENTH in length). Table 10 shows the data area used by the security/transaction module.

Table 10. Security/Transaction Exit Data

Description	Format	Value
CICS transaction identifier	4-byte character	CICS transaction requested by the client or supplied by the CSTRANID parameter.

Table 10. Security/Transaction Exit Data (continued)

Description	Format	Value
Data area-1	35-byte character	If the FORMAT parameter is STANDARD, this contains the 35-byte application data extracted from the initial client data. Otherwise, this contains up to the first 35 bytes of data sent by the client (MSGLENTH determines the limit).
Security/Transaction exit data level	1-byte character	Indicates whether or not this data area is in the expanded format: **1** Expanded format **0** Not expanded
Reserved	4-byte character	Reserved for IBM Use
Action	2-byte character	Method of starting the task: **IC** Interval control **KC** Task control **TD** Transient data
Interval control time	6-byte character	Interval requested for IC start. Has the form *hhmmss*.
Address family	Halfword binary	Network address family. A value of 2 must be set.
Client's Port	Halfword binary	The port number of the requester's port.
Client's IP Address	Fullword binary	The IP address of the requester's host.
Switch-1	1-byte character	Switch: **1** Permit the transaction **Not 1** Prohibit the transaction
Switch-2	1-byte character	Switch: **1** Listener sends message to Client. **Not 1** Security/Transaction Exit program sends message to client.
Terminal identification	4-byte character	Return binary zeros if no CICS terminal is associated with the new task. Otherwise, return the CICS terminal identifier associated with the new task.
Socket descriptor	Halfword binary	Current socket descriptor.
User ID	8-byte character	In CICS V4R1 and higher, a user ID value can be returned and associated with the new task. This is mutually exclusive from terminal identification.
Listener's IP Address	Fullword binary	The local IP address associated with this new TCP/IP connection.
Listener's Port	Halfword binary	The listener's port number.
Reserved	20 fullwords	Reserved for future use.
Data length	Halfword binary	The length of the data received from the client.
Data area-2	Length determined by the previous field	The data received from the client starting at position 1. If this is the enhanced listener, the first 35 bytes are the same as data area-1.

Data Conversion Routines

CICS uses the EBCDIC data format, whereas TCP/IP networks use ASCII. When moving data between CICS and the TCP/IP network, your application programs must initiate the necessary data conversion. Sockets for CICS programs can use routines provided by TCP/IP Services for:

- Converting data from EBCDIC to ASCII and back, when sending and receiving data to and from the TCP/IP network, with the SEND, RECEIVE, READ, and WRITE calls.
- Converting between bit arrays and character strings when using the SELECT call.

For details of these routines, refer to EZACIC04, EZACIC05, and EZACIC06 in "Chapter 8. Sockets Extended Application Programming Interface (API)" on page 141.

Chapter 7. C Language Application Programming

This chapter describes the C language API provided by CICS TCP/IP.

The chapter is organized under following headings:

- "C Socket Library" lists the required header files and explains how to make them available to your programs.
- "C Socket Compilation" shows how to compile a C Socket program that contains calls to Sockets for CICS.
- "Structures Used in Socket Calls" on page 112 lists data structures used in C language socket calls.
- "The errno Variable" on page 113 describes the use of a global variable used by the socket system to report errors.
- "C Socket Calls" on page 113 describes the syntax and semantics of the socket calls and explains what they do and how they work together in the context of an application.

C Socket Library

To use the socket routines described in this chapter, you must include these header files:

```
fnctl.h          manifest.h (non-reentrant programs only)
if.h             cmanifes.h (reentrant programs only)
in.h             ezacichd.h (non-reentrant programs only)
inet.h           errno.h    (reentrant programs only)
ioctl.h          netdb.h
bsdtypes.h       socket.h
rtrouteh.h       uio.h
saiucv.h
```

The files are in the *hlq*.SEZACMAC data set, which must be concatenated to the SYSLIB DD in the compilation JCL (as described in Step **4** of "C Socket Compilation"). These files carry a .h extension in this text to distinguish them as header files.

In the IBM implementation, you must include either manifest.h (if the program is non-reentrant) or cmanifes.h (if the program is reentrant) to remap the function long name to eight-character names. To reference manifest.h or cmanifes.h, you need to include one of the following statements as the first #include at the beginning of each program:

```
Non-reentrant programs:
#include <manifest.h>

Reentrant programs:
#include <cmanifes.h>
```

C Socket Compilation

To compile a C Socket program that contains calls to CICS TCP/IP, you must change the standard procedure for C Socket compilation provided with CICS. Figure 81 on page 111 shows a sample job for the compilation of a C Socket program that contains calls to CICS TCP/IP. It includes the following modifications:

- **1** The prototyping statement is required for CICS.

- **2** In the C step (running the C Socket compiler) you must concatenate the *hlq*.SEZACMAC data set to the SYSLIB DD.
- **3** In the PLKED step you must concatenate the *hlq*.SEZARNT1 data set to the SYSLIB DD if and only if the program is to be compiled as reentrant (that is, with the RENT option).
- **4** In the LKED step you must concatenate the *hlq*.SEZATCP and *hlq*.SEZACMTX data sets to the SYSLIB DD.
- **5** Also in the LKED step, you must add an INCLUDE for either module EZACIC07 (if the program is non-reentrant) or module EZACIC17 (if the program is reentrant).

Notes:

1. Furthermore, regarding Step 5 above, Sockets for CICS application programs must include either EZACIC07 (if the program is non-reentrant) or EZACIC17 (if the program is reentrant) instead of CMIUCSOC, which is included in most C programs.
2. You must specify the compiler option of NORENT (non-reentrant) when including the module EZACIC07 and <ezacichd.h>.
3. You must specify the compiler option of RENT (reentrant) when including the module EZACIC17 and <errno.h>.
4. For more information about compiling and linking, see *z/OS C/C++ User's Guide* and *z/OS Communications Server: IP Application Programming Interface Guide*.

```
//CICSRS1C JOB (999,POK),'CICSRS1',NOTIFY=CICSRS1,
//    CLASS=A,MSGCLASS=T,TIME=1439,
//    REGION=5000K,MSGLEVEL=(1,1)
//DFHEITDL PROC SUFFIX=1$,
//         INDEX='CICS410',
//         INDEX2='CICS410',
//CPARM='DEFINE(MVS)',       1
           ..........
//TRN      EXEC PGM=DFHEDP&SUFFIX,
//         REGION=&REG
           ..........
//*
//C        EXEC PGM=EDCCOMP,REGION=&REG,
//         COND=(7,LT,TRN),
//         PARM=(,'&CPARM')
//STEPLIB  DD DSN=&VSCCHD..&CVER..SEDCLINK,DISP=SHR
//         DD DSN=&COMHD..&COMVER..SIBMLINK,DISP=SHR
//         DD DSN=&VSCCHD..&CVER..SEDCCOMP,DISP=SHR
//SYSMSGS  DD DSN=&VSCCHD..&CVER..SEDCMSGS(EDCMSGE),DISP=SHR
//SYSLIB   DD DSN=&VSCCHD..&CVER..SEDCHDRS,DISP=SHR
//         DD DSN=&INDEX..SDFHC370,DISP=SHR
//         DD DSN=&INDEX..SDFHMAC,DISP=SHR
//         DD DSN=hlq.SEZACMAC,DISP=SHR
 2
//SYSLIN   DD DSN=&&LOAD,DISP=(,PASS),
//            UNIT=&WORK,SPACE=&WRKSPC,DCB=&DCB80
//SYSPRINT DD SYSOUT=&OUTC
//SYSCPRT  DD SYSOUT=&OUTC
//SYSTERM  DD DUMMY
//SYSUT1   DD DSN=&&SYSUT1,DISP=(,PASS),
//            UNIT=&WORK,SPACE=&WRKSPC,DCB=&DCB80
           ..........
//SYSUT10  DD DUMMY
//SYSIN    DD DSN=*.TRN.SYSPUNCH,DISP=(OLD,DELETE)
//*
//COPYLINK EXEC PGM=IEBGENER,COND=((7,LT,C),(7,LT,TRN))
           ..........
//*
//PLKED    EXEC PGM=EDCPRLK,COND=((7,LT,C),(7,LT,TRN)),  3
//         REGION=&REG,PARM='&PPARM'
//SYSLIB   DD DSN=hlq.SEZARNT1 (reentrant programs only)
           ..........
//*
//LKED     EXEC PGM=IEWL,REGION=&REG,
//         PARM='&LNKPARM',
//         COND=((7,LT,C),(7,LT,PLKED),(7,LT,TRN))
//SYSLIB   DD DSN=&INDEX2..SDFHLOAD,DISP=SHR
//         DD DSN=&VSCCHD..&CVER..SEDCBASE,DISP=SHR
//         DD DSN=&COMHD..&COMVER..SIBMBASE,DISP=SHR
//         DD DSN=hlq.SEZATCP,DISP=SHR
 4
//         DD DSN=hlq.SEZACMTX,DISP=SHR
//SYSLIN   DD DSN=*.PLKED.SYSMOD,DISP=(OLD,DELETE)
//         DD DSN=*.COPYLINK.SYSUT2,DISP=(OLD,DELETE)
//         DD DDNAME=SYSIN
//SYSLMOD  DD DSN=CICSRS2.CICS410.PGMLIB,DISP=SHR
//*RESLIB   DD DSN=&IMSIND..RESLIB,DISP=SHR
//SYSUT1   DD DSN=&&SYSUT1L,DISP=(,PASS),
//            UNIT=&WORK,SPACE=&WRKSPC,DCB=&DCB80
```

Figure 81. Modified JCL for C Socket Compilation (Part 1 of 2)

```
| //SYSPRINT DD SYSOUT=&OUTC
| // PEND
| //APPLPROG EXEC DFHEITDL
| //TRN.SYSIN  DD DISP=SHR,DSN=CICSRS1.JCL.DATA(SICUCCLD)
| //LKED.SYSIN DD * 5
| INCLUDE SYSLIB(EZACIC07) (non-reentrant programs only)
| INCLUDE SYSLIB(EZACIC17) (reentrant programs only)
|   NAME SICUCCLD(R)
| /*
```

Figure 81. Modified JCL for C Socket Compilation (Part 2 of 2)

Structures Used in Socket Calls

The parameter lists for some C language socket calls include a pointer to a data structure defined by a C structure. The structures are defined in the header files *in.h*, *socket.h*, and *if.h*. Table 11 shows the structures used by the calls described in this chapter.

Table 11. C Structures

C Structure	Format

clientid
 	
Used in many calls
	`struct clientid {`
	`    int       domain;`
	`    char      name[8];`
	`    char      subtaskname[8];`
	`    char      reserved[20];`
	`};`

ifconf
 	
Used in the ioctl() call only
	`struct   ifconf {`
	`    int  ifc_len;`
	`    union {`
	`    caddr_t   ifcu_buf;`
	`    struct    ifreq *ifcu_req;`
	`    } ifc_ifcu;`
	`};`

ifreq
 	
Used in the ioctl() call only
	`struct   ifreq {`
	`#define  IFNAMSIZ  16`
	`    char    ifr_name[IFNAMSIZ];`
	`    union {`
	`    struct  sockaddr ifru_addr;`
	`    struct  sockaddr ifru_dstaddr;`
	`    struct  sockaddr ifru_broadaddr;`
	`    short   ifru_flags;`
	`    int     ifru_metric;`
	`    caddr_t ifru_data;`
	`    } ifr_ifru;`
	`};`

linger
 	
Used in the get/setsockopt() calls only
	`struct  linger {`
	`    int     l_onoff;`
	`    int     l_linger;`
	`};`

Table 11. C Structures (continued)

C Structure	Format

sockaddr_in
 	
Used in many calls
	`struct in_addr`
	`{`
	`        unsigned long s_addr;`
	`};`
	`struct sockaddr_in {`
	`    short   sin_family;`
	`    ushort  sin_port;`
	`    struct  in_addr sin_addr;`
	`    char    sin_zero[8];`
	`};`

timeval
 	
Used in the select() call only
	`struct timeval {`
	`    long    tv_sec;`
	`    long    tv_usec;`
	`};`

The errno Variable

The global variable *errno* is used by the socket system calls to report errors. If a socket call results in an error, the call returns a negative value, and an error value is set in errno. To be able to access these values, you must add one of the following include statements:

```
Non-reentrant programs:
#include <ezacichd.h>

Reentrant programs:
#include <errno.h>
```

Note: Do not use tcperror().

C Socket Calls

This section contains guidance for each C socket call supported by CICS TCP/IP.

For syntax, parameters, and other reference information for each C socket call, refer to *z/OS Communications Server: IP Programmer's Reference*.

accept()

A server issues the accept() call to accept a connection request from a client. The call uses a socket already created with a socket() call and marked by a listen() call.

An accept() call
1. Accepts the first connection on its queue of pending connections.
2. Creates a new socket with the same properties as the socket used in the call.
3. Returns the new socket descriptor to the server.

The new socket cannot be used to accept new connections, but is used by the client for application purposes. The server issues a givesocket() call and a CICS START command to enable a child server to communicate with the client for application purposes. The original socket remains available to the server to accept more connection requests.

The accept() call optionally saves the connection requester's address for use by the server.

Notes:

1. If the queue has no pending connection requests, accept() blocks the socket unless the socket is in nonblocking mode. The socket can be set to nonblocking by calling ioctl().
2. accept() calls are the only way to screen clients. The application cannot predetermine clients from which it will accept connections, but it can close a connection immediately after discovering the identity of the client.
3. The select() call checks a socket for incoming connection requests.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <in.h>
#include <socket.h>
int accept(int s, struct sockaddr *name, int *namelen)
```

Parameters

s
: The *s* parameter is a stream socket descriptor that has already been created with the socket() call. It is usually bound to an address with the bind() call. The listen() call marks the socket as one that accepts connections and allocates a queue to hold pending connection requests. The listen() call allows the caller to place an upper boundary on the size of the queue.

name
: The pointer to a *sockaddr* structure into which the address of a client requesting a connection is placed on completion of the accept() call. If the server application does not need the client address, set the *name* parameter to the NULL pointer before making the accept() call.

  The format of the name buffer is expected to be *sockaddr*, as defined in the header file *in.h*. The format of the structure is shown in Table 11 on page 112.

namelen
: The size, in bytes, of the buffer pointed to by *name*.

Return Values

A nonnegative socket descriptor indicates success; the value −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: The *s* parameter is not a valid socket descriptor.

EFAULT
: Using *addr* and *addrlen* would result in an attempt to copy the address into a portion of the caller's address space into which information cannot be written.

EINVAL
: Listen() was not called for socket *s*.

ENOBUFS
: Insufficient buffer space is available to create the new socket.

EOPNOTSUPP
: The *s* parameter is not of type SOCK_STREAM.

EWOULDBLOCK
The socket *s* is in nonblocking mode, and no connections are in the queue.

bind()

The bind() call binds a unique local port to an existing socket. Note that, on successful completion of a socket() call, the new socket descriptor does not have an associated port.

The bind() call can specify the required port or let the system choose. A listener application should always bind to the same well-known port, so that clients can know which PORT to use.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>
#include <in.h>
int bind(int s, struct sockaddr *name, int namelen)
```

Parameters

s The socket descriptor returned by a previous socket() call.

name

The pointer to a *sockaddr* structure containing the name that is to be bound to *s*. The format of the name buffer is expected to be *sockaddr*, as defined in the header file *in.h*. The format of the structure is shown in Table 11 on page 112.

The *sin_family* field must be set to AF_INET.

The *sin_port* field is set to the port to which the application must bind. It must be specified in network byte order. If *sin_port* is set to 0, the caller expects the system to assign an available port. The application can call getsockname() to discover the port number assigned.

The *in_addr.s_addr* field is set to the IP address and must be specified in network byte order. On hosts with more than one network interface (called multihomed hosts), you can select the interface to which it is to bind. Subsequently, only TCP connection requests from this interface are routed to the application.

If you set this field to the constant INADDR_ANY, as defined in in.h, the socket is bound to all network interfaces on the host. By leaving the address unspecified with INADDR_ANY, the server can accept all TCP connection requests made for its port, regardless of the network interface on which the requests arrived. Set INADDR_ANY for servers that offer a service to multiple networks.

The *sin_zero* field is not used and must be set to all zeros.

namelen
The size, in bytes, of the buffer pointed to by *name*.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EADDRINUSE
: The address is already in use. See the SO_REUSEADDR option described under “getsockopt(), setsockopt()” on page 123 for more information.

EADDRNOTAVAIL
: The address specified is not valid on this host. For example, the IP address does not specify a valid network interface.

EAFNOSUPPORT
: The address family is not supported (it is not AF_INET).

EBADF
: The *s* parameter is not a valid socket descriptor.

EFAULT
: Using *name* and *namelen* would result in an attempt to copy the address into a nonwritable portion of the caller’s address space.

EINVAL
: The socket is already bound to an address. An example is trying to bind a name to a socket that is in the connected state. This value is also returned if *namelen* is not the expected length.

close()

A close() call shuts down a socket and frees all resources allocated to the socket. If the socket refers to an open TCP connection, the connection is closed. If a stream socket is closed when input data is queued, the TCP connection is reset rather than being cleanly closed.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>
int close(int s)
```

Parameter

s
: The descriptor of the socket to be closed.

Return Values

The value 0 indicates success; the value −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: The *s* parameter is not a valid socket descriptor.

connect()

A connect() call attempts to establish a connection between a local socket and a remote socket. For a stream socket, the call performs two tasks. First, it completes the binding necessary for a stream socket in case it has not been previously bound by a bind() call. Second, it attempts to make a connection to another socket.

The connect() call on a stream socket is used by a client application to establish a connection to a server. To be able to accept a connection with an accept() call, the server must have a passive open pending, which means it must have successfully called bind() and listen() before the client issues connect().

If the socket is in blocking mode, the connect() call blocks the caller until the connection is set up, or until an error is received. If the socket is in nonblocking mode and no errors occurred, the return codes indicate that the connection can be initiated. The caller can test the completion of the connection setup by calling select() and testing for the ability to write to the socket.

Stream sockets can call connect() once only.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>
#include <in.h>
int connect(int s, struct sockaddr *name,
int namelen)
```

Parameters

s
The socket descriptor of the socket that is going to be used as the local endpoint of the connection.

name
The pointer to a socket address structure containing the destination socket address to which a connection is requested.

The format of the name buffer is expected to be *sockaddr*, as defined in the header file *in.h*. The format of the structure is shown in Table 11 on page 112.

The *sin_family* field must be set to AF_INET. The *sin_port* field is set to the port to which the server is bound. It must be specified in network byte order. The *sin_zero* field is not used and must be set to all zeros.

namelen
The size of the *socket address* pointed to by *name* in bytes.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EADDRNOTAVAIL
The calling host cannot reach the specified destination.

EAFNOSUPPORT
The address family is not supported.

EALREADY
The socket *s* is marked nonblocking, and a previous connection attempt has not completed.

EBADF
The *s* parameter is not a valid socket descriptor.

ECONNREFUSED
The connection request was rejected by the destination host.

EFAULT
Using *name* and *namelen* would result in an attempt to copy the address into a portion of the caller's address space to which data cannot be written.

EINPROGRESS
The socket *s* is marked nonblocking, and the connection cannot be completed immediately. The EINPROGRESS value does not indicate an error condition.

EINVAL
: The *namelen* parameter is not a valid length.

EISCONN
: The socket *s* is already connected.

ENETUNREACH
: The network cannot be reached from this host.

ETIMEDOUT
: The connection establishment timed out before a connection was made.

fcntl()

The fcntl() call controls whether a socket is in blocking or nonblocking mode.

The blocking or nonblocking mode of a socket affects the operation of certain commands. In blocking mode, a call waits for certain events until they happen. When this happens, the operating system suspends the program until the event occurs.

In similar situations with nonblocking calls, the call returns an error return code and the program continues.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>
#include <bsdtypes.h>
#include <fcntl.h>
signed int fcntl(int s, int cmd, int arg)
```

Parameters

s The socket descriptor.

cmd The command to perform. Set *cmd* to one of the following:

F_SETFL
: This command sets the status flags of socket *s*. One flag, FNDELAY, can be set.

  Setting the FNDELAY flag marks *s* as being in nonblocking mode. If data is not present on calls that can block, such as recvfrom(), the call returns –1, and errno is set to EWOULDBLOCK.

F_GETFL
: This command gets the status flags of socket *s*. One flag, FNDELAY, can be queried.

  The FNDELAY flag marks *s* as being in nonblocking mode. If data is not present on calls that can block, such as recvfrom(), the call returns with –1, and errno is set to EWOULDBLOCK.

arg Set to FNDELAY if using F_SETFL. Ignored otherwise.

Return Values

For the F_GETFL command, the return value is a bit mask that is comprised of the flag settings. For the F_SETFL command, the value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: The *s* parameter is not a valid socket descriptor.

EINVAL
The *arg* parameter is not a valid flag.

getclientid()

A getclientid() call returns the identifier by which the calling application is known to the TCPIP address space. Do not be confused by the term *client* in the name of this call; the call always returns the ID of the calling process, be it client or server. For example, in CICS TCP/IP, this call is issued by the IBM Listener; the identifier returned in that case is that of the Listener (a server). This identifier is used in the givesocket() and takesocket() calls.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>
int getclientid(int domain, struct clientid)
```

Parameters

domain
The *domain* must be AF_INET.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EFAULT
Using the *clientid* parameter as specified would result in an attempt to access storage outside the caller's address space, or storage not modifiable by the caller.

EPFNOSUPPORT
Domain is not AF_INET

gethostbyaddr()

The gethostbyaddr() call tries to resolve the host address through a name server, if one is present. If a name server is not present, gethostbyaddr() searches *hlq*.HOSTS.ADDRINFO until a matching host address is found or an EOF marker is reached.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <netdb.h>
 struct hostent *gethostbyaddr(char *addr, int addrlen, int domain)
```

Parameters

addr The pointer to an unsigned long value containing the address of the host.

addrlen
The size of *addr* in bytes.

domain
The address domain supported (AF_INET).

Return Values

The gethostbyaddr() call returns a pointer to a hostent structure for the host address specified on the call. For more information on the hostent structure, see Figure 90 on page 155. A null pointer is returned if the gethostbyaddr() call fails.

There are no errno values for gethostbyaddr().

gethostbyname()

The gethostbyname() call tries to resolve the host address through a name server, if one is present. If a name server is not present, gethostbyname() searches *hlq*.HOSTS.SITEINFO until a matching host name is found or an EOF marker is reached.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <netdb.h>
 struct hostent *gethostbyname(char *name)
```

Parameters

name The name of the host being queried.

Return Values

The gethostbyname() call returns a pointer to a hostent structure for the host name specified on the call. For more information on the hostent structure, see Figure 92 on page 157. A null pointer is returned if the gethostbyname() call fails.

There are no errno values for gethostbyname().

A new part called EZACIC17 has been created. EZACIC17 is like EZACIC07 except it uses the internal C errno function. Also, a new header file called cmanifes.h has been created to remap EZACIC17's long function names into unique 8-character names.

EZACIC07 and EZACIC17 now support the gethostbyaddr() and gethostbyname() functions.

gethostid()

The gethostid() call gets the unique 32-bit identifier for the current host in network byte order. This value is the default home IP address.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>

unsigned long gethostid()
```

Parameters

None.

Return Values

The gethostid() call returns the 32-bit identifier of the current host, which should be unique across all hosts.

gethostname()

The gethostname() call returns the name of the host processor on which the program is running.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>

int gethostname(char *name, int namelen)
```

Parameters

name The character array to be filled with the host name.

namelen
The length of *name*.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EFAULT
The *name* parameter specified an address outside of the caller's address space.

getpeername()

The getpeername() call returns the name of the peer connected to a specified socket.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>
#include <bsdtypes.h>
int getpeername(int s, struct sockaddr
*name, int *namelen)
```

Parameters

s The socket descriptor.

name A pointer to a structure containing the IP address of the connected socket that is filled by getpeername() before it returns. The exact format of *name* is determined by the domain in which communication occurs.

namelen
A pointer to the structure containing the size of the address structure pointed to by *name* in bytes.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
The *s* parameter is not a valid socket descriptor.

EFAULT
Using the *name* and *namelen* parameters as specified would result in an attempt to access storage outside of the caller's address space.

ENOTCONN
The socket is not in the connected state.

getsockname()

A getsockname() call returns the current name for socket s in the *sockaddr* structure pointed to by the *name* parameter. It returns the address of the socket that has been bound. If the socket is not bound to an address, the call returns with family set, and the rest of the structure set to zero. For example, an unbound socket would cause the name to point to a *sockaddr* structure with the *sin_ family* field set to AF_INET and all other fields set to zero.

Stream sockets are not assigned a name until after a successful call to either bind(), connect(), or accept().

The getsockname() call is often used to discover the port assigned to a socket after the socket has been implicitly bound to a port. For example, an application can call connect() without previously calling bind(). In this case, the connect() call completes the binding necessary by assigning a port to the socket. This assignment can be discovered with a call to getsockname().

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>
#include <bsdtypes.h>
#include <in.h>

int getsockname(int s, struct sockaddr *name, int *
namelen)
```

Parameters

s The socket descriptor.

name The address of the buffer into which getsockname() copies the name of *s*.

namelen
Must initially point to an integer that contains the size in bytes of the storage pointed to by *name*. Upon return, that integer contains the size of the data returned in the storage pointed to by *name*.

Return Values

The value 0 indicates success; the value −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
The *s* parameter is not a valid socket descriptor.

EFAULT
Using the *name* and *namelen* parameters as specified would result in an attempt to access storage outside of the caller's address space.

getsockopt(), setsockopt()

The getsockopt() call gets options associated with a socket; setsockopt() sets the options.

The following options are recognized at the socket level:

- The ability to broadcast messages (UDP socket only)
- The ability to toggle the TCP keep-alive mechanism for a stream socket
- Lingering on close if data is present
- Reception of out-of-band data
- Local address reuse

The following option is recognized at the TCP level (IPPROTO_TCP):

- Disable sending small data amounts until acknowledgment (Nagle algorithm)

As well as checking current options, getsockopt() can return pending errors and the type of socket.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>
#include <bsdtypes.h>

int getsockopt(int s, int level, int optname, char *optval, int
*optlen)
```

Note: The above code sample is for getsockopt(). The setsockopt() call requires the same parameters and declarations, except that:

- Getsockopt becomes setsockopt.
- `int *optlen`, should be replaced by `int optlen` (without the asterisk).

Parameters

s
: The socket descriptor.

level
: When manipulating socket options, you must specify the level at which the option resides and the name of the option. To manipulate options at the socket level, the *level* parameter must be set to SOL_SOCKET as defined in *socket.h*. For TCP_NODELAY at the TCP level, the level parameter must be set to IPPROTO_TCP. To manipulate other TCP level options or options at any other level, such as the IP level, supply the appropriate protocol number for the protocol controlling the option. Currently, only the SOL_SOCKET and IPPROTO_TCP levels are supported.

optname
: The name of a specified socket option. The options that are available with CICS TCP/IP are shown in “Possible Entries for optname” on page 124.

optval **and** *optlen*
: For getsockopt(), the *optval* and *optlen* parameters are used to return data used by the particular form of the call. The *optval* parameter points to a buffer that is to receive the data requested by the get command. The *optlen* parameter points to the size of the buffer pointed to by the *optval* parameter. It must be initially set to the size of the buffer before calling getsockopt(). On return it is set to the actual size of the data returned.

For setsockopt(), the *optval* and *optlen* parameters are used to pass data used by the particular set command. The *optval* parameter points to a buffer containing the data needed by the set command. The *optval* parameter is optional and can be set to the NULL pointer, if data is not needed by the command. The *optlen* parameter must be set to the size of the data pointed to by *optval*.

For both calls, all of the socket level options except SO_LINGER expect *optval* to point to an integer and *optlen* to be set to the size of an integer. When the integer is nonzero, the option is enabled. When it is zero, the option is disabled. The SO_LINGER option expects *optval* to point to a *linger* structure as defined in *socket.h*.

This structure is defined in the following example:

```
#include <manifest.h>
struct  linger
{
       int     l_onoff;               /* option on/off */
       int     l_linger;              /* linger time */
};
```

The *l_onoff* field is set to zero if the SO_LINGER option is being disabled. A nonzero value enables the option. The *l_linger* field specifies the amount of time to linger on close. The units of *l_linger* are seconds.

Possible Entries for optname

The following option is recognized at the TCP level:

Option **Description**

TCP_NODELAY
For setsockopt, toggles the use of the Nagle algorithm (RFC 896) for all data sent over the socket. Under most circumstances, TCP sends data when it is presented. However, when outstanding data has not yet been acknowledged, TCP gathers small amounts of output to be sent in a single packet once an acknowledgment is received. For interactive applications, such as ones that send a stream of mouse events which receive no replies, this gathering of output can cause significant delays. For these types of applications, disabling the Nagle algorithm improves response time. When the Nagle algorithm is disabled, TCP can send small amounts of data before the acknowledgment for previously sent data is received.

For getsockopt, returns the setting of the Nagle algorithm for the socket. When optval is 0, the Nagle algorithm is enabled and TCP waits to send small packets of data until the acknowledgment for the previous data is received. When optval is not 0, the Nagle algorithm is disabled and TCP can send small packets of data before the acknowledgment for previously sent data is received.

The following options are recognized at the socket level:

Option **Description**

SO_BROADCAST
Toggles the ability to broadcast messages. If this option is enabled, it allows the application to send broadcast messages over *s*, if the interface specified in the destination supports the broadcasting of packets. This option has no meaning for stream sockets.

SO_ERROR
: This cannot be specified with setsockopt(). It returns any pending error on the socket and clears the error status. It can be used to check for asynchronous errors on connected datagram sockets or for other asynchronous errors (errors that are not returned explicitly by one of the socket calls).

SO_LINGER
: Lingers on close if data is present. When this option is enabled and there is unsent data present when close() is called, the calling application is blocked during the close() call until the data is transmitted or the connection has timed out. If this option is disabled, the TCPIP address space waits to try to send the data. Although the data transfer is usually successful, it cannot be guaranteed, because the TCPIP address space waits a finite amount of time trying to send the data. The close() call returns without blocking the caller.

SO_OOBINLINE
: Toggles reception of out-of-band data. When this option is enabled, it causes out-of-band data to be placed in the normal data input queue as it is received, making it available to recvfrom() without having to specify the MSG_OOB flag in the call. When this option is disabled, it causes out-of-band data to be placed in the priority data input queue as it is received, making it available to recvfrom(), and only by specifying the MSG_OOB flag in that call.

SO_REUSEADDR
: Toggles local address reuse. When enabled, this option allows local addresses that are already in use to be bound. This alters the normal algorithm used in the bind() call. Normally, the system checks at connect time to ensure that the local address and port do not have the same foreign address and port. The error EADDRINUSE is returned if the association already exists.

SO_SNDBUF
: Applies to getsockopt() only. Returns the size of the data portion of the TCP/IP send buffer in *optval*. The size of the data portion of the send buffer is protocol-specific, based on the DATABUFFERPOOLSIZE statement in the PROFILE.TCPIP data set. The value is adjusted to allow for protocol header information.

SO_TYPE
: This is for getsockopt() only. This option returns the type of the socket. On return, the integer pointed to by *optval* is set to SOCK_STREAM or SOCK_DGRAM.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: The *s* parameter is not a valid socket descriptor.

EFAULT
: Using *optval* and *optlen* parameters would result in an attempt to access storage outside the caller's address space.

ENOPROTOOPT
The *optname* parameter is unrecognized, or the *level* parameter is not SOL_SOCKET.

givesocket()

The givesocket() call tells TCP/IP to make a specified socket available to a takesocket() call issued by another program. Any connected stream socket can be given. Typically, givesocket() is used by a parent server that obtains sockets by means of accept() and gives them to child servers that handle one socket at a time.

To pass a socket, the parent server first calls givesocket(), passing the name of the child server's address space.

The parent server then uses the EXEC CICS START command to start the child server. The START command uses the FROM data to pass the socket descriptor and the parent's client ID that were previously returned by the socket() and getclientid() calls respectively.

The child server calls takesocket(), specifying the parent's client ID and socket descriptor.

Having issued a givesocket() and started the child server that is to take the socket, the concurrent server uses select() to test the socket for an exception condition. When select() reports that an exceptional condition is pending, the concurrent server calls close() to free the socket. If the concurrent server closes the socket before a pending exception condition is indicated, the TCP connection is immediately reset, and the child server's takesocket() call is unsuccessful.

When a program has issued a givesocket() call for a socket, it cannot issue any further calls for that socket, except close().

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>
```

Parameters

s The descriptor of a socket to be given to another application.

clientid
A pointer to a clientid structure specifying the target program to whom the socket is to be given. You should fill the structure as follows:

domain
AF_INET (2).

name This is the child server's address space name, left-justified and padded with blanks. The child server can run in the same address space as the parent server. In this case, the field is set to the parent server's address space.

subtaskname
Blanks.

reserved
Binary zeros.

Return Values

The value 0 indicates success; the value −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: The *s* parameter is not a valid socket descriptor, the socket has already been given, or the socket domain is not AF_INET.

EBUSY
: listen() has been called for the socket.

EFAULT
: Using the *clientid* parameter as specified would result in an attempt to access storage outside the caller's address space.

EINVAL
: The *clientid* parameter does not specify a valid client identifier.

ENOTCONN
: The socket is not connected.

EOPNOTSUPP
: The socket type is not SOCK_STREAM.

initapi()

The initapi() call connects your application to the TCP/IP interface.

Format

```
| #include <manifest.h> (non-reentrant programs only)
| #include <cmanifes.h> (reentrant programs only)
| int initapi(int max_sock, char *subtaskid)
```

Parameters

max_sock
: The maximum number of sockets requested.

subtaskid
: A unique eight-character ID, which should be the 4-byte packed EIBTASKN value in the EIB plus three character 0's and a unique displayable character.

  Note: Using L as the last character in the subtaskid parameter causes the tasking mechanism to assume the CICS transaction is a listener and schedule it using an attached task.

Return Values

A positive value indicates success; a value of −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code.

ioctl()

The ioctl() call controls the operating characteristics of sockets. This call can issue a command to do any of the following:

- Set or clear nonblocking input and output for a socket.
- Get the number of immediately readable bytes for the socket.
- Add a routing table entry.

- Query whether the current location in the data input is pointing to out-of-band data.
- Delete a routing table entry.
- Get the network interface address.
- Get the network interface broadcast address.
- Get the network interface configuration.
- Get the network interface destination address.
- Get the network interface flags.
- Get the network interface routing metric.
- Get the network interface network mask.
- Set the network interface routing metric.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <ioctl.h>
#include <rtrouteh.h>
#include <if.h>

int ioctl(int s, unsigned long cmd, char *arg)
```

Parameters

s The socket descriptor.

cmd **and** *arg*

cmd is the command to perform; *arg* is a pointer to the data associated with *cmd*. The following are valid ioctl() commands:

Command
Description

FIONBIO
Sets or clears nonblocking input and output for a socket. *arg* is a pointer to an integer. If the integer is 0, the socket is in nonblocking mode. Otherwise, the socket is set for nonblocking input/output.

FIONREAD
Gets the number of immediately readable bytes for the socket. *arg* is a pointer to an integer. Sets the value of the integer to the number of immediately readable characters for the socket.

SIOCADDRT
Adds a routing table entry. *arg* is a pointer to a *rtentry* structure, as defined in *rtroute.h*. The routing table entry, passed as an argument, is added to the routing tables.

SIOCATMARK
Queries whether the current location in the data input is pointing to out-of-band data. The *arg* parameter is a pointer to an integer. The parameter sets the argument to 1 if the socket points to a mark in the data stream for out-of-band data. Otherwise, it sets the argument to 0.

SIOCDELRT
Deletes a routing table entry. The *arg* parameter is a pointer to a *rtentry* structure, as defined in *rtroute.h*. If it exists, the routing table entry passed as an argument is deleted from the routing tables.

SIOCGIFADDR
: Gets the network interface address. The *arg* parameter is a pointer to an *ifreq* structure, as defined in if.h. The interface address is returned in the argument.

SIOCGIFBRDADDR
: Gets the network interface broadcast address. The *arg* parameter is a pointer to an *ifreq* structure, as defined in if.h. The interface broadcast address is returned in the argument.

SIOCGIFCONF
: Gets the network interface configuration. The *arg* parameter is a pointer to an *ifconf* structure, as defined in if.h. The interface configuration is returned in the argument.

SIOCGIFDSTADDR
: Gets the network interface destination address. The *arg* parameter is a pointer to an *ifreq* structure, as defined in if.h. The interface destination (point-to-point) address is returned in the argument.

SIOCGIFFLAGS
: Gets the network interface flags. *arg* is a pointer to an *ifreq* structure, as defined in if.h. The interface flags are returned in the argument.

SIOCGIFMETRIC
: Gets the network interface routing metric. The *arg* parameter is a pointer to an *ifreq* structure, as defined in if.h. The interface routing metric is returned in the argument.

SIOCGIFNETMASK
: Gets the network interface network mask. The *arg* parameter is a pointer to an *ifreq* structure, as defined in if.h. The interface network mask is returned in the argument.

SIOCSIFDSTADDR
: Sets the network interface destination address.

SIOCSIFFLAGS
: Sets the network interface flags.

SIOCSIFMETRIC
: Sets the network interface routing metric. The *arg* parameter is a pointer to an *ifreq* structure, as defined in if.h. Set the interface routing metric to the value passed in the argument.

Return Values

The value 0 indicates success; the value −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: The *s* parameter is not a valid socket descriptor.

EINVAL
: The request is not correct or not supported.

listen()

The listen() call performs two tasks for a specified stream socket:

1. Completes the necessary binding if bind() has not been called for the socket.
2. Creates a connection request queue of a specified length to queue incoming connection requests.

The listen() call indicates a readiness to accept client connection requests. It transforms an active socket into a passive socket. A passive socket can never be used as an active socket to initiate connection requests.

Calling listen() is the third of four steps that a server performs to accept a connection. It is called after allocating a stream socket with socket(), and after binding a name to the socket with bind(). It must be called before calling accept() to accept a connection request from a client.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>

int listen(int s, int backlog)
```

Parameters

s
The socket descriptor.

backlog
Defines the maximum length for the queue of pending connections.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
The *s* parameter is not a valid socket descriptor.

EOPNOTSUPP
The *s* parameter is not a socket descriptor that supports the listen() call.

read()

The read() call reads data on a specified connected socket.

Stream sockets act like streams of information with no boundaries separating data. For example, if applications A and B are connected with a stream socket and application A sends 1000 bytes, each call to this function can return one byte, or 10 bytes, or the entire 1000 bytes. Therefore, applications using stream sockets should place this call in a loop, which should repeat until all data has been received.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)

int read(int s, char *buf, int
len)
```

Parameters

s
The socket descriptor.

buf
The pointer to the buffer that receives the data.

len
The length in bytes of the buffer pointed to by the *buf* parameter.

Return Values

If successful, the number of bytes copied into the buffer is returned. The value 0 indicates that the connection is closed. The value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: *s* is not a valid socket descriptor.

EFAULT
: Using the *buf* and *len* parameters would result in an attempt to access storage outside the caller's address space.

EWOULDBLOCK
: *s* is in nonblocking mode, and data is not available to read.

recv()

The recv() call receives data on a specified socket.

If a datagram packet is too long to fit in the supplied buffer, datagram sockets discard extra bytes. Stream sockets act like streams of information with no boundaries separating data. For example, if applications A and B are connected with a stream socket and application A sends 1000 bytes, each call to this function can return 1 byte, or 10 bytes, or up to 1000 bytes. Therefore, applications using stream sockets should place this call in a loop, calling this function until all data has been received.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>
int recvfrom(int s, char *buf, int len, int flags)
```

Parameters

s
: The socket descriptor.

buf
: The pointer to the buffer that receives the data.

len
: The length in bytes of the buffer pointed to by the *buf* parameter.

flags
: A parameter that can be set to 0 or MSG_PEEK.

  MSG_OOB
  : Reads any out-of-band data on the socket.

  MSG_PEEK
  : Peeks at the data present on the socket. The data is returned but not destroyed, so that a subsequent receive operation sees the same data.

Return Values

If successful, the length of the message or datagram in bytes is returned. The value 0 indicates that the connection is closed. The value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: *s* is not a valid socket descriptor.

EFAULT
: Using the *buf* and *len* parameters would result in an attempt to access storage outside the caller's address space.

EWOULDBLOCK
: *s* is in nonblocking mode, and data is not available to read.

recvfrom()

The recvfrom() call receives data on a specified socket. The recvfrom() call applies to any datagram socket, whether connected or unconnected.

The call returns the length of the incoming message or data. If a datagram packet is too long to fit in the supplied buffer, datagram sockets discard extra bytes. Stream sockets act like streams of information with no boundaries separating data. For example, if applications A and B are connected with a stream socket and application A sends 1000 bytes, each call to this function can return 1 byte, or 10 bytes, or the entire 1000 bytes. Therefore, applications using stream sockets should place this call in a loop, calling this function until all data has been received.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>

int recvfrom(int s, char *buf, int len, int flags,
struct sockaddr *name, int *namelen)
```

Parameters

s
: The socket descriptor.

buf
: The pointer to the buffer that receives the data.

len
: The length in bytes of the buffer pointed to by the *buf* parameter.

flags
: A parameter that can be set to 0 or MSG_PEEK.

  MSG_OOB
  : Reads any out-of-band data on the socket.

  MSG_PEEK
  : Peeks at the data present on the socket. The data is returned but not destroyed, so that a subsequent receive operation sees the same data.

name
: A pointer to a *socket address* structure from which data is received. If *name* is a nonzero value, the source address is returned.

namelen
: A pointer to an integer containing the size of *name* in bytes.

Return Values

If successful, the length of the message or datagram in bytes is returned. The value 0 indicates that the connection is closed. The value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: *s* is not a valid socket descriptor.

EFAULT
Using the *buf* and *len* parameters would result in an attempt to access storage outside the caller's address space.

EWOULDBLOCK
s is in nonblocking mode, and data is not available to read.

select()

The select() call is useful in processes where multiple operations can occur, and it is necessary for the program to be able to wait on one or several of the operations to complete.

For example, consider a program that issues a read() to multiple sockets whose blocking mode is set. Because the socket would block on a read() call, only one socket could be read at a time. Setting the sockets nonblocking would solve this problem, but would require polling each socket repeatedly until data became available. The select() call allows you to test several sockets and to execute a subsequent I/O call only when one of the tested sockets is ready, thereby ensuring that the I/O call will not block.

Defining which sockets to test

The select() call monitors for read operations, write operations, and exception operations:

- When a socket is ready to read, either:
  - A buffer for the specified sockets contains input data. If input data is available for a given socket, a read operation on that socket will not block.
  - A connection has been requested on that socket.
- When a socket is ready to write, TCP/IP can accommodate additional output data. If TCP/IP can accept additional output for a given socket, a write operation on that socket will not block.
- When an exception condition has occurred on a specified socket, it is an indication that a takesocket() has occurred for that socket.

Each socket is represented by a bit in a bit string. The bit strings are contained in 32-bit fullwords, numbered *from right-to-left*. The right-most bit represents socket 0, the leftmost bit represents socket 31, and so on. Thus, if the process uses 32 (or less) sockets, the bit string is one word long; if the process uses up to 64 sockets, the bit string is two words long, etc. You define which sockets to test by turning on the corresponding bit in the bit string.

Read Operations: Read operations include accept(), read(), recv(), or recvfrom() calls. A socket is ready to be read when data has been received for it, or when a connection request has occurred.

To test whether any of several sockets is ready for reading, set the appropriate bits in READFDS to '1' before issuing the select() call. When the select() call returns, the corresponding bits in the READFDS indicate sockets ready for reading.

Write Operations: A socket is selected for writing (ready to be written) when:

- TCP/IP can accept additional outgoing data.
- A connection request is received in response to an accept() call.
- The socket is marked nonblocking, and a connect() cannot be completed immediately. In this case ERRNO will contain a value of 36 (EINPROGRESS). This is not an error condition.

A call to write(), send(), or sendto() blocks when the amount of data to be sent exceeds the amount of data TCP/IP can accept. To avoid this, you can precede the write operation with a select() call to ensure that the socket is ready for writing. Once a socket is selected for write(), the program can determine the amount of TCP/IP buffer space available by issuing the getsockopt() call with the SO_SNDBUF option.

To test whether any of several sockets is ready for writing, set the WRITEFDS bits representing those sockets to ‘1’ before issuing the select() call. When the select() call returns, the corresponding bits in the WRITEFDS indicate sockets ready for writing.

Exception Operations: For each socket to be tested, the select() call can check for an existing exception condition. Two exception conditions are supported:

- The calling program (concurrent server) has issued a givesocket() command and the target child server has successfully issued the takesocket() call. When this condition is selected, the calling program (concurrent server) should issue close() to dissociate itself from the socket.
- A socket has received out-of-band data. On this condition, a READ will return the out-of-band data ahead of program data.

To test whether any of several sockets have an exception condition, set the EXCEPTFDS bits representing those sockets to ‘1’. When the select() call returns, the corresponding bits in the EXCEPTFDS indicate sockets with exception conditions.

NFDS Parameter: The select() call will test each bit in each string before returning results. For efficiency, the NFDS parameter can be used to specify the number of socket descriptors that need to be tested for any event type. The select() call tests only bits in the range 0 through the (NFDS-1) value.

TIMEOUT Parameter: If the time specified in the TIMEOUT parameter elapses before any event is detected, the select() call returns, and RETCODE is set to 0.

Format:

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>
#include <bsdtypes.h>
#include <bsdtime.h>

int select(int nfds, fd_set *readfds, fd_set *writefds, fd_set *exceptfds,
struct timeval *timeout)
```

Parameters:

nfds The number of socket descriptors to check.

readfds
The pointer to a bit mask of descriptors to check for reading.

writefds
The pointer to a bit mask of descriptors to check for writing.

exceptfds
The pointer to a bit mask of descriptors to be checked for exceptional pending conditions.

timeout
: The pointer to the time to wait for the select() call to complete. (If *timeout* is a NULL pointer, a zero-valued timeval structure is substituted in the call.) The zero-valued timeval structure causes TCPIP to poll the sockets and return immediately to the caller.

Return Values: A positive value represents the total number of ready sockets in all bit masks. The value 0 indicates an expired time limit. The three bit masks indicate status (with one bit for each socket). A 1-bit indicates that the respective socket is ready; a 0-bit indicates that the respective socket is not ready. You can use the macro FD_ISSET [10] with each socket to test its status.

The value −1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: One of the bit masks specified an incorrect socket. FD_ZERO was probably not called to clear the bit mask before the sockets were set.

EFAULT
: One of the bit masks pointed to a value outside the caller's address space.

EINVAL
: One of the fields in the timeval structure is not correct.

send()

The send() call sends data on an already-connected socket.

The select() call can be used prior to issuing the send() call to determine when it is possible to send more data.

Stream sockets act like streams of information with no boundaries separating data. For example, if an application is required to send 1000 bytes, each call to this function can send 1 byte, or 10 bytes, or the entire 1000 bytes. Therefore, applications using stream sockets should place this call in a loop, calling this function until all data has been sent.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>

int send(int s, char *msg, int len, int flags)
```

Parameters

s The socket descriptor.

msg The pointer to the buffer containing the message to transmit.

len The length of the message pointed to by the *buf* parameter.

flags The *flags* parameter is set by specifying one or more of the following flags. If more than one flag is specified, the logical OR operator (|) must be used to separate them.

10. See *z/OS Communications Server: IP Programmer's Reference* for details.

MSG_OOB
: Sends out-of-band data.

MSG_DONTROUTE
: The SO_DONTROUTE option is turned on for the duration of the operation. This is usually used only by diagnostic or routing programs.

Return Values

A positive value represents the number of bytes sent. The value –1 indicates locally detected errors. When datagram sockets are specified, no indication of failure to deliver is implicit in a send() routine.

To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: *s* is not a valid socket descriptor.

EFAULT
: Using the *buf* and *len* parameters would result in an attempt to access storage outside the caller's address space.

ENOBUFS
: Buffer space is not available to send the message.

EWOULDBLOCK
: *s* is in nonblocking mode and data is not available to read.

sendto()

The sendto() call sends data to the address specified in the call.

Stream sockets act like streams of information with no boundaries separating data. For example, if an application wishes to send 1000 bytes, each call to this function can send 1 byte, or 10 bytes, or the entire 1000 bytes. Therefore, applications using stream sockets should place this call in a loop, calling this function until all data has been sent.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>

int sendto(int s, char *msg, int len, int flags,
struct sockaddr *to, int tolen)
```

Parameters

s The socket descriptor.

msg The pointer to the buffer containing the message to transmit.

len The length of the message in the buffer pointed to by the *msg* parameter.

flags A parameter that can be set to 0 or MSG_DONTROUTE.

MSG_DONTROUTE
: The SO_DONTROUTE option is turned on for the duration of the operation. This is usually used only by diagnostic or routing programs.

to The address of the target.

tolen The size of the structure pointed to by *to*.

Return Values

If positive, indicates the number of bytes sent. The value –1 indicates an error. No indication of failure to deliver is implied in the return value of this call when used with datagram sockets.

To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
s is not a valid socket descriptor.

EFAULT
Using the *buf* and *len* parameters would result in an attempt to access storage outside the caller's address space.

EINVAL
tolen is not the size of a valid address for the specified address family.

EMSGSIZE
The message was too big to be sent as a single datagram. The default is large-envelope-size.

ENOBUFS
Buffer space is not available to send the message.

EWOULDBLOCK
s is in nonblocking mode, and data is not available to read.

setsockopt()

See "getsockopt(), setsockopt()" on page 123.

shutdown()

The shutdown() call shuts down all or part of a duplex connection.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>

int shutdown(int s, int how)
```

Parameters

s The socket descriptor.

how The *how* parameter can have a value of 0, 1, or 2, where:
- 0 ends communication from socket *s*.
- 1 ends communication to socket *s*.
- 2 ends communication both to and from socket *s*.

Return Values

The value 0 indicates success; the value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
: *s* is not a valid socket descriptor.

EINVAL
: The *how* parameter was not set to one of the valid values. Valid values are 0, 1, and 2.

socket()

The socket() call creates an endpoint for communication and returns a socket descriptor representing the endpoint. Different types of sockets provide different communication services.

SOCK_STREAM sockets model duplex byte streams. They provide reliable, flow-controlled connections between peer applications. Stream sockets are either active or passive. Active sockets are used by clients that initiate connection requests with connect(). By default, socket() creates active sockets. Passive sockets are used by servers to accept connection requests with the connect() call. An active socket is transformed into a passive socket by binding a name to the socket with the bind() call and by indicating a willingness to accept connections with the listen() call. Once a socket is passive, it cannot be used to initiate connection requests.

SOCK_DGRAM supports datagrams (connectionless messages) of a fixed maximum length. Transimission reliability is not guaranteed. Datagrams can be corrupted, received out of order, lost, or delivered multiple times.

Sockets are deallocated with the close() call.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>

int socket(int domain, int type, int
protocol)
```

Parameters

domain
: The *domain* parameter specifies a communication domain within which communication is to take place. This parameter selects the address family (format of addresses within a domain) that is used. The only family supported by CICS TCP/IP is AF_INET, which is the internet domain. The AF_INET constant is defined in the *socket.h* header file.

type
: The *type* parameter specifies the type of socket created. These socket type constants are defined in the *socket.h* header file.

  This must be set to either SOCK_STREAM or SOCK_DGRAM.

protocol
: The *protocol* parameter specifies a particular protocol to be used with the socket. In most cases, a single protocol exists to support a particular type of socket in a particular addressing family. If the *protocol* parameter is set to 0, the system selects the default protocol number for the domain and

socket type requested. Protocol numbers are found in the *hlq*.ETC.PROTO data set. The default *protocol* for stream sockets is TCP. The default *protocol* for datagram sockets is UDP.

Return Values

A nonnegative socket descriptor indicates success. The value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EPROTONOSUPPORT
: The *protocol* is not supported in this *domain*, or this *protocol* is not supported for this socket *type*.

takesocket()

The takesocket() call acquires a socket from another program. The CICS Listener passes the client ID and socket descriptor in the COMMAREA.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <bsdtypes.h>
#include <socket.h>

int takesocket(struct clientid *client_id, int hisdesc)
```

Parameters

clientid
: A pointer to the *clientid* of the application from which you are taking a socket.

hisdesc
: The descriptor of the socket to be taken.

Return Values

A nonnegative socket descriptor is the descriptor of the socket to be used by this process. The value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EACCES
: The other application did not give the socket to your application.

EBADF
: The *hisdesc* parameter does not specify a valid socket descriptor owned by the other application. The socket has already been taken.

EFAULT
: Using the *clientid* parameter as specified would result in an attempt to access storage outside the caller’s address space.

EINVAL
: The *clientid* parameter does not specify a valid client identifier.

EMFILE
: The socket descriptor table is already full.

ENOBUFS
: The operation cannot be performed because of the shortage of SCB or SKCB control blocks in the TCPIP address space.

EPFNOSUPPORT
The domain field of the *clientid* parameter is not AF_INET.

write()

The write() call writes data on a connected socket.

Stream sockets act like streams of information with no boundaries separating data. For example, if an application wishes to send 1000 bytes, each call to this function can send 1 byte or 10 bytes or the entire 1000 bytes. Therefore, applications using stream sockets should place this call in a loop, calling this function until all data has been sent.

Format

```
#include <manifest.h> (non-reentrant programs only)
#include <cmanifes.h> (reentrant programs only)
#include <socket.h>

int write(int s, char *buf, int len)
```

Parameters

s The socket descriptor.

buf The pointer to the buffer holding the data to be written.

len The length in bytes of the buffer pointed to by the *buf* parameter.

Return Values

If successful, the number of bytes written is returned. The value –1 indicates an error. To see which error has occurred, check the *errno* global variable, which will be set to a return code. Possible codes include:

EBADF
s is not a valid socket descriptor.

EFAULT
Using the *buf* and *len* parameters would result in an attempt to access storage outside the caller's address space.

ENOBUFS
Buffer space is not available to send the message.

EWOULDBLOCK
s is in nonblocking mode and data is not available to write.

Chapter 8. Sockets Extended Application Programming Interface (API)

Environmental Restrictions and Programming Requirements

The following environmental restrictions and programming requirements apply to the Callable Socket API:

- SRB mode

  This API may only be invoked in TCB mode (task mode).
- Cross-memory mode

  This API may only be invoked in a non-cross-memory environment (PASN=SASN=HASN).
- Functional Recovery Routine (FRR)

  Do not invoke this API with an FRR set. This will cause system recovery routines to be bypassed and severely damage the system.
- Locks

  No locks should be held when issuing this call.
- INITAPI/TERMAPI calls

  The INITAPI/TERMAPI calls must be issued under the same task.
- Storage

  Storage acquired for the purpose of containing data returned from a socket call must be obtained in the same key as the application program status word (PSW) at the time of the socket call.
- Nested socket API calls

  You can not issue ″nested″ API calls within the same task. That is, if a request block (RB) issues a socket API call and is interrupted by an interrupt request block (IRB) in an STIMER exit, any additional socket API calls that the IRB attempts to issue are detected and flagged as an error.

CALL Instruction Application Programming Interface (API)

This section describes the CALL instruction API for TCP/IP application programs written in the COBOL, PL/I, or System/370 Assembler language. The format and parameters are described for each socket call.

For more information about sockets, refer to the *UNIX Programmer's Reference Manual*.

Notes:

1. Unless your program is running in a CICS environment, reentrant code and multithread applications are not supported by this interface.
2. Only one copy of an interface can exist in a single address space.
3. For a PL/I program, include the following statement before your first call instruction.
   ```
   DCL EZASOKET ENTRY OPTIONS(RETCODE,ASM,INTER) EXT;
   ```
4. A C run-time library is required when you use the GETHOSTBYADDR or GETHOSTBYNAME call.
5. The entry point for the CICS Sockets Extended module (EZASOKET) is within the EZACICAL module; therefore, EZACICAL should be included explicitly in

your link-editing JCL. If not included, you could experience problems, such as the CICS region waiting for the socket calls to complete.

See Figure 127 on page 222.

Understanding COBOL, Assembler, and PL/1 Call Formats

This API is invoked by calling the EZASOKET program and performs the same functions as the C language calls. The parameters look different because of the differences in the programming languages.

COBOL Language Call Format

```
►►──CALL 'EZASOKET' USING SOC-FUNCTION──parm1, parm2, ...──ERRNO RETCODE.──────────►◄
```

SOC-FUNCTION
A 16-byte character field, left-justified and padded on the right with blanks. Set to the name of the call. SOC-FUNCTION is case-specific. It must be in uppercase.

parm*n* A variable number of parameters depending on the type call.

ERRNO
If RETCODE is negative, there is an error number in ERRNO. This field is used in most, but not all, of the calls. It corresponds to the value returned by the tcperror() function in C.

RETCODE
A fullword binary variable containing a code returned by the EZASOKET call. This value corresponds to the normal return value of a C function.

Assembler Language Call Format

The following is the 'EZASOKET' call format for assembler language programs.

```
►►CALL EZASOKET,(SOC-FUNCTION,──parm1, parm2, ...────ERRNO RETCODE),VL,MF=(E, PARMLIST)─►◄
```

PARMLIST
A remote parameter list defined in dynamic storage `DFHEISTG`. This list contains addresses of 30 parameters that can be referenced by all execute forms of the CALL.

Note: This form of CALL is necessary to meet the CICS requirement for quasi-reentrant programming.

PL/1 Language Call Format

```
►►──CALL EZASOKET (SOC-FUNCTION──parm1, parm2, ...──ERRNO RETCODE);────────────────►◄
```

SOC-FUNCTION
A 16-byte character field, left-justified and padded on the right with blanks. Set to the name of the call.

parm*n* A variable number of parameters depending on the type call.

ERRNO
: If RETCODE is negative, there is an error number in ERRNO. This field is used in most, but not all, of the calls. It corresponds to the value returned by the tcperror() function in C.

RETCODE
: A fullword binary variable containing a code returned by the EZASOKET call. This value corresponds to the normal return value of a C function.

Converting Parameter Descriptions

The parameter descriptions in this chapter are written using the VS COBOL II PIC language syntax and conventions, but you should use the syntax and conventions that are appropriate for the language you want to use.

Figure 82 shows examples of storage definition statements for COBOL, PL/1, and assembler language programs.

```
VS COBOL II PIC

  PIC S9(4) BINARY                   HALFWORD BINARY VALUE
  PIC S9(8) BINARY                   FULLWORD BINARY VALUE
  PIC   X(n)                         CHARACTER FIELD OF N BYTES

COBOL PIC

  PIC S9(4) COMP                     HALFWORD BINARY VALUE
  PIC S9(8) COMP                     FULLWORD BINARY VALUE
  PIC   X(n)                         CHARACTER FIELD OF N BYTES

PL/1 DECLARE STATEMENT

  DCL   HALF       FIXED BIN(15),    HALFWORD BINARY VALUE
  DCL   FULL       FIXED BIN(31),    FULLWORD BINARY VALUE
  DCL   CHARACTER  CHAR(n)           CHARACTER FIELD OF n BYTES

ASSEMBLER DECLARATION

  DS    H                            HALFWORD BINARY VALUE
  DS    F                            FULLWORD BINARY VALUE
  DS    CLn                          CHARACTER FIELD OF n BYTES
```

Figure 82. Storage Definition Statement Examples

Error Messages and Return Codes

For information about error messages, refer to *z/OS Communications Server: IP Messages Volume 1 (EZA)*.

For information about error codes that are returned by TCP/IP, see “Appendix B. Return Codes” on page 249.

Code CALL Instructions

This section contains the description, syntax, parameters, and other related information for each call instruction included in this API.

ACCEPT

A server issues the ACCEPT call to accept a connection request from a client. The call points to a socket that was previously created with a SOCKET call and marked by a LISTEN call.

The ACCEPT call is a blocking call. When issued, the ACCEPT call:

1. Accepts the first connection on a queue of pending connections.
2. Creates a new socket with the same properties as s, and returns its descriptor in RETCODE. The original sockets remain available to the calling program to accept more connection requests.
3. The address of the client is returned in NAME for use by subsequent server calls.

Notes:

1. The blocking or nonblocking mode of a socket affects the operation of certain commands. The default is blocking; nonblocking mode can be established by use of the FCNTL and IOCTL calls. When a socket is in blocking mode, an I/O call waits for the completion of certain events. For example, a READ call will block until the buffer contains input data. When an I/O call is issued: if the socket is blocking, program processing is suspended until the event completes; if the socket is nonblocking, program processing continues.
2. If the queue has no pending connection requests, ACCEPT blocks the socket unless the socket is in nonblocking mode. The socket can be set to nonblocking by calling FCNTL or IOCTL.
3. When multiple socket calls are issued, a SELECT call can be issued prior to the ACCEPT to ensure that a connection request is pending. Using this technique ensures that subsequent ACCEPT calls will not block.
4. TCP/IP does not provide a function for screening clients. As a result, it is up to the application program to control which connection requests it accepts, but it can close a connection immediately after discovering the identity of the client.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 83 on page 145 shows an example of ACCEPT call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'ACCEPT'.
    01  S               PIC 9(4) BINARY.
    01  NAME.
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S NAME ERRNO RETCODE.
```

Figure 83. ACCEPT Call Instructions Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'ACCEPT'. Left-justify the field and pad it on the right with blanks.

S A halfword binary number specifying the descriptor of a socket that was previously created with a SOCKET call. In a concurrent server, this is the socket upon which the server listens.

Parameter Values Returned to the Application:

NAME A socket address structure that contains the client’s socket address.

FAMILY
A halfword binary field specifying the addressing family. The call returns the value 2 for AF_INET.

PORT A halfword binary field that is set to the client’s port number.

IP-ADDRESS
A fullword binary field that is set to the 32-bit internet address, in network-byte-order, of the client’s host machine.

RESERVED
Specifies eight bytes of binary zeros. This field is required, but not used.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
If the RETCODE value is positive, the RETCODE value is the new socket number.

If the RETCODE value is negative, check the ERRNO field for an error number.

BIND

In a typical server program, the BIND call follows a SOCKET call and completes the process of creating a new socket.

The BIND call can either specify the required port or let the system choose the port. A listener program should always bind to the same well-known port, so that clients know what socket address to use when attempting to connect.

In the AF_INET domain, the BIND call for a stream socket can specify the networks from which it is willing to accept connection requests. The application can fully specify the network interface by setting the ADDRESS field to the internet address of a network interface. Alternatively, the application can use a *wildcard* to specify that it wants to receive connection requests from any network interface. This is done by setting the ADDRESS field to a fullword of zeros.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 84 shows an example of BIND call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'BIND'.
    01  S               PIC 9(4) BINARY.
    01  NAME.
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S NAME ERRNO RETCODE.
```

Figure 84. BIND Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing BIND. The field is left-justified and padded to the right with blanks.

S
A halfword binary number specifying the socket descriptor for the socket to be bound.

NAME Specifies the socket address structure for the socket that is to be bound.

FAMILY
A halfword binary field specifying the addressing family. The value is always set to 2, indicating AF_INET.

PORT A halfword binary field that is set to the port number to which you want the socket to be bound.

Note: If PORT is set to 0 when the call is issued, the system assigns the port number for the socket. The application can call the GETSOCKNAME call after the BIND call to discover the assigned port number.

IP-ADDRESS
A fullword binary field that is set to the 32-bit internet address (network byte order) of the socket to be bound.

RESERVED
Specifies an eight-byte character field that is required but not used.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this field contains an error number. See "Appendix B. Return Codes" on page 249, for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

CLOSE

The CLOSE call performs the following functions:

- The CLOSE call shuts down a socket and frees all resources allocated to it. If the socket refers to an open TCP connection, the connection is closed.
- The CLOSE call is also issued by a concurrent server after it gives a socket to a child server program. After issuing the GIVESOCKET and receiving notification that the client child has successfully issued a TAKESOCKET, the concurrent server issues the close command to complete the passing of ownership. In high-performance, transaction-based systems the timeout associated with the CLOSE call can cause performance problems. In such systems you should consider the use of a SHUTDOWN call before you issue the CLOSE call. See "SHUTDOWN" on page 204 for more information.

Notes:

1. If a stream socket is closed while input or output data is queued, the TCP connection is reset and data transmission may be incomplete. The SETSOCKET call can be used to set a *linger* condition, in which TCP/IP will continue to attempt to complete data transmission for a specified period of time after the CLOSE call is issued. See SO-LINGER in the description of "SETSOCKOPT" on page 201.
2. A concurrent server differs from an iterative server. An iterative server provides services for one client at a time; a concurrent server receives connection requests from multiple clients and creates child servers that actually serve the clients. When a child server is created, the concurrent

server obtains a new socket, passes the new socket to the child server, and then dissociates itself from the connection. The CICS Listener is an example of a concurrent server.

3. After an unsuccessful socket call, a close should be issued and a new socket should be opened. An attempt to use the same socket with another call results in a nonzero return code.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 85 shows an example of CLOSE call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'CLOSE'.
    01  S               PIC 9(4) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.


CALL 'EZASOKET' USING SOC-FUNCTION S ERRNO RETCODE.
```

Figure 85. CLOSE Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Returned to the Application:

SOC-FUNCTION
A 16-byte field containing CLOSE. Left-justify the field and pad it on the right with blanks.

S A halfword binary field containing the descriptor of the socket to be closed.

Parameter Values Set by the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this field contains an error number. See “Appendix B. Return Codes” on page 249, for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

CONNECT

The CONNECT call is issued by a client to establish a connection between a local socket and a remote socket.

Stream Sockets: For stream sockets, the CONNECT call is issued by a client to establish connection with a server. The call performs two tasks:

1. It completes the binding process for a stream socket if a BIND call has not been previously issued.
2. It attempts to make a connection to a remote socket. This connection is necessary before data can be transferred.

UDP Sockets: For UDP sockets, a CONNECT call need not precede an I/O call, but if issued, it allows you to send messages without specifying the destination.

The call sequence issued by the client and server for stream sockets is:

1. The *server* issues BIND and LISTEN to create a passive open socket.
2. The *client* issues CONNECT to request the connection.
3. The *server* accepts the connection on the passive open socket, creating a new connected socket.

The blocking mode of the CONNECT call conditions its operation.

- If the socket is in blocking mode, the CONNECT call blocks the calling program until the connection is established, or until an error is received.
- If the socket is in nonblocking mode, the return code indicates whether the connection request was successful.
  - A RETCODE of 0 indicates that the connection was completed.
  - A nonzero RETCODE with an ERRNO of 36 (EINPROGRESS) indicates that the connection is not completed but since the socket is nonblocking, the CONNECT call returns normally.

  The caller must test the completion of the connection setup by calling SELECT and testing for the ability to write to the socket.

The completion cannot be checked by issuing a second CONNECT. For more information, see “SELECT” on page 187.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked

Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 86 shows an example of CONNECT call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'CONNECT'.
    01  S               PIC 9(4) BINARY.
    01  NAME.
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.


CALL 'EZASOKET' USING SOC-FUNCTION S NAME ERRNO RETCODE.
```

Figure 86. CONNECT Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte field containing CONNECT. Left-justify the field and pad it on the right with blanks.

S A halfword binary number specifying the socket descriptor of the socket that is to be used to establish a connection.

NAME A structure that contains the socket address of the target to which the local client socket is to be connected.

FAMILY
A halfword binary field specifying the addressing family. The value must be 2 for AF_INET.

PORT A halfword binary field that is set to the server’s port number in network byte order. For example, if the port number is 5000 in decimal, it is stored as X'1388' in hex.

IP-ADDRESS
A fullword binary field that is set to the 32-bit internet address of the server’s host machine in network byte order. For example, if the internet address is 129.4.5.12 in dotted decimal notation, it would be represented as ’8104050C’ in hex.

RESERVED
Specifies an 8-byte reserved field. This field is required, but is not used.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

FCNTL

The blocking mode of a socket can either be queried or set to nonblocking using the FNDELAY flag described in the FCNTL call. You can query or set the FNDELAY flag even though it is not defined in your program.

See “IOCTL” on page 170 for another way to control a socket’s blocking mode.

Values for Command which are supported by the UNIX Systems Services fcntl callable service will also be accepted. Refer to the *z/OS UNIX System Services Programming: Assembler Callable Services Reference* for more information.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 87 shows an example of FCNTL call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'FCNTL'.
    01  S               PIC 9(4) BINARY.
    01  COMMAND         PIC 9(8) BINARY.
    01  REQARG          PIC 9(8) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.


PROCEDURE
CALL 'EZASOKET' USING SOC-FUNCTION S COMMAND REQARG
                ERRNO RETCODE.
```

Figure 87. FCNTL Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing FCNTL. The field is left-justified and padded on the right with blanks.

S A halfword binary number specifying the socket descriptor for the socket that you want to unblock or query.

COMMAND
A fullword binary number with the following values.

Value	**Description**
3	Query the blocking mode of the socket
4	Set the mode to blocking or nonblocking for the socket

REQARG
A fullword binary field containing a mask that TCP/IP uses to set the FNDELAY flag.

- If COMMAND is set to 3 ('query') the REQARG field should be set to 0.
- If COMMAND is set to 4 ('set')
  - Set REQARG to 4 to turn the FNDELAY flag on. This places the socket in nonblocking mode.
  - Set REQARG to 0 to turn the FNDELAY flag off. This places the socket in blocking mode.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

- If COMMAND was set to 3 (query), a bit string is returned.
  - If RETCODE contains X'00000004', the socket is nonblocking. (The FNDELAY flag is on.)
  - If RETCODE contains X'00000000', the socket is blocking. (The FNDELAY flag is off.)
- If COMMAND was set to 4 (set), a successful call is indicated by 0 in this field. In both cases, a RETCODE of −1 indicates an error (Check the ERRNO field for the error number.)

GETCLIENTID

GETCLIENTID call returns the identifier by which the calling application is known to the TCP/IP address space in the calling program. The CLIENT parameter is used in the GIVESOCKET and TAKESOCKET calls. See “GIVESOCKET” on page 166 for a discussion of the use of GIVESOCKET and TAKESOCKET calls.

Do not be confused by the terminology; when GETCLIENTID is called by a server, the identifier of the *caller* (not necessarily the *client*) is returned.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN

Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 88 shows an example of GETCLIENTID call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETCLIENTID'.
    01  CLIENT.
        03  DOMAIN      PIC 9(8) BINARY.
        03  NAME        PIC X(8).
        03  TASK        PIC X(8).
        03  RESERVED    PIC X(20).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION CLIENT ERRNO RETCODE.
```

Figure 88. GETCLIENTID Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'GETCLIENTID'. The field is left-justified and padded to the right with blanks.

Parameter Values Returned to the Application:

CLIENT
A client-ID structure that describes the application that issued the call.

DOMAIN
A fullword binary number specifying the caller’s domain. For TCP/IP, the value is set to 2 for AF_INET.

NAME An 8-byte character field set to the caller’s address space name.

TASK An 8-byte character field set to the task identifier of the caller.

RESERVED
Specifies 20-byte character reserved field. This field is required, but not used.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249, for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	**Description**
0	Successful call
–1	Check ERRNO for an error code

GETHOSTBYADDR

The GETHOSTBYADDR call returns the domain name and alias name of a host whose internet address is specified in the call. A given TCP/IP host can have multiple alias names and multiple host internet addresses.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 89 shows an example of GETHOSTBYADDR call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETHOSTBYADDR'.
    01  HOSTADDR        PIC 9(8) BINARY.
    01  HOSTENT         PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION HOSTADDR HOSTENT RETCODE.
```

Figure 89. GETHOSTBYADDR Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'GETHOSTBYADDR'. The field is left-justified and padded on the right with blanks.

HOSTADDR
A fullword binary field set to the internet address (specified in network byte order) of the host whose name is being sought. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

Parameter Values Returned to the Application:

HOSTENT
A fullword containing the address of the HOSTENT structure.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	An error occurred

GETHOSTBYADDR returns the HOSTENT structure shown in Figure 90.

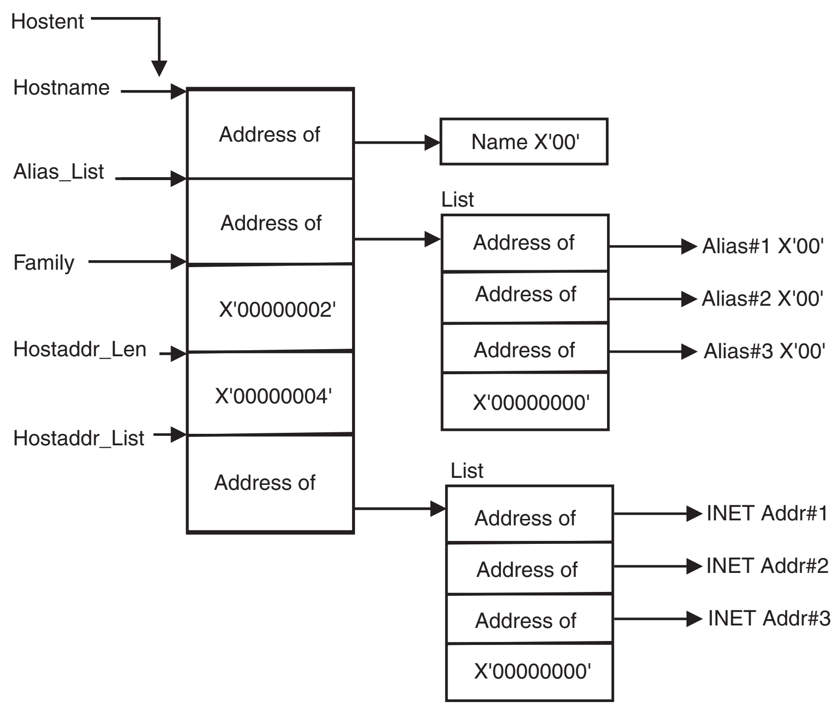


Figure 90. HOSTENT Structure Returned by the GETHOSTBYADDR Call

This structure contains:

- The address of the host name that is returned by the call. The name length is variable and is ended by X'00'.
- The address of a list of addresses that point to the alias names returned by the call. This list is ended by the pointer X'00000000'. Each alias name is a variable length field ended by X'00'.
- The value returned in the FAMILY field is always 2 for AF_INET.
- The length of the host internet address returned in the HOSTADDR_LEN field is always 4 for AF_INET.
- The address of a list of addresses that point to the host internet addresses returned by the call. The list is ended by the pointer X'00000000'. If the call cannot be resolved, the HOSTENT structure contains the ERRNO 10214.

The HOSTENT structure uses indirect addressing to return a variable number of alias names and internet addresses. If you are coding in PL/1 or assembler language, this structure can be processed in a relatively straight-forward manner. If you are coding in COBOL, this structure may be difficult to interpret. You can use the subroutine EZACIC08 to simplify interpretation of the information returned by the GETHOSTBYADDR and GETHOSTBYNAME calls. For more information about EZACIC08, see “EZACIC08” on page 218.

GETHOSTBYNAME

The GETHOSTBYNAME call returns the alias name and the internet address of a host whose domain name is specified in the call. A given TCP/IP host can have multiple alias names and multiple host internet addresses.

TCP/IP tries to resolve the host name through a name server, if one is present. If a name server is not present, the system searches the HOSTS.SITEINFO data set until a matching host name is found or until an EOF marker is reached.

Notes:

1. HOSTS.LOCAL, HOSTS.ADDRINFO, and HOSTS.SITEINFO are described in *z/OS Communications Server: IP Configuration Guide*.
2. The C run-time libraries are required when GETHOSTBYNAME is issued by your program. For CICS, the C run-time library must be included in the link list.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 91 shows an example of GETHOSTBYNAME call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETHOSTBYNAME'.
    01  NAMELEN         PIC 9(8)  BINARY.
    01  NAME            PIC X(24).
    01  HOSTENT         PIC 9(8)  BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION NAMELEN NAME
                     HOSTENT RETCODE.
```

Figure 91. GETHOSTBYNAME Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'GETHOSTBYNAME'. The field is left-justified and padded on the right with blanks.

NAMELEN
A value set to the length of the host name.

NAME A character string, up to 24 characters, set to a host name. This call returns the address of the HOSTENT structure for this name.

Parameter Values Returned to the Application:

HOSTENT
A fullword binary field that contains the address of the HOSTENT structure.

RETCODE
A fullword binary field that returns one of the following:

Value	**Description**
0	Successful call
–1	An error occurred

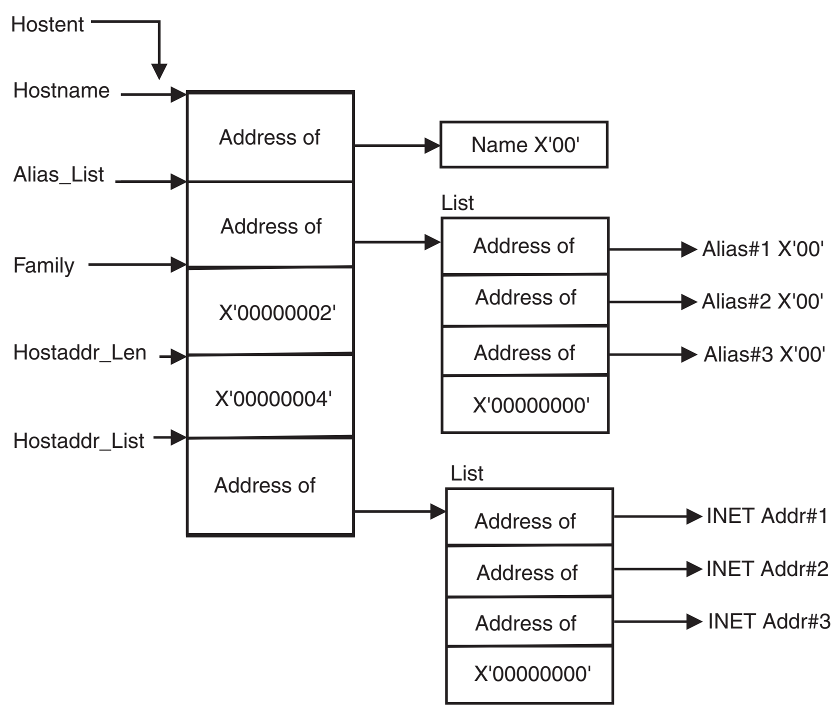


Figure 92. HOSTENT Structure Returned by the GETHOSTYBYNAME Call

GETHOSTBYNAME returns the HOSTENT structure shown in Figure 92. This structure contains:

- The address of the host name that is returned by the call. The name length is variable and is ended by X'00'.
- The address of a list of addresses that point to the alias names returned by the call. This list is ended by the pointer X'00000000'. Each alias name is a variable length field ended by X'00'.
- The value returned in the FAMILY field is always 2 for AF_INET.

- The length of the host internet address returned in the HOSTADDR_LEN field is always 4 for AF_INET.
- The address of a list of addresses that point to the host internet addresses returned by the call. The list is ended by the pointer X'00000000'. If the call cannot be resolved, the HOSTENT structure contains the ERRNO 10214.

The HOSTENT structure uses indirect addressing to return a variable number of alias names and internet addresses. If you are coding in PL/1 or assembler language, this structure can be processed in a relatively straight-forward manner. If you are coding in COBOL, this structure may be difficult to interpret. You can use the subroutine EZACIC08 to simplify interpretation of the information returned by the GETHOSTBYADDR and GETHOSTBYNAME calls. For more information about EZACIC08, see “EZACIC08” on page 218.

GETHOSTID

The GETHOSTID call returns the 32-bit internet address for the current host.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 93 shows an example of GETHOSTID call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETHOSTID'.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION RETCODE.
```

Figure 93. GETHOSTID Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

SOC-FUNCTION
: A 16-byte character field containing 'GETHOSTID'. The field is left-justified and padded on the right with blanks.

RETCODE
: Returns a fullword binary field containing the 32-bit internet address of the host. There is no ERRNO parameter for this call.

GETHOSTNAME

The GETHOSTNAME call returns the domain name of the local host.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 94 shows an example of GETHOSTNAME call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETHOSTNAME'.
    01  NAMELEN         PIC 9(8) BINARY.
    01  NAME            PIC X(24).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION NAMELEN NAME
                     ERRNO RETCODE.
```

Figure 94. GETHOSTNAME Call Instruction Example

For equivalent PL/I and assembler language declarations, see "Converting Parameter Descriptions" on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing GETHOSTNAME. The field is left-justified and padded on the right with blanks.

NAMELEN
A fullword binary field set to the length of the NAME field.

Parameter Values Returned to the Application:

NAMELEN
A fullword binary field set to the length of the host name.

| **NAME** Indicates the receiving field for the host name. TCP/IP Services allows a
| maximum length of 24 characters. The Internet standard is a maximum
| name length of 255 characters. The actual length of the NAME field is
| found in NAMELEN.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	**Description**
0	Successful call
–1	Check ERRNO for an error code

GETPEERNAME

The GETPEERNAME call returns the name of the remote socket to which the local socket is connected.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 95 shows an example of GETPEERNAME call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETPEERNAME'.
    01  S               PIC 9(4) BINARY.
    01  NAME.
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S NAME ERRNO RETCODE.
```

Figure 95. GETPEERNAME Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing GETPEERNAME. The field is left-justified and padded on the right with blanks.

S A halfword binary number set to the socket descriptor of the local socket connected to the remote peer whose address is required.

Parameter Values Returned to the Application:

NAME A structure to contain the peer name. The structure that is returned is the socket address structure for the remote socket that is connected to the local socket specified in field S.

FAMILY
A halfword binary field containing the connection peer's addressing family. The call always returns the value 2, indicating AF_INET.

PORT A halfword binary field set to the connection peer's port number.

IP-ADDRESS
A fullword binary field set to the 32-bit internet address of the connection peer's host machine.

RESERVED
Specifies an eight-byte reserved field. This field is required, but not used.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See "Appendix B. Return Codes" on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	**Description**
0	Successful call
–1	Check ERRNO for an error code

GETSOCKNAME

The GETSOCKNAME call returns the address currently bound to a specified socket. If the socket is not currently bound to an address, the call returns with the FAMILY field set, and the rest of the structure set to 0.

Since a stream socket is not assigned a name until after a successful call to either BIND, CONNECT, or ACCEPT, the GETSOCKNAME call can be used after an implicit bind to discover which port was assigned to the socket.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode

Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 96 shows an example of GETSOCKNAME call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETSOCKNAME'.
    01  S               PIC 9(4) BINARY.
    01  NAME.
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S NAME ERRNO RETCODE.
```

Figure 96. GETSOCKNAME Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing GETSOCKNAME. The field is left-justified and padded on the right with blanks.

S A halfword binary number set to the descriptor of a local socket whose address is required.

Parameter Values Returned to the Application:

NAME Specifies the socket address structure returned by the call.

FAMILY
A halfword binary field containing the addressing family. The call always returns the value 2, indicating AF_INET.

PORT A halfword binary field set to the port number bound to this socket. If the socket is not bound, zero is returned.

IP-ADDRESS
A fullword binary field set to the 32-bit internet address of the local host machine.

RESERVED
Specifies eight bytes of binary zeros. This field is required but not used.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

GETSOCKOPT

The GETSOCKOPT call queries the options that are set by the SETSOCKOPT call.

Several options are associated with each socket. These options are described below. You must specify the option to be queried when you issue the GETSOCKOPT call.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key.
Dispatchable unit mode:	Task.
Cross memory mode:	PASN = HASN.
Amode:	31-bit or 24-bit. **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode.
Interrupt status:	Enabled for interrupts.
Locks:	Unlocked.
Control parameters:	All parameters must be addressable by the caller and in the primary address space.

Figure 97 shows an example of GETSOCKOPT call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GETSOCKOPT'.
    01  S               PIC 9(4) BINARY.
    01  OPTNAME         PIC 9(8) BINARY.
        88  SO-REUSEADDR  VALUE  4.
        88  SO-KEEPALIVE  VALUE  8.
        88  SO-BROADCAST  VALUE  32.
        88  SO-LINGER     VALUE  128.
        88  SO-OOBINLINE  VALUE  256.
        88  SO-SNDBUF     VALUE  4097.
        88  SO-ERROR      VALUE  4103.
        88  SO-TYPE       VALUE  4104.
    01  OPTVAL          PIC X(16) BINARY.
    01  OPTLEN          PIC 9(8) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S OPTNAME
                    OPTVAL OPTLEN ERRNO RETCODE.
```

Figure 97. GETSOCKOPT Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Figure 98 shows sample instructions for use with the TCP_NODELAY option.

```
WORKING STORAGE
    01  TCP-NODELAY-VAL PIC 9(10) COMP VALUE 2147483649.
    01  TCP-NODELAY-REDEF REDEFINES TCP-NODELAY-VAL.
        05  FILLER               PIC 9(6) COMP.
        05  TCP-NODELAY-BITSTREAM PIC 9(8) COMP.
    01  OPTNAME         PIC 9(8) COMP.

PROCEDURE DIVISION
     MOVE TCP-NODELAY-BITSTREAM to OPTNAME.
```

Figure 98. GETSOCKOPT Call Instruction Example for Use with TCP_NODELAY

Figure 99 shows sample code to use in PL1 to set the TCP_NODELAY option.

```
dcl optname bit (32) init('80000001'BX);
```

Figure 99. Sample PL1 Code to Set TCP_NODELAY

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing GETSOCKOPT. The field is left-justified and padded on the right with blanks.

S A halfword binary number specifying the socket descriptor for the socket requiring options.

OPTNAME
Set OPTNAME to the required option before you issue GETSOCKOPT.

The following can be specified for TCP level options.

Note: If not using the literal when specifying a TCP level option, turn on the high order bit in the option value.

TCP_NODELAY
Returns the status of the Nagle algorithm (RFC 896). When optval is 0, the Nagle algorithm is enabled and TCP waits to send small packets of data until the acknowledgment for previously sent data is received. When optval is not 0, the Nagle algorithm is disabled and TCP can send small packets of data before the acknowledgment for previously sent data is received.

The following can be specified for socket level options:

SO-REUSEADDR
Returns the status of local address reuse. When enabled, this option allows local addresses that are already in use to be bound. Instead of checking at BIND time (the normal algorithm) the system checks at CONNECT time to ensure that the local address and port do not have the same remote address and port. If the association already exists, Error 48 (EADDRINUSE) is returned when the CONNECT is issued.

SO-BROADCAST
Requests the status of the broadcast option, which is the ability to send broadcast messages. This option has no meaning for stream sockets.

SO-KEEPALIVE
Requests the status of the TCP keep-alive mechanism for a stream socket. When activated, the keep-alive mechanism periodically sends a packet on an otherwise idle connection. If the remote TCP does not respond to the packet or to retransmissions of the packet, the connection is terminated with the error ETIMEDOUT.

SO-LINGER
Requests the status of LINGER.

- When the LINGER option has been enabled, and data transmission has not been completed, a CLOSE call blocks the calling program until the data is transmitted or until the connection has timed out.
- If LINGER is not enabled, a CLOSE call returns without blocking the caller. TCP/IP attempts to send the data; although the data transfer is usually successful, it cannot be guaranteed, because TCP/IP only attempts to send the data for a specified amount of time.

SO-OOBINLINE
Requests the status of how out-of-band data is to be received. This option has meaning only for stream sockets.

- When this option is enabled, out-of-band data is placed in the normal data input queue as it is received, making it available to RECV and RECVFROM without having to specify the MSG-OOB flag in those calls.
- When this option is disabled, out-of-band data is placed in the priority data input queue as it is received, making it available to RECV and RECVFROM only when the MSG-OOB flag is set.

SO-SNDBUF
Returns the size of the data portion of the TCP/IP send buffer in OPTVAL. The size of the data portion of the send buffer is protocol-specific, based on the DATABUFFERPOOLSIZE statement in the PROFILE.TCPIP data set. This value is adjusted to allow for protocol header information.

SO-ERROR
Requests any pending error on the socket and clears the error status. It can be used to check for asynchronous errors on connected datagram sockets or for other asynchronous errors (errors that are not returned explicitly by one of the socket calls).

SO-TYPE
Returns socket type: stream, datagram, or raw.

Parameter Values Returned to the Application:

OPTVAL

- For all values of OPTNAME other than SO-LINGER, OPTVAL is a 32-bit fullword, containing the status of the specified option.
  - If the requested option is enabled, the fullword contains a positive value; if the requested option is disabled, the fullword contains zero.

- If OPTNAME is set to SO-ERROR, OPTVAL contains the most recent ERRNO for the socket. This error variable is then cleared.
- If OPTNAME is set to SO-TYPE, OPTVAL returns X'1' for SOCK-STREAM, to X'2' for SOCK-DGRAM, or to X'3' for SOCK-RAW.

- If SO-LINGER is specified in OPTNAME, the following structure is returned:

```
ONOFF        PIC X(8)
LINGER       PIC 9(8)
```

  - A nonzero value returned in ONOFF indicates that the option is enabled; a zero value indicates that it is disabled.
  - The LINGER value indicates the amount of time (in seconds) TCP/IP will continue to attempt to send the data after the CLOSE call is issued. To *set* the Linger time, see “SETSOCKOPT” on page 201.

OPTLEN

A fullword binary field containing the length of the data returned in OPTVAL.

- For all values of OPTNAME except SO-LINGER, OPTLEN will be set to 4 (one fullword).
- For OPTNAME of SO-LINGER, OPTVAL contains two fullwords, so OPTLEN will be set to 8 (two fullwords).

ERRNO

A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE

A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

GIVESOCKET

The GIVESOCKET call is used to pass a socket from one process to another.

UNIX-based platforms use a command called FORK to create a new child process that has the same descriptors as the parent process. You can use this new child process in the same way that you used the parent process.

TCP/IP normally uses GETCLIENTID, GIVESOCKET, and TAKESOCKET calls in the following sequence:

1. A process issues a GETCLIENTID call to get the job name of its region and its MVS subtask identifier. This information is used in a GIVESOCKET call.
2. The process issues a GIVESOCKET call to prepare a socket for use by a child process.
3. The child process issues a TAKESOCKET call to get the socket. The socket now belongs to the child process, and can be used by TCP/IP to communicate with another process.

   Note: The TAKESOCKET call returns a new socket descriptor in RETCODE. The child process must use this new socket descriptor for all calls that use this socket. The socket descriptor that was passed to the TAKESOCKET call must not be used.
4. After issuing the GIVESOCKET command, the parent process issues a SELECT command that waits for the child to get the socket.

5. When the child gets the socket, the parent receives an exception condition that releases the SELECT command.
6. The parent process closes the socket.

The original socket descriptor can now be reused by the parent.

Sockets which have been given, but not taken for a period of four days, will be closed and will no longer be available for taking. If a select for the socket is outstanding, it will be posted.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 100 shows an example of GIVESOCKET call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'GIVESOCKET'.
    01  S               PIC 9(4) BINARY.
    01  CLIENT.
        03  DOMAIN      PIC 9(8) BINARY.
        03  NAME        PIC X(8).
        03  TASK        PIC X(8).
        03  RESERVED    PIC X(20).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S CLIENT ERRNO RETCODE.
```

Figure 100. GIVESOCKET Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'GIVESOCKET'. The field is left-justified and padded on the right with blanks.

S A halfword binary number set to the socket descriptor of the socket to be given.

CLIENT
A structure containing the identifier of the application to which the socket should be given.

DOMAIN
A fullword binary number that must be set to 2, indicating AF_INET.

NAME Specifies an 8-character field, left-justified, padded to the right with blanks, that can be set to the name of the MVS address space that will contain the application that is going to take the socket.

- If the socket-taking application is in the *same* address space as the socket-giving application (as in CICS), NAME can be specified. The socket-giving application can determine its own address space name by issuing the GETCLIENTID call.
- If the socket-taking application is in a *different* MVS address space this field should be set to blanks. When this is done, any MVS address space that requests the socket can have it.

TASK Specifies an eight-character field that can be set to blanks, or to the identifier of the socket-taking MVS subtask. If this field is set to blanks, any subtask in the address space specified in the NAME field can take the socket.

- As used by IMS™ and CICS, the field should be set to blanks.
- If TASK identifier is nonblank, the socket-receiving task should already be in execution when the GIVESOCKET is issued.

RESERVED
A 20-byte reserved field. This field is required, but not used.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

INITAPI

| The INITAPI call connects an application to the TCP/IP interface. Almost all sockets
| programs that are written in COBOL, PL/I, or assembler language must issue the
| INITAPI call before they issue other sockets calls.

The exceptions to this rule are the following calls, which, when issued first, will generate a default INITAPI call.
- GETCLIENTID
- GETHOSTID
- GETHOSTNAME
- SELECT
- SELECTEX
- SOCKET
- TAKESOCKET

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 101 shows an example of INITAPI call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'INITAPI'.
    01  MAXSOC          PIC 9(4) BINARY.
    01  IDENT.
        02  TCPNAME     PIC X(8).
        02  ADSNAME     PIC X(8).
    01  SUBTASK         PIC X(8).
    01  MAXSNO          PIC 9(8) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION MAXSOC IDENT SUBTASK
     MAXSNO ERRNO RETCODE.
```

Figure 101. INITAPI Call Instruction Example

For equivalent PL/I and assembler language declarations, see "Converting Parameter Descriptions" on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing INITAPI. The field is left-justified and padded on the right with blanks.

MAXSOC
A halfword binary field set to the maximum number of sockets this application will ever have open at one time. The maximum number is 2000 and the minimum number is 50. This value is used to determine the amount of memory that will be allocated for socket control blocks and buffers. If less than 50 are requested, MAXSOC defaults to 50.

| **Note:** For the SELECT call, the MAXSOC field is a fullword binary field.
| Therefore, do not reuse this field for the INITAPI and SELECT calls.

IDENT A structure containing the identities of the TCP/IP address space and the calling program's address space. Specify IDENT on the INITAPI call from an address space.

TCPNAME
: An 8-byte character field which should be set to the MVS job name of the TCP/IP address space with which you are connecting.

ADSNAME
: An 8-byte character field set to the identity of the calling program's address space. It is the name of the CICS startup job.

SUBTASK
: Indicates an 8-byte field containing a unique subtask identifier that is used to distinguish between multiple subtasks within a single address space. For your subtask name, use the zoned decimal value of the CICS task ID (EIBTASKN), plus a unique displayable character. In CICS, if no value is specified, the zoned-decimal value of the CICS task ID appended with the letter C is used.

Parameter Values Returned to the Application:

MAXSNO
: A fullword binary field that contains the highest socket number assigned to this application. The lowest socket number is zero. If you have 50 sockets, they are numbered from 0 to 49. If MAXSNO is not specified, the value for MAXSNO is 49.

ERRNO
: A fullword binary field. If RETCODE is negative, the field contains an error number. See "Appendix B. Return Codes" on page 249 for information about ERRNO return codes.

RETCODE
: A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

IOCTL

The IOCTL call is used to control certain operating characteristics for a socket.

| Before you issue an IOCTL call, you must load a value representing the
| characteristic that you want to control into the COMMAND field.

The variable length parameters REQARG and RETARG are arguments that are passed to and returned from IOCTL. The length of REQARG and RETARG is determined by the value that you specify in COMMAND. See Table 12 on page 173 for information about REQARG and RETARG.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode

Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 102 shows an example of IOCTL call instructions.

```
       WORKING-STORAGE SECTION.
       01  SOKET-FUNCTION        PIC X(16) VALUE 'IOCTL           '.
       01  S                     PIC 9(4)  BINARY.
       01  COMMAND               PIC 9(4)  BINARY.

       01  IFREQ,
         3 NAME                  PIC X(16).
         3 FAMILY                PIC 9(4)  BINARY.
         3 PORT                  PIC 9(4)  BINARY.
         3 ADDRESS               PIC 9(8)  BINARY.
         3 RESERVED              PIC X(8).

       01  IFREQOUT,
         3 NAME                  PIC X(16).
         3 FAMILY                PIC 9(4)  BINARY.
         3 PORT                  PIC 9(4)  BINARY.
         3 ADDRESS               PIC 9(8)  BINARY.
         3 RESERVED              PIC X(8).

       01  GRP_IOCTL_TABLE(100)
        02 IOCTL_ENTRY,
         3 NAME                  PIC X(16).
         3 FAMILY                PIC 9(4)  BINARY.
         3 PORT                  PIC 9(4)  BINARY.
         3 ADDRESS               PIC 9(8)  BINARY.
         3 NULLS                 PIC X(8).

       01  IOCTL_REQARG          POINTER ;
       01  IOCTL_RETARG          POINTER ;
       01  ERRNO                 PIC 9(8) BINARY.
       01  RETCODE               PIC 9(8) BINARY.


    PROCEDURE
         CALL 'EZASOKET' USING SOC-FUNCTION S COMMAND REQARG
               RETARG ERRNO RETCODE.
```

Figure 102. IOCTL Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing IOCTL. The field is left-justified and padded to the right with blanks.

S
A halfword binary number set to the descriptor of the socket to be controlled.

COMMAND
To control an operating characteristic, set this field to one of the following symbolic names. A value in a bit mask is associated with each symbolic

name. By specifying one of these names, you are turning on a bit in a mask that communicates the requested operating characteristic to TCP/IP.

FIONBIO
Sets or clears blocking status.

FIONREAD
Returns the number of immediately readable bytes for the socket.

SIOCADDRT
Adds a specified routing table entry.

SIOCATMARK
Determines whether the current location in the data input is pointing to out-of-band data.

SIOCDELRT
Deletes a specified routing table entry.

SIOCGIFADDR
Requests the network interface address for a given interface name. See the NAME field in Figure 103 for the address format.

SIOCGIFBRDADDR
Requests the network interface broadcast address for a given interface name. See the NAME field in Figure 103 for the address format.

SIOCGIFCONF
Requests the network interface configuration. The configuration is a variable number of 32-byte structures formatted as shown in Figure 103.

- When IOCTL is issued, REQARG must contain the length of the array to be returned. To determine the length of REQARG, multiply the structure length (array element) by the number of interfaces requested. The maximum number of array elements that TCP/IP can return is 100.
- When IOCTL is issued, RETARG must be set to the beginning of the storage area that you have defined in your program for the array to be returned.

```
03  NAME          PIC X(16).
03  FAMILY        PIC 9(4) BINARY.
03  PORT          PIC 9(4) BINARY.
03  ADDRESS       PIC 9(8) BINARY.
03  RESERVED      PIC X(8).
```

Figure 103. Interface Request Structure (IFREQ) for the IOCTL Call

'SIOCGIFDSTADDR'
Requests the network interface destination address for a given interface name. (See IFREQ NAME field, Figure 103 for format.)

SIOCGIFFLAGS
Requests the network interface flags.

SIOCGIFMETRIC
Requests the network interface routing metric.

SIOCGIFNETMASK
Requests the network interface network mask.

SIOCSIFMETRIC
Sets the network interface routing metric.

SIOCSIFDSTADDR
Sets the network interface destination address.

SIOCSIFFLAGS
Sets the network interface flags.

REQARG and RETARG
REQARG is used to pass arguments to IOCTL and RETARG receives arguments from IOCTL. The REQARG and RETARG parameters are described in Table 12.

Table 12. IOCTL Call Arguments

COMMAND/CODE	SIZE	REQARG	SIZE	RETARG
FIONBIO X'8004A77E'	4	Set socket mode to: X'00'=blocking; X'01'=nonblocking	0	Not used
FIONREAD X'4004A77F'	0	Not used	4	Number of characters available for read
SIOCADDRT X'8030A70A'	48	For IBM use only	0	For IBM use only
SIOCATMARK X'4004A707'	0	Not used	4	X'00'= at OOB data X'01'= not at OOB data
SIOCDELRT X'8030A70B'	48	For IBM use only	0	For IBM use only
SIOCGIFADDR X'C020A70D'	32	First 16 bytes—interface name. Last 16 bytes—not used	32	Network interface address (See Figure 103 on page 172 for format.)
SIOCGIFBRDADDR X'C020A712'	32	First 16 bytes—interface name. Last 16 bytes—not used	32	Network interface address (See Figure 103 on page 172 for format.)
SIOCGIFCONF X'C008A714'	8	Size of RETARG	See note.	
Note: When you call IOCTL with the SIOCGIFCONF command set, REQARG should contain the length in bytes of RETARG. Each interface is assigned a 32-byte array element and REQARG should be set to the number of interfaces times 32. TCP/IP for MVS can return up to 100 array elements.				
SIOCGIFDSTADDR X'C020A70F'	32	First 16 bytes—interface name. Last 16 bytes—not used	32	Destination interface address (See Figure 103 on page 172 for format.)
SIOCGIFFLAGS X'C020A711'	32	For IBM use only	32	For IBM use only
SIOCGIFMETRIC X'C020A717'	32	For IBM use only	32	For IBM use only
SIOCGIFNETMASK X'C020A715'	32	For IBM use only	32	For IBM use only
SIOCSIFMETRIC X'8020A718'	32	For IBM use only	0	For IBM use only

Table 12. IOCTL Call Arguments (continued)

COMMAND/CODE	SIZE	REQARG	SIZE	RETARG
SIOCSIFDSTADDR X'8020A70E'	32	For IBM use only	0	For IBM use only
SIOCSIFFLAGS X'8020A710'	32	For IBM use only	0	For IBM use only

Parameter Values Returned to the Application:

RETARG
Returns an array whose size is based on the value in COMMAND. See Table 12 for information about REQARG and RETARG.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See "Appendix B. Return Codes" on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

The COMMAND SIOGIFCONF returns a variable number of network interface configurations. Figure 104 contains an example of a COBOL II routine that can be used to work with such a structure.

Note: This call can only be programmed in languages that support address pointers. Figure 104 shows a COBOL II example for SIOCGIFCONF.

```
WORKING STORAGE SECTION.
  77   REQARG        PIC 9(8) COMP.
  77   COUNT         PIC 9(8) COMP VALUE max number of interfaces.
LINKAGE SECTION.
  01   RETARG.
       05   IOCTL-TABLE OCCURS 1 TO max TIMES DEPENDING ON COUNT.
            10    NAME     PIC X(16).
            10    FAMILY   PIC 9(4) BINARY.
            10    PORT     PIC 9(4) BINARY.
            10    ADDR     PIC 9(8) BINARY.
            10    NULLS    PIC X(8).
PROCEDURE DIVISION.
  MULTIPLY COUNT BY 32 GIVING REQARQ.
  CALL 'EZASOKET' USING SOC-FUNCTION S COMMAND
      REQARG RETARG ERRNO RETCODE.
```

Figure 104. COBOL II Example for SIOCGIFCONF

LISTEN

The LISTEN call:

- Completes the bind, if BIND has not already been called for the socket.
- Creates a connection-request queue of a specified length for incoming connection requests.

Note: The LISTEN call is not supported for datagram sockets or raw sockets.

The LISTEN call is typically used by a server to receive connection requests from clients. When a connection request is received, a new socket is created by a subsequent ACCEPT call, and the original socket continues to listen for additional connection requests. The LISTEN call converts an active socket to a passive socket and conditions it to accept connection requests from clients. Once a socket becomes passive, it cannot initiate connection requests.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 105 shows an example of LISTEN call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'LISTEN'.
    01  S               PIC 9(4) BINARY.
    01  BACKLOG         PIC 9(8) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
    CALL 'EZASOKET' USING SOC-FUNCTION S BACKLOG ERRNO RETCODE.
```

Figure 105. LISTEN Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing LISTEN. The field is left-justified and padded to the right with blanks.

S
A halfword binary number set to the socket descriptor.

BACKLOG
A fullword binary number set to the number of communication requests to be queued.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	**Description**
0	Successful call
–1	Check ERRNO for an error code

READ

The READ call reads the data on socket s. This is the conventional TCP/IP read data operation. If a datagram packet is too long to fit in the supplied buffer, datagram sockets discard extra bytes.

For stream sockets, data is processed as streams of information with no boundaries separating the data. For example, if programs A and B are connected with a stream socket and program A sends 1000 bytes, each call to this function can return any number of bytes up to the entire 1000 bytes. The number of bytes returned will be contained in RETCODE. Therefore, programs using stream sockets should place this call in a loop that repeats until all data has been received.

Note: See “EZACIC05” on page 215 for a subroutine that will translate ASCII input data to EBCDIC.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 106 on page 177 shows an example of READ call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'READ'.
    01  S               PIC 9(4) BINARY.
    01  NBYTE           PIC 9(8) BINARY.
    01  BUF             PIC X(length of buffer).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S NBYTE BUF
                     ERRNO RETCODE.
```

Figure 106. READ Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing READ. The field is left-justified and padded to the right with blanks.

S
A halfword binary number set to the socket descriptor of the socket that is going to read the data.

NBYTE
A fullword binary number set to the size of BUF. READ does not return more than the number of bytes of data in NBYTE even if more data is available.

Parameter Values Returned to the Application:

BUF
On input, a buffer to be filled by completion of the call. The length of BUF must be at least as long as the value of NBYTE.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	A 0 return code indicates that the connection is closed and no data is available.
>0	A positive value indicates the number of bytes copied into the buffer.
–1	Check ERRNO for an error code.

READV

The READV function reads data on a socket and stores it in a set of buffers. If a datagram packet is too long to fit in the supplied buffers, datagram sockets discard extra bytes.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key

Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 107 shows an example of READV call instructions.

```
WORKING-STORAGE SECTION.
01  SOKET-FUNCTION         PIC X(16) VALUE 'READV           '.
01  S                      PIC 9(4)  BINARY.
01  IOVAMT                 PIC 9(4)  BINARY.

01  MSG-HDR.
    03 MSG_NAME            POINTER.
    03 MSG_NAME_LEN        POINTER.
    03 IOVPTR              POINTER.
    03 IOVCNT              POINTER.
    03 MSG_ACCRIGHTS       PIC X(4).
    03 MSG_ACCRIGHTS_LEN   PIC 9(4)  BINARY.

01  IOV.
    03 BUFFER-ENTRY OCCURS N TIMES.
      05 BUFFER_ADDR       POINTER.
      05 RESERVED          PIC X(4).
      05 BUFFER_LENGTH     PIC 9(4).

01  ERRNO                  PIC 9(8) BINARY.
01  RETCODE                PIC 9(8) BINARY.
```

Figure 107. READV Call Instruction Example

Parameter Values Set by the Application:

S
A value or the address of a halfword binary number specifying the descriptor of the socket into which the data is to be read.

IOV
An array of tripleword structures with the number of structures equal to the value in IOVCNT and the format of the structures as follows:

Fullword 1
Pointer to the address of a data buffer, which is filled in on completion of the call.

Fullword 2
Reserved.

Fullword 3
The length of the data buffer referenced in fullword one.

IOVCNT
A fullword binary field specifying the number of data buffers provided for this call.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	A 0 return code indicates that the connection is closed and no data is available.
>0	A positive value indicates the number of bytes copied into the buffer.
–1	Check ERRNO for an error code.

RECV

The RECV call, like READ, receives data on a socket with descriptor S. RECV applies only to connected sockets. If a datagram packet is too long to fit in the supplied buffers, datagram sockets discard extra bytes.

For additional control of the incoming data, RECV can:
- Peek at the incoming message without having it removed from the buffer.
- Read out-of-band data.

For stream sockets, data is processed as streams of information with no boundaries separating the data. For example, if programs A and B are connected with a stream socket and program A sends 1000 bytes, each call to this function can return any number of bytes up to the entire 1000 bytes. The number of bytes returned will be contained in RETCODE. Therefore, programs using stream sockets should place RECV in a loop that repeats until all data has been received.

If data is not available for the socket, and the socket is in blocking mode, RECV blocks the caller until data arrives. If data is not available and the socket is in nonblocking mode, RECV returns a –1 and sets ERRNO to 35 (EWOULDBLOCK). See “FCNTL” on page 151 or “IOCTL” on page 170 for a description of how to set nonblocking mode.

For raw sockets, RECV adds a 20-byte header.

Note: See “EZACIC05” on page 215 for a subroutine that will translate ASCII input data to EBCDIC.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN

Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 108 shows an example of RECV call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'RECV'.
    01  S               PIC 9(4) BINARY.
    01  FLAGS           PIC 9(8) BINARY.
        88  NO-FLAG               VALUE IS 0.
        88  OOB                   VALUE IS 1.
        88  PEEK                  VALUE IS 2.
    01  NBYTE           PIC 9(8) BINARY.
    01  BUF             PIC X(length of buffer).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S FLAGS NBYTE BUF
                     ERRNO RETCODE.
```

Figure 108. RECV Call Instruction Example

For equivalent PL/I and assembler language declarations, see "Converting Parameter Descriptions" on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing RECV. The field is left-justified and padded to the right with blanks.

S A halfword binary number set to the socket descriptor of the socket to receive the data.

FLAGS
A fullword binary field with values as follows:

Literal Value	Binary Value	Description
NO-FLAG	0	Read data.
OOB	1	Receive out-of-band data (stream sockets only). Even if the OOB flag is not set, out-of-band data can be read if the SO-OOBINLINE option is set for the socket.
PEEK	2	Peek at the data, but do not destroy data. If the peek flag is set, the next RECV call will read the same data.

NBYTE
A value or the address of a fullword binary number set to the size of BUF. RECV does not receive more than the number of bytes of data in NBYTE even if more data is available.

Parameter Values Returned to the Application:

BUF The input buffer to receive the data.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	The socket is closed
>0	A positive return code indicates the number of bytes copied into the buffer.
–1	Check ERRNO for an error code

RECVFROM

The RECVFROM call receives data on a socket with descriptor S and stores it in a buffer. The RECVFROM call applies to both connected and unconnected sockets. The socket address is returned in the NAME structure. If a datagram packet is too long to fit in the supplied buffers, datagram sockets discard extra bytes.

For datagram protocols, recvfrom() returns the source address associated with each incoming datagram. For connection-oriented protocols like TCP, getpeername() returns the address associated with the other end of the connection.

On return, NBYTE contains the number of data bytes received.

For stream sockets, data is processed as streams of information with no boundaries separating the data. For example, if programs A and B are connected with a stream socket and program A sends 1000 bytes, each call to this function can return any number of bytes, up to the entire 1000 bytes. The number of bytes returned will be contained in RETCODE. Therefore, programs using stream sockets should place RECVFROM in a loop that repeats until all data has been received.

For raw sockets, RECVFROM adds a 20-byte header.

If data is not available for the socket, and the socket is in blocking mode, RECVFROM blocks the caller until data arrives. If data is not available and the socket is in nonblocking mode, RECVFROM returns a –1 and sets ERRNO to 35 (EWOULDBLOCK). See “FCNTL” on page 151 or “IOCTL” on page 170 for a description of how to set nonblocking mode.

Note: See “EZACIC05” on page 215 for a subroutine that will translate ASCII input data to EBCDIC.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task

Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 109 shows an example of RECVFROM call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'RECVFROM'.
    01  S               PIC 9(4) BINARY.
    01  FLAGS           PIC 9(8) BINARY.
        88  NO-FLAG              VALUE IS 0.
        88  OOB                  VALUE IS 1.
        88  PEEK                 VALUE IS 2.
    01  NBYTE           PIC 9(8) BINARY.
    01  BUF             PIC X(length of buffer).
    01  NAME.
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S FLAGS
                     NBYTE BUF NAME ERRNO RETCODE.
```

Figure 109. RECVFROM Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing RECVFROM. The field is left-justified and padded to the right with blanks.

S A halfword binary number set to the socket descriptor of the socket to receive the data.

FLAGS
A fullword binary field containing flag values as follows:

Literal Value	Binary Value	Description
NO-FLAG	0	Read data.
OOB	1	Receive out-of-band data (stream sockets only). Even if the OOB flag is not set, out-of-band data can be read if the SO-OOBINLINE option is set for the socket.
PEEK	2	Peek at the data, but do not destroy data. If the peek flag is set, the next RECVFROM call will read the same data.

NBYTE
A fullword binary number specifying the length of the input buffer.

Parameter Values Returned to the Application:

BUF Defines an input buffer to receive the input data.

NAME A structure containing the address of the socket that sent the data. The structure is:

FAMILY
A halfword binary number specifying the addressing family. The value is always 2, indicating AF_INET.

PORT A halfword binary number specifying the port number of the sending socket.

IP-ADDRESS
A fullword binary number specifying the 32-bit internet address of the sending socket.

RESERVED
An 8-byte reserved field. This field is required, but is not used.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	The socket is closed.
>0	A positive return code indicates the number of bytes of data transferred by the read call.
–1	Check ERRNO for an error code.

RECVMSG

The RECVMSG call receives messages on a socket with descriptor S and stores them in an array of message headers. If a datagram packet is too long to fit in the supplied buffers, datagram sockets discard extra bytes.

For datagram protocols, recvmsg() returns the source address associated with each incoming datagram. For connection-oriented protocols like TCP, getpeername() returns the address associated with the other end of the connection.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 110 on page 185 shows an example of RECVMSG call instructions.

```
 WORKING STORAGE
     01  SOC-FUNCTION    PIC X(16)  VALUE IS 'RECVMSG'.
     01  S               PIC 9(4)   BINARY.
     01  MSG-HDR.
         03  MSG-NAME        USAGE IS POINTER.
         03  MSG-NAME-LEN    USAGE IS POINTER.
         03  IOV             USAGE IS POINTER.
         03  IOVCNT          USAGE IS POINTER.
         03  MSG-ACCRIGHTS   USAGE IS POINTER.
         03  MSG-ACCRIGHTS-LEN USAGE IS POINTER.

     01  FLAGS           PIC 9(8)   BINARY.
         88  NO-FLAG                  VALUE IS 0.
         88  OOB                      VALUE IS 1.
         88  PEEK                     VALUE IS 2.
     01  ERRNO           PIC 9(8)   BINARY.
     01  RETCODE         PIC S9(8)  BINARY.

LINKAGE SECTION.

     01 RECVMSG-IOVECTOR.
        03 IOV1A               USAGE IS POINTER.
           05 IOV1AL              PIC 9(8) COMP.
           05 IOV1L               PIC 9(8) COMP.
        03 IOV2A               USAGE IS POINTER.
           05 IOV2AL              PIC 9(8) COMP.
           05 IOV2L               PIC 9(8) COMP.
        03 IOV3A               USAGE IS POINTER.
           05 IOV3AL              PIC 9(8) COMP.
           05 IOV3L               PIC 9(8) COMP.

     01 RECVMSG-BUFFER1     PIC X(16).
     01 RECVMSG-BUFFER2     PIC X(16).
     01 RECVMSG-BUFFER3     PIC X(16).
     01 RECVMSG-BUFNO       PIC 9(8) COMP.

PROCEDURE

           SET MSG-NAME TO NULLS.
           SET MSG-NAME-LEN TO NULLS.
           SET IOV TO ADDRESS OF RECVMSG-IOVECTOR.
           MOVE 3 TO RECVMSG-BUFNO.
           SET MSG-IOVCNT TO ADDRESS OF RECVMSG-BUFNO.
           SET IOV1A TO ADDRESS OF RECVMSG-BUFFER1.
           MOVE 0 TO MSG-IOV1AL.
           MOVE LENGTH OF RECVMSG-BUFFER1 TO MSG-IOV1L.
           SET IOV2A TO ADDRESS OF RECVMSG-BUFFER2.
           MOVE 0 TO IOV2AL.
           MOVE LENGTH OF RECVMSG-BUFFER2 TO IOV2L.
           SET IOV3A TO ADDRESS OF RECVMSG-BUFFER3.
           MOVE 0 TO IOV3AL.
           MOVE LENGTH OF RECVMSG-BUFFER3 TO IOV3L.
           SET MSG-ACCRIGHTS TO NULLS.
           SET MSG-ACCRIGHTS-LEN TO NULLS.
           MOVE X'00000000' TO FLAGS.
           MOVE SPACES TO RECVMSG-BUFFER1.
           MOVE SPACES TO RECVMSG-BUFFER2.
           MOVE SPACES TO RECVMSG-BUFFER3.

    CALL 'EZASOKET' USING SOC-FUNCTION S MSGHDR FLAGS ERRNO RETCODE.
```

Figure 110. RECVMSG Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

S A value or the address of a halfword binary number specifying the socket descriptor.

MSG On input, a pointer to a message header into which the message is received upon completion of the call.

Field **Description**

NAME On input, a pointer to a buffer where the sender address is stored upon completion of the call.

NAME-LEN
On input, a pointer to the size of the address buffer that is filled in on completion of the call.

IOV On input, a pointer to an array of tripleword structures with the number of structures equal to the value in IOVCNT and the format of the structures as follows:

Fullword 1
A pointer to the address of a data buffer

Fullword 2
Reserved

Fullword 3
A pointer to the length of the data buffer referenced in fullword 1.

In COBOL, the IOV structure must be defined separately in the Linkage section, as shown in the example.

IOVCNT
On input, a pointer to a fullword binary field specifying the number of data buffers provided for this call.

ACCRIGHTS
On input, a pointer to the access rights received. This field is ignored.

ACCRLEN
On input, a pointer to the length of the access rights received. This field is ignored.

FLAGS
A fullword binary field with values as follows:

Literal Value	Binary Value	Description
NO-FLAG	0	Read data.
OOB	1	Receive out-of-band data (stream sockets only). Even if the OOB flag is not set, out-of-band data can be read if the SO-OOBINLINE option is set for the socket.
PEEK	2	Peek at the data, but do not destroy data. If the peek flag is set, the next RECVMSG call will read the same data.

Parameter Values Returned by the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field with the following values:

Value	Description
<0	Call returned error. See ERRNO field.
0	Connection partner has closed connection.
>0	Number of bytes read.

SELECT

In a process where multiple I/O operations can occur, it is necessary for the program to be able to wait on one or several of the operations to complete.

For example, consider a program that issues a READ to multiple sockets whose blocking mode is set. Because the socket would block on a READ call, only one socket could be read at a time. Setting the sockets nonblocking would solve this problem, but would require polling each socket repeatedly until data became available. The SELECT call allows you to test several sockets and to execute a subsequent I/O call only when one of the tested sockets is ready, thereby ensuring that the I/O call will not block.

To use the SELECT call as a timer in your program, do one of the following:
- Set the read, write, and except arrays to zeros.
- Specify MAXSOC <= 0.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Defining Which Sockets to Test: The SELECT call monitors for read operations, write operations, and exception operations:
- When a socket is ready to read, one of the following has occurred:
  - A buffer for the specified sockets contains input data. If input data is available for a given socket, a read operation on that socket will not block.
  - A connection has been requested on that socket.

- When a socket is ready to write, TCP/IP can accommodate additional output data. If TCP/IP can accept additional output for a given socket, a write operation on that socket will not block.
- When an exception condition has occurred on a specified socket it is an indication that a TAKESOCKET has occurred for that socket.

Each socket descriptor is represented by a bit in a bit string. The bit strings are contained in 32-bit fullwords, numbered from right to left. The rightmost bit of the first fullword represents socket descriptor 0 and the leftmost bit of the first fullword represents socket descriptor 31. If your process uses 32 or fewer sockets, the bit string is one fullword. If your process uses 33 sockets, the bit string is two fullwords. The rightmost bit of the second fullword represents socket descriptor 32, and the leftmost bit of the second fullword represents socket descriptor 63. This pattern repeats itself for each subsequent fullword. That is, the leftmost bit of fullword n represents socket 32n-1 and the rightmost bit represents socket 32(n-1).

You define the sockets that you want to test by turning on bits in the string. Although the bits in the fullwords are numbered from right to left, the fullwords are numbered from left to right with the leftmost fullword representing socket descriptor 0–31. For example:

```
First fullword             Second fullword             Third fullword
socket descriptor 31...0   socket descriptor 63...32   socket descriptor 95...64
```

Note: To simplify string processing in COBOL, you can use the program EZACIC06 to convert each bit in the string to a character. For more information, see "EZACIC06" on page 216.

Read Operations: Read operations include ACCEPT, READ, READV, RECV, RECVFROM, or RECVMSG calls. A socket is ready to be read when data has been received for it, or when a connection request has occurred.

To test whether any of several sockets is ready for reading, set the appropriate bits in RSNDMSK to one before issuing the SELECT call. When the SELECT call returns, the corresponding bits in the RRETMSK indicate sockets ready for reading.

Write Operations: A socket is selected for writing (ready to be written) when:

- TCP/IP can accept additional outgoing data.
- The socket is marked nonblocking and a previous CONNECT did not complete immediately. In this case, CONNECT returned an ERRNO with a value of 36 (EINPROGRESS). This socket will be selected for write when the CONNECT completes.

A call to WRITE, SEND, or SENDTO blocks when the amount of data to be sent exceeds the amount of data TCP/IP can accept. To avoid this, you can precede the write operation with a SELECT call to ensure that the socket is ready for writing. Once a socket is selected for WRITE, the program can determine the amount of TCP/IP buffer space available by issuing the GETSOCKOPT call with the SO-SNDBUF option.

To test whether any of several sockets is ready for writing, set the WSNDMSK bits representing those sockets to one before issuing the SELECT call. When the SELECT call returns, the corresponding bits in the WRETMSK indicate sockets ready for writing.

Exception Operations: For each socket to be tested, the SELECT call can check for an existing exception condition. Two exception conditions are supported:

- The calling program (concurrent server) has issued a GIVESOCKET command and the target child server has successfully issued the TAKESOCKET call. When this condition is selected, the calling program (concurrent server) should issue CLOSE to dissociate itself from the socket.
- A socket has received out-of-band data. On this condition, a READ will return the out-of-band data ahead of program data.

To test whether any of several sockets have an exception condition, set the ESNDMSK bits representing those sockets to one. When the SELECT call returns, the corresponding bits in the ERETMSK indicate sockets with exception conditions.

MAXSOC Parameter: The SELECT call must test each bit in each string before returning results. For efficiency, the MAXSOC parameter can be used to specify the largest socket descriptor number that needs to be tested for any event type. The SELECT call tests only bits in the range 0 through the MAXSOC value.

TIMEOUT Parameter: If the time specified in the TIMEOUT parameter elapses before any event is detected, the SELECT call returns and RETCODE is set to 0.

Figure 111 shows an example of SELECT call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SELECT'.
    01  MAXSOC          PIC 9(8) BINARY.
    01  TIMEOUT.
        03  TIMEOUT-SECONDS   PIC 9(8) BINARY.
        03  TIMEOUT-MICROSEC  PIC 9(8) BINARY.
    01  RSNDMSK        PIC X(*).
    01  WSNDMSK        PIC X(*).
    01  ESNDMSK        PIC X(*).
    01  RRETMSK        PIC X(*).
    01  WRETMSK        PIC X(*).
    01  ERETMSK        PIC X(*).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION MAXSOC TIMEOUT
                     RSNDMSK WSNDMSK ESNDMSK
                     RRETMSK WRETMSK ERETMSK
                     ERRNO RETCODE.
```

* The bit mask lengths can be determined from the expression:

```
((maximum socket number +32)/32 (drop the remainder))*4
```

Figure 111. SELECT Call Instruction Example

Bit masks are 32-bit fullwords with one bit for each socket. Up to 32 sockets fit into one 32-bit mask [PIC X(4)]. If you have 33 sockets, you must allocate two 32-bit masks [PIC X(8)].

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing SELECT. The field is left-justified and padded on the right with blanks.

MAXSOC
A fullword binary field set to the largest socket descriptor number that is to be checked plus 1. (Remember to start counting at 0).

Note: For the INITAPI call, the MAXSOC field is a halfword binary field. Therefore, do not reuse this field for the SELECT and INITAPI calls.

TIMEOUT
If TIMEOUT is a positive value, it specifies the maximum interval to wait for the selection to complete. If TIMEOUT-SECONDS is a negative value, the SELECT call blocks until a socket becomes ready. To poll the sockets and return immediately, specify the TIMEOUT value to be 0.

TIMEOUT is specified in the two-word TIMEOUT as follows:

- TIMEOUT-SECONDS, word one of the TIMEOUT field, is the seconds component of the timeout value.
- TIMEOUT-MICROSEC, word two of the TIMEOUT field, is the microseconds component of the timeout value (0—999999).

For example, if you want SELECT to timeout after 3.5 seconds, set TIMEOUT-SECONDS to 3 and TIMEOUT-MICROSEC to 500000.

RSNDMSK
A bit string sent to request read event status.

- For each socket to be checked for pending read events, the corresponding bit in the string should be set to 1.
- For sockets to be ignored, the value of the corresponding bit should be set to 0.

If this parameter is set to all zeros, the SELECT will not check for read events.

WSNDMSK
A bit string sent to request write event status.

- For each socket to be checked for pending write events, the corresponding bit in the string should be set to set.
- For sockets to be ignored, the value of the corresponding bit should be set to 0.

If this parameter is set to all zeros, the SELECT will not check for write events.

ESNDMSK
A bit string sent to request exception event status.

- For each socket to be checked for pending exception events, the corresponding bit in the string should be set to set.
- For each socket to be ignored, the corresponding bit should be set to 0.

If this parameter is set to all zeros, the SELECT will not check for exception events.

Parameter Values Returned to the Application:

RRETMSK
A bit string returned with the status of read events. The length of the string should be equal to the maximum number of sockets to be checked. For each socket that is ready to read, the corresponding bit in the string will be set to 1; bits that represent sockets that are not ready to read will be set to 0.

WRETMSK
A bit string returned with the status of write events. The length of the string should be equal to the maximum number of sockets to be checked. For each socket that is ready to write, the corresponding bit in the string will be set to 1; bits that represent sockets that are not ready to be written will be set to 0.

ERETMSK
A bit string returned with the status of exception events. The length of the string should be equal to the maximum number of sockets to be checked. For each socket that has an exception status, the corresponding bit will be set to 1; bits that represent sockets that do not have exception status will be set to 0.

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
>0	Indicates the sum of all ready sockets in the three masks
0	Indicates that the SELECT time limit has expired
–1	Check ERRNO for an error code

SELECTEX

The SELECTEX call monitors a set of sockets, a time value and an ECB or list of ECBs. It completes when either one of the sockets has activity, the time value expires, or one of the ECBs is posted.

To use the SELECTEX call as a timer in your program, do either of the following:
- Set the read, write, and except arrays to zeros
- Specify MAXSOC <= 0

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked

Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 112 shows an example of SELECTEX call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SELECTEX'.
    01  MAXSOC          PIC 9(8)   BINARY.
    01  TIMEOUT.
        03  TIMEOUT-SECONDS    PIC 9(8) BINARY.
        03  TIMEOUT-MINUTES    PIC 9(8) BINARY.
    01  RSNDMSK        PIC X(*).
    01  WSNDMSK        PIC X(*).
    01  ESNDMSK        PIC X(*).
    01  RRETMSK        PIC X(*).
    01  WRETMSK        PIC X(*).
    01  ERETMSK        PIC X(*).
    01  SELECB          PIC X(4).
    01  ERRNO           PIC 9(8)   BINARY.
    01  RETCODE         PIC S9(8)  BINARY.


where * is the size of the select mask

PROCEDURE
    CALL 'EZASOKET' USING SOC-FUNCTION MAXSOC TIMEOUT
                    RSNDMSK WSNDMSK ESNDMSK
                    RRETMSK WRETMSK ERETMSK
                    SELECB ERRNO RETCODE.
```

* The bit mask lengths can be determined from the expression:

```
((maximum socket number +32)/32 (drop the remainder))*4
```

Figure 112. SELECTEX Call Instruction Example

Parameter Values Set by the Application:

MAXSOC

A fullword binary field specifying the largest socket descriptor number being checked.

TIMEOUT

If TIMEOUT is a positive value, it specifies a maximum interval to wait for the selection to complete. If TIMEOUT-SECONDS is a negative value, the SELECT call blocks until a socket becomes ready. To poll the sockets and return immediately, set TIMEOUT to be zeros.

TIMEOUT is specified in the two-word TIMEOUT as follows:

- TIMEOUT-SECONDS, word one of the TIMEOUT field, is the seconds component of the timeout value.
- TIMEOUT-MICROSEC, word two of the TIMEOUT field, is the microseconds component of the timeout value (0—999999).

For example, if you want SELECTEX to timeout after 3.5 seconds, set TIMEOUT-SECONDS to 3 and TIMEOUT-MICROSEC to 500000.

RSNDMSK

The bit-mask array to control checking for read interrupts. If this parameter is not specified or the specified bit-mask is zeros, the SELECT will not check for read interrupts. The length of this bit-mask array is dependent on the value in MAXSOC.

WSNDMSK
The bit-mask array to control checking for write interrupts. If this parameter is not specified or the specified bit-mask is zeros, the SELECT will not check for write interrupts. The length of this bit-mask array is dependent on the value in MAXSOC.

ESNDMSK
The bit-mask array to control checking for exception interrupts. If this parameter is not specified or the specified bit-mask is zeros, the SELECT will not check for exception interrupts. The length of this bit-mask array is dependent on the value in MAXSOC.

SELECB
An ECB which, if posted, causes completion of the SELECTEX.

COBOL users who need more information should see the assembler macroinstruction guide for their operating system.

Note: The maximum number of ECBs that can be specified in a list is 63.

Parameter Values Returned by the Application:

ERRNO
A fullword binary field; if RETCODE is negative, this contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field

Value	Meaning
>0	The number of ready sockets.
0	Either the SELECTEX time limit has expired (ECB value will be 0) or one of the caller’s ECBs has been posted (ECB value will be nonzero and the caller’s descriptor sets will be set to 0). The caller must initialize the ECB values to 0 before issuing the SELECTEX call.
-1	Error; check ERRNO.

RRETMSK
The bit-mask array returned by the SELECT if RSNDMSK is specified. The length of this bit-mask array is dependent on the value in MAXSOC.

WRETMSK
The bit-mask array returned by the SELECT if WSNDMSK is specified. The length of this bit-mask array is dependent on the value in MAXSOC.

ERETMSK
The bit-mask array returned by the SELECT if ESNDMSK is specified. The length of this bit-mask array is dependent on the value in MAXSOC.

Note: See EZACIC06 for information on bits mask conversion.

SEND

The SEND call sends data on a specified connected socket.

The FLAGS field allows you to:

- Send out-of-band data, for example, interrupts, aborts, and data marked urgent. Only stream sockets created in the AF_INET address family support out-of-band data.
- Suppress use of local routing tables. This implies that the caller takes control of routing and writing network software.

For datagram sockets, SEND transmits the entire datagram if it fits into the receiving buffer. Extra data is discarded.

For stream sockets, data is processed as streams of information with no boundaries separating the data. For example, if a program is required to send 1000 bytes, each call to this function can send any number of bytes, up to the entire 1000 bytes, with the number of bytes sent returned in RETCODE. Therefore, programs using stream sockets should place this call in a loop, reissuing the call until all data has been sent.

Note: See "EZACIC04" on page 214 for a subroutine that will translate EBCDIC input data to ASCII.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 113 on page 195 shows an example of SEND call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SEND'.
    01  S               PIC 9(4) BINARY.
    01  FLAGS           PIC 9(8) BINARY.
        88  NO-FLAG                VALUE IS 0.
        88  OOB                    VALUE IS 1.
        88  DONT-ROUTE             VALUE IS 4.
    01  NBYTE           PIC 9(8) BINARY.
    01  BUF             PIC X(length of buffer).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S FLAGS NBYTE
                   BUF ERRNO RETCODE.
```

Figure 113. SEND Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing SEND. The field is left-justified and padded on the right with blanks.

S A halfword binary number specifying the socket descriptor of the socket that is sending data.

FLAGS
A fullword binary field with values as follows:

Literal Value	Binary Value	Description
NO-FLAG	0	No flag is set. The command behaves like a WRITE call.
OOB	1	Send out-of-band data (stream sockets only). Even if the OOB flag is not set, out-of-band data can be read if the SO-OOBINLINE option is set for the socket.
DONT-ROUTE	4	Do not route. Routing is provided by the calling program.

NBYTE
A fullword binary number set to the number of bytes of data to be transferred.

BUF The buffer containing the data to be transmitted. BUF should be the size specified in NBYTE.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value Description

≥0 A successful call. The value is set to the number of bytes transmitted.

–1 Check ERRNO for an error code

SENDMSG

The SENDMSG call sends messages on a socket with descriptor S passed in an array of messages.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 114 on page 197 shows an example of SENDMSG call instructions.

```
 WORKING STORAGE
     01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SENDMSG'.
     01  S               PIC 9(4)   BINARY.
     01  MSG-HDR.
         03  MSG-NAME        USAGE IS POINTER.
         03  MSG-NAME-LEN    USAGE IS POINTER.
         03  IOV             USAGE IS POINTER.
         03  IOVCNT          USAGE IS POINTER.
         03  MSG-ACCRIGHTS   USAGE IS POINTER.
         03  MSG-ACCRIGHTS-LEN USAGE IS POINTER.

     01  FLAGS           PIC 9(8)   BINARY.
         88  NO-FLAG                  VALUE IS 0.
         88  OOB                      VALUE IS 1.
         88  DONTROUTE                VALUE IS 4.
     01  ERRNO           PIC 9(8)   BINARY.
     01  RETCODE         PIC S9(8)  BINARY.

LINKAGE SECTION.

     01 SENDMSG-IOVECTOR.
        03 IOV1A               USAGE IS POINTER.
           05 IOV1AL              PIC 9(8) COMP.
           05 IOV1L               PIC 9(8) COMP.
        03 IOV2A               USAGE IS POINTER.
           05 IOV2AL              PIC 9(8) COMP.
           05 IOV2L               PIC 9(8) COMP.
        03 IOV3A               USAGE IS POINTER.
           05 IOV3AL              PIC 9(8) COMP.
           05 IOV3L               PIC 9(8) COMP.

     01 SENDMSG-BUFFER1     PIC X(16).
     01 SENDMSG-BUFFER2     PIC X(16).
     01 SENDMSG-BUFFER3     PIC X(16).
     01 SENDMSG-BUFNO       PIC 9(8) COMP.

PROCEDURE

           SET MSG-NAME TO NULLS.
           SET MSG-NAME-LEN TO NULLS.
           SET IOV TO ADDRESS OF SENDMSG-IOVECTOR.
           MOVE 3 TO SENDMSG-BUFNO.
           SET MSG-IOVCNT TO ADDRESS OF SENDMSG-BUFNO.
           SET IOV1A TO ADDRESS OF SENDMSG-BUFFER1.
           MOVE 0 TO MSG-IOV1AL.
           MOVE LENGTH OF SENDMSG-BUFFER1 TO MSG-IOV1L.
           SET IOV2A TO ADDRESS OF SENDMSG-BUFFER2.
           MOVE 0 TO IOV2AL.
           MOVE LENGTH OF SENDMSG-BUFFER2 TO IOV2L.
           SET IOV3A TO ADDRESS OF SENDMSG-BUFFER3.
           MOVE 0 TO IOV3AL.
           MOVE LENGTH OF SENDMSG-BUFFER3 TO IOV3L.
           SET MSG-ACCRIGHTS TO NULLS.
           SET MSG-ACCRIGHTS-LEN TO NULLS.
           MOVE X'00000000' TO FLAGS.
           MOVE SPACES TO SENDMSG-BUFFER1.
           MOVE SPACES TO SENDMSG-BUFFER2.
           MOVE SPACES TO SENDMSG-BUFFER3.

    CALL 'EZASOKET' USING SOC-FUNCTION S MSGHDR FLAGS ERRNO RETCODE.
```

Figure 114. SENDMSG Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

S A value or the address of a halfword binary number specifying the socket descriptor.

MSG A pointer to an array of message headers from which messages are sent.

Field **Description**

NAME On input, a pointer to a buffer where the sender's address is stored upon completion of the call.

NAME-LEN
On input, a pointer to the size of the address buffer that is filled in on completion of the call.

IOV On input, a pointer to an array of three fullword structures with the number of structures equal to the value in IOVCNT and the format of the structures as follows:

Fullword 1
A pointer to the address of a data buffer

Fullword 2
Reserved

Fullword 3
A pointer to the length of the data buffer referenced in Fullword 1.

In COBOL, the IOV structure must be defined separately in the Linkage section, as shown in the example.

IOVCNT
On input, a pointer to a fullword binary field specifying the number of data buffers provided for this call.

ACCRIGHTS
On input, a pointer to the access rights received. This field is ignored.

ACCRLEN
On input, a pointer to the length of the access rights received. This field is ignored.

FLAGS
A fullword field containing the following:

Literal Value	Binary Value	Description
NO-FLAG	0	No flag is set. The command behaves like a WRITE call.
OOB	1	Send out-of-band data (stream sockets only). Even if the OOB flag is not set, out-of-band data can be read if the SO-OOBINLINE option is set for the socket.
DONT-ROUTE	4	Do not route. Routing is provided by the calling program.

Parameter Values Returned by the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
≥0	A successful call. The value is set to the number of bytes transmitted.
–1	Check ERRNO for an error code.

SENDTO

SENDTO is similar to SEND, except that it includes the destination address parameter. The destination address allows you to use the SENDTO call to send datagrams on a UDP socket, regardless of whether the socket is connected.

The FLAGS parameter allows you to:

- Send out-of-band data such as interrupts, aborts, and data marked as urgent.
- Suppress use of local routing tables. This implies that the caller takes control of routing, which requires writing network software.

For datagram sockets SENDTO transmits the entire datagram if it fits into the receiving buffer. Extra data is discarded.

For stream sockets, data is processed as streams of information with no boundaries separating the data. For example, if a program is required to send 1000 bytes, each call to this function can send any number of bytes, up to the entire 1000 bytes, with the number of bytes sent returned in RETCODE. Therefore, programs using stream sockets should place SENDTO in a loop that repeats the call until all data has been sent.

Note: See “EZACIC04” on page 214 for a subroutine that will translate EBCDIC input data to ASCII.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 115 shows an example of SENDTO call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SENDTO'.
    01  S               PIC 9(4) BINARY.
    01  FLAGS.          PIC 9(8) BINARY.
        88  NO-FLAG         VALUE IS 0.
        88  OOB             VALUE IS 1.
        88  DONT-ROUTE      VALUE IS 4.
    01  NBYTE           PIC 9(8) BINARY.
    01  BUF             PIC X(length of buffer).
    01  NAME
        03  FAMILY      PIC 9(4) BINARY.
        03  PORT        PIC 9(4) BINARY.
        03  IP-ADDRESS  PIC 9(8) BINARY.
        03  RESERVED    PIC X(8).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S FLAGS NBYTE
                    BUF NAME ERRNO RETCODE.
```

Figure 115. SENDTO Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing SENDTO. The field is left-justified and padded on the right with blanks.

S A halfword binary number set to the socket descriptor of the socket sending the data.

FLAGS
A fullword field that returns one of the following:

Literal Value	Binary Value	Description
NO-FLAG	0	No flag is set. The command behaves like a WRITE call.
OOB	1	Send out-of-band data (stream sockets only). Even if the OOB flag is not set, out-of-band data can be read if the SO-OOBINLINE option is set for the socket.
DONT-ROUTE	4	Do not route. Routing is provided by the calling program.

NBYTE
A fullword binary number set to the number of bytes to transmit.

BUF Specifies the buffer containing the data to be transmitted. BUF should be the size specified in NBYTE.

NAME Specifies the socket name structure as follows:

FAMILY
A halfword binary field containing the addressing family. For TCP/IP the value must be 2, indicating AF_INET.

PORT A halfword binary field containing the port number bound to the socket.

IP-ADDRESS
A fullword binary field containing the socket's 32-bit internet address.

RESERVED
Specifies eight-byte reserved field. This field is required, but not used.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See "Appendix B. Return Codes" on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
≥0	A successful call. The value is set to the number of bytes transmitted.
–1	Check ERRNO for an error code

SETSOCKOPT

The SETSOCKOPT call sets the options associated with a socket. SETSOCKOPT can be called only for sockets in the AF_INET domain.

The OPTVAL and OPTLEN parameters are used to pass data used by the particular set command. The OPTVAL parameter points to a buffer containing the data needed by the set command. The OPTVAL parameter is optional and can be set to 0, if data is not needed by the command. The OPTLEN parameter must be set to the size of the data pointed to by OPTVAL.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 116 on page 202 shows an example of SETSOCKOPT call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SETSOCKOPT'.
    01  S               PIC 9(4) BINARY.
    01  OPTNAME         PIC 9(8) BINARY.
        88  SO-REUSEADDR  VALUE  4.
        88  SO-KEEPALIVE  VALUE  8.
        88  SO-BROADCAST  VALUE  32.
        88  SO-LINGER     VALUE  128.
        88  SO-OOBINLINE  VALUE  256.
    01  OPTVAL          PIC 9(16) BINARY.
    01  OPTLEN          PIC 9(8) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S OPTNAME
                    OPTVAL OPTLEN ERRNO RETCODE.
```

Figure 116. SETSOCKOPT Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'SETSOCKOPT'. The field is left-justified and padded to the right with blanks.

S A halfword binary number set to the socket whose options are to be set.

OPTNAME
Specify one of the following values.

The following can be specified for TCP level options.

Note: If not using the literal when specifying a TCP level option, turn on the high order bit in the option value.

TCP_NODELAY
TCP_NODELAY toggles the use of the Nagle algorithm (RFC 896) for all data sent over the socket. Under most circumstances, TCP sends data when it is presented. However, when outstanding data has not yet been acknowledged, TCP gathers small amounts of output to be sent in a single packet once an acknowledgement is received. For interactive applications, such as ones that send a stream of mouse events that receive no replies, this gathering of output can cause significant delays. For these types of applications, disabling the Nagle algorithm improves response time. When the Nagle algorithm is disabled, TCP can send small amounts of data before the acknowledgement for previously sent data is received.

The following can be specified for socket level options:

SO-REUSEADDR
Toggles local address reuse. The default is disabled. This alters the normal algorithm used in the bind() call.

The normal bind() call algorithm allows each internet address and port combination to be bound only once. If the address and port have been bound already, a subsequent bind() will fail and result in error EADDRINUSE.

After the 'SO_REUSEADDR' option is active, the following situations are supported:

- A server can bind() the same port multiple times as long as every invocation uses a different local IP address, and the wildcard address INADDR_ANY is used only one time per port.
- A server with active client connections can be restarted and can bind to its port without having to close all of the client connections.
- For datagram sockets, multicasting is supported so multiple bind() calls can be made to the same class D address and port number.

SO-BROADCAST

Toggles the ability to broadcast messages. This option has no meaning for stream sockets.

If SO-BROADCAST is enabled, the program can send broadcast messages over the socket to destinations that support the receipt of packets.

The default is DISABLED.

SO-KEEPALIVE

Toggles the TCP keep-alive mechanism for a stream socket. The default is disabled. When activated, the keep-alive mechanism periodically sends a packet on an otherwise idle connection. If the remote TCP does not respond to the packet or to retransmissions of the packet, the connection is terminated with the error ETIMEDOUT.

SO-LINGER

Controls how TCP/IP deals with data that it has not been able to transmit when the socket is closed. This option has meaning only for stream sockets.

- When LINGER is enabled and CLOSE is called, the calling program is blocked until the data is successfully transmitted or the connection has timed out.
- When LINGER is disabled, the CLOSE call returns without blocking the caller, and TCP/IP continues to attempt to send the data for a specified period of time. Although this usually provides sufficient time to complete the data transfer, use of the LINGER option does not guarantee successful completion because TCP/IP only waits the amount of time specified in OPTVAL LINGER.

The default is DISABLED.

SO-OOBINLINE

Toggles the ability to receive out-of-band data. This option has meaning only for stream sockets.

- When this option is enabled, out-of-band data is placed in the normal data input queue as it is received, and is available to a RECVFROM or a RECV call whether or not the OOB flag is set in the call.
- When this option is disabled, out-of-band data is placed in the priority data input queue as it is received and is available to a RECV or a RECVFROM call only when the OOB flag is set.

The default is DISABLED.

OPTVAL
Contains data that further defines the option specified in OPTNAME.

- For OPTNAME of SO-BROADCAST, SO-OOBINLINE, and SO-REUSEADDR, OPTVAL is a one-word binary integer. Set OPTVAL to a nonzero positive value to enable the option; set OPTVAL to 0 to disable the option.
- For SO-LINGER, OPTVAL assumes the following structure:

```
ONOFF       PIC X(4).
LINGER      PIC 9(8) BINARY.
```

Set ONOFF to a nonzero value to enable the option; set it to zero to disable the option. Set the LINGER value to the amount of time (in seconds) TCP/IP will linger after the CLOSE call.

OPTLEN
A fullword binary number specifying the length of the data returned in OPTVAL.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	**Description**
0	Successful call
–1	Check ERRNO for an error code

SHUTDOWN

One way to terminate a network connection is to issue the CLOSE call which attempts to complete all outstanding data transmission requests prior to breaking the connection. The SHUTDOWN call can be used to close one-way traffic while completing data transfer in the other direction. The HOW parameter determines the direction of traffic to shutdown.

When the CLOSE call is used, the SETSOCKOPT OPTVAL LINGER parameter determines the amount of time the system will wait before releasing the connection. For example, with a LINGER value of 30 seconds, system resources (including the IMS or CICS transaction) will remain in the system for up to 30 seconds after the CLOSE call is issued. In high volume, transaction-based systems like CICS and IMS, this can impact performance severely.

If the SHUTDOWN call is issued, when the CLOSE call is received, the connection can be closed immediately, rather than waiting for the 30-second delay.

If you issue SHUTDOWN for a socket that currently has outstanding socket calls pending, see Table 13 on page 205 to determine the effects of this operation on the outstanding socket calls.

Table 13. Effect of Shutdown Socket Call

Socket calls in local program	Local Program		Remote Program	
	Shutdown SEND	Shutdown RECEIVE	Shutdown RECEIVE	Shutdown SEND
Write calls	Error number EPIPE on first call		Error number EPIPE on second call*	
Read calls		Zero length return code		Zero length return code
* If you issue two write calls immediately, both might be successful, and an EPIPE error number might not be returned until a third write call is issued.				

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 117 shows an example of SHUTDOWN call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SHUTDOWN'.
    01  S               PIC 9(4) BINARY.
    01  HOW             PIC 9(8) BINARY.
        88  END-FROM      VALUE  0.
        88  END-TO        VALUE  1.
        88  END-BOTH      VALUE  2.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S HOW ERRNO RETCODE.
```

Figure 117. SHUTDOWN Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing SHUTDOWN. The field is left-justified and padded on the right with blanks.

S A halfword binary number set to the socket descriptor of the socket to be shutdown.

HOW A fullword binary field. Set to specify whether all or part of a connection is to be shut down. The following values can be set:

Value	Description
0 (END-FROM)	Ends further receive operations.
1 (END-TO)	Ends further send operations.
2 (END-BOTH)	Ends further send and receive operations.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See "Appendix B. Return Codes" on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

SOCKET

The SOCKET call creates an endpoint for communication and returns a socket descriptor representing the endpoint.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 118 on page 207 shows an example of SOCKET call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'SOCKET'.
    01  AF              PIC 9(8) COMP VALUE 2.
    01  SOCTYPE         PIC 9(8) BINARY.
        88  STREAM        VALUE  1.
        88  DATAGRAM      VALUE  2.

    01  PROTO           PIC 9(8) BINARY.
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION AF SOCTYPE
                    PROTO ERRNO RETCODE.
```

Figure 118. SOCKET Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing 'SOCKET'. The field is left-justified and padded on the right with blanks.

AF
A fullword binary field set to the addressing family. For TCP/IP the value is set to 2 for AF_INET.

SOCTYPE
A fullword binary field set to the type of socket required. The types are:

Value **Description**

1 Stream sockets provide sequenced, two-way byte streams that are reliable and connection-oriented. They support a mechanism for out-of-band data.

2 Datagram sockets provide datagrams, which are connectionless messages of a fixed maximum length whose reliability is not guaranteed. Datagrams can be corrupted, received out of order, lost, or delivered multiple times.

PROTO
A fullword binary field set to the protocol to be used for the socket. If this field is set to 0, the default protocol is used. For streams, the default is TCP; for datagrams, the default is UDP.

PROTO numbers are found in the *hlq*.etc.proto data set.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value **Description**

> or = 0
Contains the new socket descriptor

–1 Check ERRNO for an error code

TAKESOCKET

The TAKESOCKET call acquires a socket from another program and creates a new socket. Typically, a child server issues this call using client ID and socket descriptor data that it obtained from the concurrent server. See “GIVESOCKET” on page 166 for a discussion of the use of GETSOCKET and TAKESOCKET calls.

Note: When TAKESOCKET is issued, a new socket descriptor is returned in RETCODE. You should use this new socket descriptor in subsequent calls such as GETSOCKOPT, which require the S (socket descriptor) parameter.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 119 shows an example of TAKESOCKET call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'TAKESOCKET'.
    01  SOCRECV         PIC 9(4) BINARY.
    01  CLIENT.
        03  DOMAIN      PIC 9(8) BINARY.
        03  NAME        PIC X(8).
        03  TASK        PIC X(8).
        03  RESERVED    PIC X(20).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION  SOCRECV CLIENT
                     ERRNO RETCODE.
```

Figure 119. TAKESOCKET Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION

A 16-byte character field containing TAKESOCKET. The field is left-justified and padded to the right with blanks.

SOCRECV
A halfword binary field set to the descriptor of the socket to be taken. The socket to be taken is passed by the concurrent server.

CLIENT
Specifies the client ID of the program that is giving the socket. In CICS and IMS, these parameters are passed by the Listener program to the program that issues the TAKESOCKET call.

- In CICS, the information is obtained using EXEC CICS RETRIEVE.
- In IMS, the information is obtained by issuing GU TIM.

DOMAIN
A fullword binary field set to the domain of the program giving the socket. It is always 2, indicating AF_INET.

NAME Specifies an 8-byte character field set to the MVS address space identifier of the program that gave the socket.

TASK Specifies an 8-byte character field set to the task identifier of the task that gave the socket.

RESERVED
A 20-byte reserved field. This field is required, but not used.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See "Appendix B. Return Codes" on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
> or = 0	Contains the new socket descriptor
–1	Check ERRNO for an error code

TERMAPI

This call terminates the session created by INITAPI.

In the CICS environment, the use of TERMAPI is not recommended. CICS task termination processing automatically performs the functions of TERMAPI. A CICS application program should only issue TERMAPI if there is a particular need to terminate the session before task termination.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See "Addressability mode (Amode) considerations" under "Environmental Restrictions and Programming Requirements" on page 141.
ASC mode:	Primary address space control (ASC) mode

Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 120 shows an example of TERMAPI call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'TERMAPI'.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION.
```

Figure 120. TERMAPI Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing TERMAPI. The field is left-justified and padded to the right with blanks.

WRITE

The WRITE call writes data on a connected socket. This call is similar to SEND, except that it lacks the control flags available with SEND.

For datagram sockets the WRITE call writes the entire datagram if it fits into the receiving buffer.

Stream sockets act like streams of information with no boundaries separating data. For example, if a program wishes to send 1000 bytes, each call to this function can send any number of bytes, up to the entire 1000 bytes. The number of bytes sent will be returned in RETCODE. Therefore, programs using stream sockets should place this call in a loop, calling this function until all data has been sent.

See “EZACIC04” on page 214 for a subroutine that will translate EBCDIC output data to ASCII.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN
Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked

Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 121 shows an example of WRITE call instructions.

```
WORKING STORAGE
    01  SOC-FUNCTION    PIC X(16)  VALUE IS 'WRITE'.
    01  S               PIC 9(4) BINARY.
    01  NBYTE           PIC 9(8) BINARY.
    01  BUF             PIC X(length of buffer).
    01  ERRNO           PIC 9(8) BINARY.
    01  RETCODE         PIC S9(8) BINARY.

PROCEDURE
     CALL 'EZASOKET' USING SOC-FUNCTION S NBYTE BUF
                     ERRNO RETCODE.
```

Figure 121. WRITE Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

SOC-FUNCTION
A 16-byte character field containing WRITE. The field is left-justified and padded on the right with blanks.

S
A halfword binary field set to the socket descriptor.

NBYTE
A fullword binary field set to the number of bytes of data to be transmitted.

BUF
Specifies the buffer containing the data to be transmitted.

Parameter Values Returned to the Application:

ERRNO
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

Value	Description
≥0	A successful call. A return code greater than zero indicates the number of bytes of data written.
–1	Check ERRNO for an error code.

WRITEV

The WRITEV function writes data on a socket from a set of buffers.

The following requirements apply to this call:

Authorization:	Supervisor state or problem state, any PSW key
Dispatchable unit mode:	Task
Cross memory mode:	PASN = HASN

Amode:	31-bit or 24-bit **Note:** See “Addressability mode (Amode) considerations” under “Environmental Restrictions and Programming Requirements” on page 141.
ASC mode:	Primary address space control (ASC) mode
Interrupt status:	Enabled for interrupts
Locks:	Unlocked
Control parameters:	All parameters must be addressable by the caller and in the primary address space

Figure 122 shows an example of WRITEV call instructions.

```
WORKING-STORAGE SECTION.
01  SOKET-FUNCTION         PIC X(16) VALUE 'WRITE'.
01  S                      PIC 9(4)  BINARY.
01  IOVAMT                 PIC 9(4)  BINARY.

01  MSG-HDR.
    03 MSG_NAME            POINTER.
    03 MSG_NAME_LEN        POINTER.
    03 IOVPTR              POINTER.
    03 IOVCNT              POINTER.
    03 MSG_ACCRIGHTS       PIC X(4).
    03 MSG_ACCRIGHTS_LEN   PIC 9(4)  BINARY.

01  IOV.
    03 BUFFER-ENTRY OCCURS N TIMES.
      05 BUFFER_ADDR       POINTER.
      05 RESERVED          PIC X(4).
      05 BUFFER_LENGTH     PIC 9(4).

01  ERRNO                  PIC 9(8) BINARY.
01  RETCODE                PIC 9(8) BINARY.

PROCEDURE

    SET BUFFER-POINTER(1) TO ADDRESS-OF BUFFER1.
    SET BUFFER-LENGTH(1)  TO LENGTH-OF  BUFFER1.
    SET BUFFER-POINTER(2) TO ADDRESS-OF BUFFER2.
    SET BUFFER-LENGTH(2)  TO LENGTH-OF  BUFFER2.
    "   "                 "  "          "
    "   "                 "  "          "
    SET BUFFER-POINTER(n) TO ADDRESS-OF BUFFERn.
    SET BUFFER-LENGTH(n)  TO LENGTH-OF  BUFFERn.

    CALL 'EZASOKET' USING SOC-FUNCTION S IOV IOVCNT ERRNO RETCODE.
```

Figure 122. WRITEV Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values Set by the Application:

S
A value or the address of a halfword binary number specifying the descriptor of the socket from which the data is to be written.

IOV
An array of tripleword structures with the number of structures equal to the value in IOVCNT and the format of the structures as follows:

Fullword 1
The address of a data buffer.

Fullword 2
Reserved.

Fullword 3
The length of the data buffer referenced in Fullword 1.

IOVCNT
A fullword binary field specifying the number of data buffers provided for this call.

Parameters Returned by the Application:

ERRNO
A fullword binary field. If RETCODE is negative, this contains an error number. See “Appendix B. Return Codes” on page 249 for information about ERRNO return codes.

RETCODE
A fullword binary field.

Value	Meaning
<0	Error. Check ERRNO.
0	Connection partner has closed connection.
>0	Number of bytes sent.

Using Data Translation Programs for Socket Call Interface

In addition to the socket calls, you can use the following utility programs to translate data:

Data Translation

TCP/IP hosts and networks use ASCII data notation; MVS TCP/IP and its subsystems use EBCDIC data notation. In situations where data must be translated from one notation to the other, you can use the following utility programs:
- EZACIC04—Translates EBCDIC data to ASCII data
- EZACIC05—Translates ASCII data to EBCDIC data

Bit String Processing

In C-language, bit strings are often used to convey flags, switch settings, and so on; TCP/IP makes frequent uses of bit strings. However, since bit strings are difficult to decode in COBOL, TCP/IP includes:
- EZACIC06—Translates bit-masks into character arrays and character arrays into bit-masks.
- EZACIC08—Interprets the variable length address list in the HOSTENT structure returned by GETHOSTBYNAME or GETHOSTBYADDR.

EZACIC04:

The EZACIC04 program is used to translate EBCDIC data to ASCII data.

Figure 123 shows an example of EZACIC04 call instructions.

```
WORKING STORAGE
    01  OUT-BUFFER   PIC X(length of output).
    01  LENGTH       PIC 9(8) BINARY.

PROCEDURE
     CALL 'EZACIC04' USING OUT-BUFFER LENGTH.
```

Figure 123. EZACIC04 Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

OUT-BUFFER
A buffer that contains the following:
- When called – EBCDIC data
- Upon return – ASCII data

LENGTH
Specifies the length of the data to be translated.

EZACIC05:

The EZACIC05 program is used to translate ASCII data to EBCDIC data. EBCDIC data is required by COBOL, PL/1, and assembler language programs.

Figure 124 shows an example of EZACIC05 call instructions.

```
WORKING STORAGE
    01  IN-BUFFER    PIC X(length of output)
    01  LENGTH       PIC 9(8) BINARY VALUE

PROCEDURE
     CALL 'EZACIC05' USING IN-BUFFER LENGTH.
```

Figure 124. EZACIC05 Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

IN-BUFFER
A buffer that contains the following:
- When called – ASCII data
- Upon return – EBCDIC data

LENGTH
Specifies the length of the data to be translated.

EZACIC06:

The SELECT call uses bit strings to specify the sockets to test and to return the results of the test. Because bit strings are difficult to manage in COBOL, you might want to use the assembler language program EZACIC06 to translate them to character strings to be used with the SELECT call.

Figure 125 shows an example of EZACIC06 call instructions.

```
WORKING STORAGE
    01  CHAR-MASK.
        05 CHAR-STRING              PIC X(nn).

    01  CHAR-ARRAY  REDEFINES CHAR-MASK.
           05  CHAR-ENTRY-TABLE  OCCURS nn TIMES.
               10  CHAR-ENTRY       PIC X(1).
    01  BIT-MASK.
        05 BIT-ARRAY-FWDS           PIC 9(16) COMP.

    01  BIT-FUNCTION-CODES.
        05  CTOB                    PIC X(4) VALUE 'CTOB'.
        05  BTOC                    PIC X(4) VALUE 'BTOC'.

    01  BIT-MASK-LENGTH             PIC 9(8) COMP VALUE 50 .



PROCEDURE CALL (to convert from character to binary)
     CALL 'EZACIC06' USING CTOB
                           BIT-MASK
                           CHAR-MASK
                           BIT-MASK-LENGTH
                           RETCODE.


PROCEDURE CALL (to convert from binary to character)
     CALL 'EZACIC06' USING BTOC
                           BIT-MASK
                           CHAR-MASK
                           BIT-MASK-LENGTH
                           RETCODE.
```

Figure 125. EZACIC06 Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

TOKEN
Specifies a 16-character identifier. This identifier is required and it must be the first parameter in the list.

CH-MASK
Specifies the character array where *nn* is the maximum number of sockets in the array.

BIT-MASK
Specifies the bit string to be translated for the SELECT call. The bits are ordered right to left with the rightmost bit representing socket 0. The socket positions in the character array are indexed starting with 1, making socket 0 index number 1 in the character array. You should keep this in mind when turning character positions on and off.

COMMAND

BTOC—Specifies bit string to character array translation.

CTOB—Specifies character array to bit string translation.

BIT-MASK-LENGTH

Specifies the length of the bit-mask.

RETCODE

A binary field that returns one of the following:

Value	Description
0	Successful call
–1	Check ERRNO for an error code

Examples: If you want to use the SELECT call to test sockets 0, 5, and 9, and you are using a character array to represent the sockets, you must set the appropriate characters in the character array to 1. In this example, index positions 1, 6 and 10 in the character array are set to 1. Then you can call EZACIC06 with the COMMAND parameter set to CTOB. When EZACIC06 returns, BIT-MASK contains a fullword with bits 0, 5, and 9 (numbered from the right) turned on as required by the SELECT call. These instructions process the bit string shown in the following example.

```
MOVE ZEROS TO CHAR-STRING.
MOVE '1'TO CHAR-ENTRY(1), CHAR-ENTRY(6), CHAR-ENTRY(10).
CALL 'EZACIC06' USING TOKEN CTOB BIT-MASK CH-MASK
      BIT-LENGTH RETCODE.
MOVE BIT-MASK TO ....
```

When the select call returns and you want to check the bit-mask string for socket activity, enter the following instructions.

```
MOVE ..... TO BIT-MASK.
CALL 'EZACIC06' USING TOKEN BTOC BIT-MASK CH-MASK
         BIT-LENGTH RETCODE.
PERFORM TEST-SOCKET THRU TEST-SOCKET-EXIT  VARYING IDX
     FROM 1 BY 1 UNTIL IDX EQUAL 10.

TEST-SOCKET.
      IF CHAR-ENTRY(IDX) EQUAL '1'
           THEN PERFORM SOCKET-RESPONSE THRU SOCKET-RESPONSE-EXIT
           ELSE NEXT SENTENCE.
TEST-SOCKET-EXIT.
      EXIT.
```

EZACIC08:

The GETHOSTBYNAME and GETHOSTBYADDR calls were derived from C socket calls that return a structure known as HOSTENT. A given TCP/IP host can have multiple alias names and host internet addresses.

TCP/IP uses indirect addressing to connect the variable number of alias names and internet addresses in the HOSTENT structure that is returned by the GETHOSTBYADDR AND GETHOSTBYNAME calls.

If you are coding in PL/1 or assembler language, the HOSTENT structure can be processed in a relatively straight-forward manner. However, if you are coding in COBOL, HOSTENT can be more difficult to process and you should use the EZACIC08 subroutine to process it for you.

It works as follows:

- GETHOSTBYADDR or GETHOSTBYNAME returns a HOSTENT structure that indirectly addresses the lists of alias names and internet addresses.
- Upon return from GETHOSTBYADDR or GETHOSTBYNAME your program calls EZACIC08 and passes it the address of the HOSTENT structure. EZACIC08 processes the structure and returns the following:
  1. The length of host name, if present
  2. The host name
  3. The number of alias names for the host
  4. The alias name sequence number
  5. The length of the alias name
  6. The alias name
  7. The host internet address type, always 2 for AF_INET
  8. The host internet address length, always 4 for AF_INET
  9. The number of host internet addresses for this host
  10. The host internet address sequence number
  11. The host internet address
- If the GETHOSTBYADDR or GETHOSTBYNAME call returns more than one alias name or host internet address (steps 3 and 9 above), the application program should repeat the call to EZACIC08 until all alias names and host internet addresses have been retrieved.

Figure 126 on page 219 shows an example of EZACIC08 call instructions.

```
WORKING STORAGE

    01  HOSTENT-ADDR       PIC 9(8) BINARY.
    01  HOSTNAME-LENGTH    PIC 9(4) BINARY.
    01  HOSTNAME-VALUE     PIC X(255)
    01  HOSTALIAS-COUNT    PIC 9(4) BINARY.
    01  HOSTALIAS-SEQ      PIC 9(4) BINARY.
    01  HOSTALIAS-LENGTH   PIC 9(4) BINARY.
    01  HOSTALIAS-VALUE    PIC X(255)
    01  HOSTADDR-TYPE      PIC 9(4) BINARY.
    01  HOSTADDR-LENGTH    PIC 9(4) BINARY.
    01  HOSTADDR-COUNT     PIC 9(4) BINARY.
    01  HOSTADDR-SEQ       PIC 9(4) BINARY.
    01  HOSTADDR-VALUE     PIC 9(8) BINARY.
    01  RETURN-CODE        PIC 9(8) BINARY.

PROCEDURE

   CALL 'EZASOKET' USING 'GETHOSTBYxxxx'
                   HOSTENT-ADDR
                   RETCODE.

   Where xxxx is ADDR or NAME.

   CALL 'EZACIC08' USING HOSTENT-ADDR HOSTNAME-LENGTH
                   HOSTNAME-VALUE HOSTALIAS-COUNT HOSTALIAS-SEQ
                   HOSTALIAS-LENGTH HOSTALIAS-VALUE
                   HOSTADDR-TYPE HOSTADDR-LENGTH HOSTADDR-COUNT
                   HOSTADDR-SEQ HOSTADDR-VALUE RETURN-CODE
```

Figure 126. EZAZIC08 Call Instruction Example

For equivalent PL/I and assembler language declarations, see “Converting Parameter Descriptions” on page 143.

Parameter Values set by the Application

HOSTENT-ADDR
: This fullword binary field must contain the address of the HOSTENT structure (as returned by the GETHOSTBY*xxxx* call). This variable is the same as the variable HOSTENT in the GETHOSTBYADDR and GETHOSTBYNAME socket calls.

HOSTALIAS-SEQ
: This halfword field is used by EZACIC08 to index the list of alias names. When EZACIC08 is called, it adds one to the current value of HOSTALIAS-SEQ and uses the resulting value to index into the table of alias names. Therefore, for a given instance of GETHOSTBYxxxx, this field should be set to 0 for the initial call to EZACIC08. For all subsequent calls to EZACIC08, this field should contain the HOSTALIAS-SEQ number returned by the previous invocation.

HOSTADDR-SEQ
: This halfword field is used by EZACIC08 to index the list of IP addresses. When EZACIC08 is called, it adds one to the current value of HOSTADDR-SEQ and uses the resulting value to index into the table of IP addresses. Therefore, for a given instance of GETHOSTBYxxxx, this field should be set to 0 for the initial call to EZACIC08. For all subsequent calls to EZACIC08, this field should contain the HOSTADDR-SEQ number returned by the previous call.

Parameter Values Returned to the Application

HOSTNAME-LENGTH
This halfword binary field contains the length of the host name (if host name was returned).

HOSTNAME-VALUE
This 255-byte character string contains the host name (if host name was returned).

HOSTALIAS-COUNT
This halfword binary field contains the number of alias names returned.

HOSTALIAS-SEQ
This halfword binary field is the sequence number of the alias name currently found in HOSTALIAS-VALUE.

HOSTALIAS-LENGTH
This halfword binary field contains the length of the alias name currently found in HOSTALIAS-VALUE.

HOSTALIAS-VALUE
This 255-byte character string contains the alias name returned by this instance of the call. The length of the alias name is contained in HOSTALIAS-LENGTH.

HOSTADDR-TYPE
This halfword binary field contains the type of host address. For FAMILY type AF_INET, HOSTADDR-TYPE is always 2.

HOSTADDR-LENGTH
This halfword binary field contains the length of the host internet address currently found in HOSTADDR-VALUE. For FAMILY type AF_INET, HOSTADDR-LENGTH is always set to 4.

HOSTADDR-COUNT
This halfword binary field contains the number of host internet addresses returned by this instance of the call.

HOSTADDR-SEQ
This halfword binary field contains the sequence number of the host internet address currently found in HOSTADDR-VALUE.

HOSTADDR-VALUE
This fullword binary field contains a host internet address.

RETURN-CODE
This fullword binary field contains the EZACIC08 return code:

Value	Description
0	Successful completion
-1	Invalid HOSTENT address

Appendix A. Original COBOL Application Programming Interface (EZACICAL)

This appendix describes the first COBOL API provided with TCP/IP Version 2.2.1 for MVS. It is referred to as the EZACICAL API to distinguish it from the Sockets Extended API. (EZACICAL is the routine that is called for this API.)

It gives the format of each socket call and describes the call parameters. It starts with guidance on compiling COBOL programs.

Using the EZACICAL or Sockets Extended API

The EZACICAL API (described in this appendix) and the Sockets Extended API (described in Chapter 8) both provide sockets APIs for COBOL, PL/I, and Assembler language programs.

The Sockets Extended API is recommended because it has a simpler set of parameters for each call.

You might want to use the EZACICAL API if you have existing TCP/IP Version 2.2.1. for MVS COBOL/assembler language programs that require maintenance or modification.

COBOL Compilation

The procedure that you use to compile a (non-CICS TCP/IP) source VS COBOL II CICS program can be used for CICS TCP/IP programs, but it needs some modification.

The modified JCL procedure is shown in Figure 127 on page 222. The procedure contains 3 steps:

1. **TRN** translates the COBOL program
2. **COB** compiles the translated COBOL program
3. **LKED** link-edits the final module to a LOADLIB

```
//CICSRS2C JOB (999,POK),'CICSRS2',NOTIFY=CICSRS2,
//    CLASS=A,MSGCLASS=T,TIME=1439,
//    REGION=5000K,MSGLEVEL=(1,1)
//DFHEITVL PROC SUFFIX=1$,
//       INDEX='CICS410',
//       INDEX2='CICS410',
//       OUTC=*,
//       REG=2048K,
//       LNKPARM='LIST,XREF',
//       WORK=SYSDA
//TRN    EXEC PGM=DFHECP&SUFFIX,
//            PARM='COBOL2',
//            REGION=&REG
//STEPLIB  DD DSN=&INDEX2..SDFHLOAD,DISP=SHR
//SYSPRINT DD SYSOUT=&OUTC
//SYSPUNCH DD DSN=&&SYSCIN,
//            DISP=(,PASS),UNIT=&WORK,
//            DCB=BLKSIZE=400,
//            SPACE=(400,(400,100))
//*
//COB    EXEC PGM=IGYCRCTL,REGION=&REG,
//       PARM='NODYNAM,LIB,OBJECT,RENT,RES,APOST,MAP,XREF'
//STEPLIB  DD DSN=COBOL.V1R3M2.COB2COMP,DISP=SHR
//SYSLIB   DD DSN=&INDEX..SDFHCOB,DISP=SHR
//         DD DSN=&INDEX..SDFHMAC,DISP=SHR
//         DD DSN=CICSRS2.MAPA.DATA,DISP=SHR
//SYSPRINT DD SYSOUT=&OUTC
//SYSIN    DD DSN=&&SYSCIN,DISP=(OLD,DELETE)
//SYSLIN   DD DSN=&&LOADSET,DISP=(MOD,PASS),
//            UNIT=&WORK,SPACE=(80,(250,100))
//SYSUT1   DD UNIT=&WORK,SPACE=(460,(350,100))
//SYSUT2   DD UNIT=&WORK,SPACE=(460,(350,100))
//SYSUT3   DD UNIT=&WORK,SPACE=(460,(350,100))
//SYSUT4   DD UNIT=&WORK,SPACE=(460,(350,100))
//SYSUT5   DD UNIT=&WORK,SPACE=(460,(350,100))
//SYSUT6   DD UNIT=&WORK,SPACE=(460,(350,100))
//SYSUT7   DD UNIT=&WORK,SPACE=(460,(350,100))
//*                                                                        X
//*
//LKED   EXEC PGM=IEWL,REGION=&REG,
//            PARM='&LNKPARM',COND=(5,LT,COB)
//SYSLIB   DD DSN=&INDEX2..SDFHLOAD,DISP=SHR
//         DD DSN=SYS1.COBOL.V1R3M2.COB2CICS,DISP=SHR
//         DD DSN=COBOL.V1R3M2.COB2LIB,DISP=SHR
//         DD DSN=hlq.SEZATCP,DISP=SHR
//SYSLMOD  DD DSN=CICSRS2.CICS410.PGMLIB,DISP=SHR
//SYSUT1   DD UNIT=&WORK,DCB=BLKSIZE=1024,
//            SPACE=(1024,(200,20))
//SYSPRINT DD SYSOUT=&OUTC
//*                                                                         X
//SYSLIN   DD DSN=&&LOADSET,DISP=(OLD,DELETE)
//         DD DDNAME=SYSIN
//   PEND
//APPLPROG EXEC DFHEITVL
//TRN.SYSIN  DD DISP=SHR,DSN=CICSRS2.JCL.DATA(SISSRR1C)
//LKED.SYSIN DD *
   INCLUDE SYSLIB(EZACICAL)
   NAME SISSRR1C(R)
/*
```

Figure 127. Modified JCL for COBOL Compilation

The EZACICAL API

The EZACICAL API can be used by Assembler language, COBOL, or PL/I programs and is invoked by calling the EZACICAL routine. Although the calls to this routine perform the same function as the C language calls described in Chapter 7, the parameters are presented differently because of the differences in the languages. The equivalent to the return code provided by all C function calls is found in a decimal value parameter included as the last parameter variable.

COBOL

The following is the ‘EZACICAL’ call format for COBOL:

```
►►──CALL 'EZACICAL' USING TOKEN COMMAND──parm1, parm2, ...──ERRNO RETCODE.──────────────────────►◄
```

TOKEN
A 16-character field with the value 'TCPIPIUCVSTREAMS'

COMMAND
A binary halfword of value from 1 to 32, identifying the socket call.

parm*n* The parameters particular to each socket call. For example, BIND, described on page 225, has two such parameters: S (socket), which is a halfword binary, and NAME, which is a structure specifying a port name.

ERRNO
There is an error number in this field if the RETCODE is negative. This field is used in most, but not all, of the calls. It corresponds to the global errno variable in C.

RETCODE
A fullword binary variable containing the code returned by the EZACICAL call. This value corresponds to the normal return value of a C function.

PL/I

The following is the ‘EZACICAL’ call format for PL/I:

```
►►──CALL EZACICAL (TOKEN COMMAND──parm1, parm2, ...──ERRNO RETCODE);──────────────────────►◄
```

TOKEN
A 16-character field with the value 'TCPIPIUCVSTREAMS'

COMMAND
A binary halfword of value from 1 to 32, identifying the socket call.

parm*n* The parameters particular to each socket call. For example, BIND, described on page 225, has two such parameters: S (socket), which is a halfword binary, and NAME, which is a structure specifying a port name.

ERRNO
There is an error number in this field if the RETCODE is negative. This field is used in most, but not all, of the calls. It corresponds to the global errno variable in C.

RETCODE
A fullword binary variable containing the code returned by the EZACICAL call. This value corresponds to the normal return value of a C function.

Assembler Language

The following is the EZACICAL call format for assembler language:

```
►►──CALL EZACICAL,(TOKEN,COMMAND,──parm1, parm2, ...──ERRNO RETCODE),VL──────────────────────────────►◄
```

The parameter descriptions in this section are written using the COBOL language syntax and conventions. For assembler language, use the following conversions:

```
COBOL PIC

  PIC S9(4) COMP                      HALFWORD BINARY VALUE
  PIC S9(8) COMP                      FULLWORD BINARY VALUE
  PIC   X(n)                          CHARACTER FIELD OF N BYTES

ASSEMBLER DECLARATION

  DS    H                             HALFWORD BINARY VALUE
  DS    F                             FULLWORD BINARY VALUE
  DS    CLn                           CHARACTER FIELD OF n BYTES
```

COBOL and Assembler Language Socket Calls

The rest of this chapter describes the EZACICAL API call formats.

The descriptions assume you are using VS COBOL II. If you are using an earlier version, the picture clauses should read COMP rather than BINARY.

The following abbreviations are used:

H Halfword

F Fullword

D Doubleword

CL*n* Character format, length *n* bytes

XL*n* Hexadecimal format, length *n* bytes

ACCEPT

This call functions in the same way as the equivalent call described on page 144. The format of the COBOL call for ACCEPT is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S ZERO-FWRD NEW-S NAME ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
ZERO-FWRD	F	PIC 9(8) BINARY
NEW-S	F	PIC 9(8) BINARY

NAME STRUCTURE:		
Internet Family	H	PIC 9(4) BINARY
Port	H	PIC 9(4) BINARY
Internet Address	F	PIC 9(8) BINARY
Zeros	XL8	PIC X(8)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to 1 for the ACCEPT command

S The descriptor of the local socket on which the connection is accepted

ZERO-FWRD
Set to zeros

NEW-S
Set to −1. The system will return the socket number in the RETCODE field.

Note: Be sure to use **only** the socket number returned by the system.

Parameter Values Returned to the Application

NAME Structure giving the name of the port to which the new socket is connected

Internet Family
AF-INET is always returned

Port The port address of the new socket

Internet Address
The IP address of the new socket

Zeros Set to binary zeros or LOW VALUES

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
The socket number for new socket is returned. A RETCODE of −1 indicates an error.

BIND

This call functions in the same way as the equivalent call described on page 145. The format of the COBOL call for the BIND function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S NAME ERRNO RETCODE.
```

In assembler language, issue the macro call CALL EZACICAL, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY

S	H	PIC 9(4) BINARY
NAME STRUCTURE:		
Internet Family	H	PIC 9(4) BINARY
Port	H	PIC 9(4) BINARY
Internet Address	F	PIC 9(8) BINARY
Zeros	XL8	PIC X(8)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `2` for the BIND command

S The descriptor of the local socket to be bound

NAME Structure giving the name of the port to which the socket is to be bound, consisting of:

Internet Family
Must be set to 2 (AF-INET)

Port The local port address to which the socket is to be bound

Internet Address
The local IP address to which the socket is to be bound

Zeros Set to binary zeros or low values

Parameter Values Returned to the Application

NAME (*Port*)
If *Port* was set to 0, the system returns an available port.

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return of 0 indicates a successful call. A return of –1 indicates an error.

CLOSE

This call functions in the same way as the equivalent call described on page 147. The format of the COBOL call for the CLOSE function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S DZERO ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
ERRNO	F	PIC S9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `3` for the CLOSE command

S The descriptor of the socket to be closed

DZERO
Set to binary zeros or low values

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return of 0 indicates a successful call. A return of –1 indicates an error.

CONNECT

This call functions in the same way as the equivalent call described on page 149. The format of the COBOL call for the CONNECT function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S NAME ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
NAME STRUCTURE:		
Internet Family	H	PIC 9(4) BINARY
Port	H	PIC 9(4) BINARY
Internet Address	F	PIC 9(8) BINARY
Zeros	XL8	PIC X(8)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `4` for the CONNECT command

S The descriptor of the local socket to be used to establish a connection

NAME Structure giving the name of the port to which the socket is to be connected, consisting of:

Internet Family
Must be set to 2 (AF-INET)

Port The remote port number to which the socket is to be connected

Internet Address
The remote IP address to which the socket is to be connected

Zeros Set to binary zeros or low values

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in "Appendix B. Return Codes" on page 249.

RETCODE
A return of 0 indicates a successful call. A return of −1 indicates an error.

FCNTL

This call functions in the same way as the equivalent call described on page 151. The format of the COBOL call for the FCNTL function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S CMD ARG ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
CMD	F	PIC 9(8) BINARY
ARG	F	PIC 9(8)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `5` for the FCNTL command

S The socket descriptor whose FNDELAY flag is to be set or queried

CMD Set a value of 3 to query the FNDELAY flag of socket `s`. This is equivalent to setting the *cmd* parameter to F-GETFL in the fcntl() C call.

Set a value of 4 to set the FNDELAY flag of socket `s`. This is equivalent to setting the *cmd* parameter to F-SETFL in the fcntl() C call.

ARG If CMD is set to `4`, setting ARG to 4 will set the FNDELAY flag; setting ARG to 3 will reset the FNDELAY flag.

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in "Appendix B. Return Codes" on page 249.

RETCODE
: If CMD was set to 3, a bit mask is returned. If CMD was set to 4, a successful call is indicated by 0 in this field. In both cases, a RETCODE of –1 indicates an error.

GETCLIENTID

This call functions in the same way as the equivalent call described on page 152. The format of the COBOL call for the GETCLIENTID function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND HZERO DZERO CLIENTID ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
HZERO	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
CLIENTID STRUCTURE:		
Domain	F	PIC 9(8) BINARY
Name	CL8	PIC X(8)
Task	CL8	PIC X(8)
Reserved	XL20	PIC X(20)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
: Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
: Must be set to `30` for the GETCLIENTID command

HZERO
: Set to binary zeros or LOW VALUES

DZERO
: Set to binary zeros or LOW VALUES

CLIENTID

Domain
: Must be set to 2 (AF-INET)

Parameter Values Returned to the Application

CLIENTID
: Structure identifying the client as follows:

Name Address space identification is returned

Task Task identification is returned

Reserved
: Zeros or LOW VALUES are returned

ERRNO
: If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
: A return of 0 indicates a successful call. A return of −1 indicates an error.

GETHOSTID

This call functions in the same way as the equivalent call described on page 154. The format of the COBOL call for the GETHOSTID function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND HZERO DZERO ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
HZERO	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
: Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
: Must be set to 7 for the GETHOSTID command

HZERO
: Set to binary zeros or low values

DZERO
: Set to binary zeros or low values

Parameter Values Returned to the Application

ERRNO
: This field is not used

RETCODE
: Returns a fullword binary field containing the 32-bit internet address of the host. A value of -1 is a call failure, probably indicating that an INITAPI call has not been issued. There is no ERRNO parameter for this call.

GETHOSTNAME

This call functions in the same way as the equivalent call described on page 156. The format of the COBOL call for the GETHOSTNAME function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND HZERO DZERO NAMELEN NAME ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
HZERO	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
NAMELEN	F	PIC 9(8) BINARY
NAME	NAMELEN or larger	NAMELEN or larger
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to 8 for the GETHOSTNAME command

HZERO
Set to 0

DZERO
Set to binary zeros or low values

Parameter Values Returned to the Application

NAMELEN
The length of host name is returned. This cannot exceed 255.

NAME The host name returned from the call

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return of 0 indicates a successful call. A return of –1 indicates an error.

GETPEERNAME

This call functions in the same way as the equivalent call described on page 160. The format of the COBOL call for the GETPEERNAME function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S DZERO NAME ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
NAME	CL16	PIC X(16)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
: Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
: Must be set to `9` for the GETPEERNAME command

S
: The descriptor of the local socket connected to the requested peer

DZERO
: Set to binary zeros or low values

Parameter Values Returned to the Application

NAME
: The peer name returned from the call

ERRNO
: If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
: A return of 0 indicates a successful call. A return of –1 indicates an error.

GETSOCKNAME

This call functions in the same way as the equivalent call described on page 161. The format of the COBOL call for the GETSOCKNAME function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S DZERO NAME ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
NAME STRUCTURE:		
Internet Family	H	PIC 9(4) BINARY
Port	H	PIC 9(4) BINARY
Internet Address	F	PIC 9(8) BINARY
Zeros	XL8	PIC X(8)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
: Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
: Must be set to `10` for the GETSOCKNAME command

S
: The descriptor of the local socket whose address is required

DZERO
: Set to binary zeros or low values

NAME
: Structure giving the name of the port to which the socket is bound, consisting of:

Internet Family
Must be set to 2 (AF-INET).

Port The local port address to which the socket is bound

Internet Address
The local IP address to which the socket is bound

Zeros Set to binary zeros or low values

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return of 0 indicates a successful call. A return of −1 indicates an error.

GETSOCKOPT

This call functions in the same way as the equivalent call described on page 163. The format of the COBOL call for the GETSOCKOPT function is:

```
CALL 'EZACICAL'
     USING TOKEN COMMAND S LEVEL OPTNAME OPTLEN OPTVAL ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
LEVEL	F	PIC X(4)
OPTNAME	F	PIC X(4)
OPTLEN	F	PIC 9(8) BINARY
OPTVAL	CL4	PIC X(4)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to 11 for the GETSOCKOPT command

S The descriptor of the socket whose option settings are required

LEVEL
| This must be set to X'0000FFFF'.

OPTNAME
Set this field to specify the option to be queried, as shown below. For a description of these options, see “GETSOCKOPT” on page 163

Value	**Meaning**
X'00000004'	SO-REUSEADDR
X'00000020'	SO-BROADCAST

X'00001007'	SO-ERROR
X'00000080'	SO-LINGER
X'00000100'	SO-OOBINLINE
X'00001001'	SO-SNDBUF
X'00001008'	SO-TYPE
X'80000001'	TCP_NODELAY

Parameter Values Returned to the Application

OPTLEN
The length of the option data

OPTVAL
The value of the option. For all options except SO-LINGER, an integer indicates that the option is enabled, while a 0 indicates it is disabled. For SO-LINGER, the following structure is returned:

```
ONOFF    F    PIC X(4)
LINGER   F    PIC 9(4)
```

A nonzero value of ONOFF indicates that the option is enabled, and 0, that it is disabled. The LINGER value indicates the amount of time to linger after close.

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return of 0 indicates a successful call. A return of −1 indicates an error.

GIVESOCKET

This call functions in the same way as the equivalent call described on page 166. The format of the COBOL call for the GIVESOCKET function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S CLIENTID ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
CLIENTID STRUCTURE:		
Domain	F	PIC 9(8) BINARY
Name	CL8	PIC X(8)
Task	CL8	PIC X(8)
Reserved	XL20	PIC X(20)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `31` for the GIVESOCKET command

S The socket descriptor of the socket to be given

CLIENTID
Structure identifying the client ID of this application, as follows:

Domain
Must be set to 2 (AF-INET)

Name Set to the address space identifier obtained from GETCLIENTID

Task Set to blanks

Reserved
Set to binary zeros or low values

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return of 0 indicates a successful call. A return of –1 indicates an error.

INITAPI

The format of the COBOL call for the INITAPI function is:

```
CALL 'EZACICAL'
     USING TOKEN COMMAND IDENT MAX-SOCK API SUBTASK FZERO ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
IDENT	CL8	PIC X(8)
MAX-SOCK	H	PIC 9(4) BINARY
API	H	PIC 9(4) BINARY
SUBTASK	XL8	PIC X(8)
FZERO	F	PIC 9(8) BINARY
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `0` for the INITAPI command

IDENT Must be set to `'IUCVAPI'`.

MAX-SOCK
The maximum number of sockets to be supported in this application. For performance reasons, this should be one greater than the actual maximum. This value cannot exceed 2000. The minimum value is 50.

API Must be set to `2`, indicating use of the sockets API

SUBTASK
A unique subtask identifier. It should consist of the 7-character CICS task number and any printable character.

FZERO
Zeros

Parameter Values Returned to the Application

ERRNO
If RETCODE=0, contains the highest socket number available to this program.

RETCODE
A return of 0 indicates a successful call. A return of −1 indicates an error.

IOCTL

This call functions in the same way as the equivalent call described on page 170. The format of the COBOL call for the IOCTL function is:

```
CALL 'EZACICAL'
     USING TOKEN COMMAND S IOCTLCMD REQARG RETARG ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
IOCTLCMD	F	PIC 9(8)
REQARG	var	var
RETARG	var	var
ERRNO	F	PIC S9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `12` for the IOCTL command

S The descriptor of the socket to be controlled

IOCTLCMD
Set to the command value to be passed to IOCTL. See "IOCTL" on page 170 for values and descriptions.

REQARG
The request argument associated with the command. See "IOCTL" on page 170 for a list and description of possible argument values.

Parameter Values Returned to the Application

RETARG
The return argument. See "IOCTL" on page 170 for a description of the return argument for each command.

ERRNO
: If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
: A return value of 0 indicates a successful call. A return value of −1 indicates an error.

LISTEN

This call functions in the same way as the equivalent call described on page 174. The format of the COBOL call for the LISTEN function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S FZERO BACKLOG ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
FZERO	F	PIC 9(8) BINARY
BACKLOG	F	PIC 9(8) BINARY
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
: Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
: Must be set to `13` for the LISTEN command

S
: The descriptor of the socket that is going to listen for incoming connection requests

FZERO
: Set to binary zeros or low values

BACKLOG
: Set to the number of connection requests to be queued

Parameter Values Returned to the Application

ERRNO
: If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
: A return value of 0 indicates a successful call. A return value of −1 indicates an error.

READ

This call functions in the same way as the equivalent call described on page 176. The format of the COBOL call for the READ function is:

```
CALL 'EZACICAL'
     USING TOKEN COMMAND S DZERO NBYTE FILLER BUF ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
DZERO	D	PIC X(8)
NBYTE	F	PIC 9(8) BINARY
FILLER	CL16	PIC X(16)
BUF	NBYTE or larger	NBYTE or larger
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
: Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
: Must be set to `14` for the READ command

S
: The descriptor of the socket that is going to read data

DZERO
: Set to binary zeros or low values

NBYTE
: Set to the length of the buffer (maximum 32 767 bytes)

Parameter Values Returned to the Application

FILLER
: Your program should ignore this field.

BUF
: The input buffer.

ERRNO
: If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
: A positive value indicates the number of bytes copied into the buffer. A value of 0 indicates that the socket is closed. A value of –1 indicates an error.

See “EZACIC05” on page 215 for a subroutine that will translate ASCII data to EBCDIC.

RECVFROM

This call functions in the same way as the equivalent call described on page 179. The format of the COBOL call for the RECVFROM function is:

```
CALL 'EZACICAL'
     USING TOKEN COMMAND S FZERO FLAGS NBYTE FROM BUF ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
FZERO	F	PIC 9(8) BINARY
FLAGS	F	PIC 9(8) BINARY
NBYTE	F	PIC 9(8) BINARY
FROM	CL16	PIC X(16)
BUF	NBYTE or larger	NBYTE or larger
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `16` for the RECVFROM command

S The descriptor of the socket receiving data

FZERO
Set to binary zeros or low values

FLAGS
Set to 2 to peek at (read) data, but not destroy it, so that any subsequent RECVFROM calls will read the same data. CICS TCP/IP does not support out-of-band data.

NBYTE
Set to the length of the input buffer. This length cannot exceed 32 768 bytes.

Parameter Values Returned to the Application

FROM The socket address structure identifying the `from` address of the data.

BUF The input buffer.

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A positive value indicates the number of bytes copied into the buffer. A value of 0 indicates that the socket is closed. A value of −1 indicates an error.

See “EZACIC05” on page 215 for a subroutine that will translate ASCII data to EBCDIC.

SELECT

This call functions in the same way as the equivalent call described on page 187. The format of the COBOL call for the SELECT function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND LOM NUM-FDS
TIME-SW RD-SW WR-SW EX-SW
TIMEOUT RD-MASK WR-MASK EX-MASK
DZERO R-R-MASK R-W-MASK R-E-MASK
ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
LOM	H	PIC 9(4) BINARY
NUM-FDS	F	PIC 9(8) BINARY
TIME-SW	F	PIC 9(8) BINARY
RD-SW	F	PIC 9(8) BINARY
WR-SW	F	PIC 9(8) BINARY
EX-SW	F	PIC 9(8) BINARY
TIMEOUT STRUCTURE:		
Seconds	F	PIC 9(8) BINARY
Milliseconds	F	PIC 9(8) BINARY
RD-MASK	Length Of Mask*	Length Of Mask*
WR-MASK	Length of Mask*	Length of Mask*
EX-MASK	Length of Mask*	Length of Mask*
DZERO	D	PIC X(8)
R-R-MASK	Length of Mask*	Length of Mask*
R-W-MASK	Length of Mask*	Length of Mask*
R-E-MASK	Length of Mask*	Length of Mask*
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

***How to Calculate Length of Mask (LOM):**

1. LOM = ((NUM-FDS + 31)/32) * 4, using integer arithmetic.
2. So, for NUM-FDS ≤ 32, LOM = 4 bytes.
3. For 33 ≤ NUM-FDS ≤ 64, LOM = 8 bytes, and so on.

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `19` for the SELECT command

LOM Set to the length of mask. The calculation method is given above.

NUM-FDS
The number of socket descriptors to check. For efficiency, it should be set to the largest number of socket descriptors plus 1.

TIME-SW
Set to 0 to specify a wait forever on socket descriptor activity. Set to 1 to specify a timeout value; this blocks the call until the timeout value is exceeded or until there is socket activity.

RD-SW
Set either 0 (do not check for read interrupts) or 1 (check for read interrupts).

WR-SW
Set either 0 (do not check for write interrupts) or 1 (check for write interrupts).

EX-SW
Set either 0 (do not check for exception interrupts) or 1 (check for exception interrupts).

TIMEOUT
Use this structure to set the timeout value if no activity is detected. Setting this structure to (0,0) indicates that SELECT should act as a polling function; that is, as nonblocking.

Seconds
Set to the seconds component of the timeout value.

Milliseconds
Set to the milliseconds component of the timeout value (in the range 0 through 999).

RD-MASK
Set the bit mask array for reads. See *z/OS Communications Server: IP Programmer's Reference* for more information.

WR-MASK
Set the bit mask array for writes. See *z/OS Communications Server: IP Programmer's Reference* for more information.

EX-MASK
Set the bit mask array for exceptions. See *z/OS Communications Server: IP Programmer's Reference* for more information.

DZERO
Set to binary zeros or low values.

Parameter Values Returned to the Application

R-R-MASK
Returned bit mask array for reads. See *z/OS Communications Server: IP Programmer's Reference* for more information.

R-W-MASK
Returned bit mask array for writes. See *z/OS Communications Server: IP Programmer's Reference* for more information.

R-E-MASK
Returned bit mask array for exceptions. See *z/OS Communications Server: IP Programmer's Reference* for more information.

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in "Appendix B. Return Codes" on page 249.

RETCODE
A positive value indicates the total number of ready sockets in all bit masks. A value of 0 indicates an expired time limit. A value of –1 indicates an error.

SEND

This call functions in the same way as the equivalent call described on page 194. The format of the COBOL call for the SEND function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S NBYTE FLAGS DZERO BUF ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
NBYTE	F	PIC 9(8) BINARY
FLAGS	F	PIC 9(8) BINARY
DZERO	D	PIC X(8)
BUF	NBYTE or larger	NBYTE or larger
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `20` for the SEND command

S The descriptor of the socket sending the data

NBYTE
Set to the number of bytes to be transmitted (maximum 32 768 bytes)

FLAGS
Set to 0 (no flags) or 4 (do not route, routing is provided). CICS TCP/IP does not support out-of-band data.

DZERO
Set to binary zeros or low values

BUF Buffer from which data is transmitted

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A value of −1 indicates an error. Other values have no meaning.

See “EZACIC04” on page 214 for a subroutine that will translate EBCDIC data to ASCII.

SENDTO

This call functions in the same way as the equivalent call described on page 199. The format of the COBOL call for the SENDTO function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S LEN FLAGS NAME BUF ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
LEN	F	PIC 9(8) BINARY
FLAGS	F	PIC 9(8) BINARY
NAME STRUCTURE:		
in-family	H	PIC 9(4) BINARY
in-port	H	PIC 9(4) BINARY
in-address	F	PIC 9(8) BINARY
dzero	D	PIC X(8)
BUF	LEN or larger	LEN or larger
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to 22 for the SENDTO command

S The descriptor of the socket sending the data

LEN The number of bytes to be transmitted (maximum 32 768 bytes)

FLAGS
Set to 0 (no flags) or 4 (do not route, routing is provided)

NAME Structure specifying the address to which data is to be sent, as follows:

in-family
Must be set to 2 (AF-INET)

in-port Set to the port number for receiver

in-address
Set to the IP address for receiver

dzero Set to binary zeros or low values

BUF Set to the buffer from which data is transmitted

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A value of −1 indicates an error. Other values have no meaning.

See “EZACIC04” on page 214 for a subroutine that will translate EBCDIC data to ASCII.

SETSOCKOPT

This call functions in the same way as the equivalent call described on page 163. The format of the COBOL call for the SETSOCKOPT function is:

```
CALL 'EZACICAL'
    USING TOKEN COMMAND S LEN LEVEL OPTNAME OPTVAL ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
LEN	F	PIC 9(8) BINARY
LEVEL	F	PIC X(4)
OPTNAME	F	PIC 9(8) BINARY
OPTVAL	CL4	PIC X(4)
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to ’TCPIPIUCVSTREAMS’

COMMAND
Must be set to `23` for the SETSOCKOPT command

S The descriptor of the socket whose options are to be set

LEN Set to the length of OPTVAL

LEVEL
| This must be set to X'0000FFFF'.

OPTNAME
Set this field to specify the option to be set, as shown below. See “SETSOCKOPT” on page 201 for a description of these settings.

Value	Meaning
X'00000020'	SO-BROADCAST
X'00000080'	SO-LINGER
X'00000100'	SO-OOBINLINE
X'00000004'	SO-REUSEADDR
X'80000001'	TCP_NODELAY

OPTVAL
For SO-BROADCAST, SO-OOBINLINE, and SO-REUSEADDR, set to a nonzero integer to enable the option specified in OPTNAME, and set to 0 to disable the option. For SO-LINGER, see the equivalent OPTVAL parameter in “SETSOCKOPT” on page 201.

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return value of 0 indicates a successful call. A return value of –1 indicates an error.

SHUTDOWN

This call functions in the same way as the equivalent call described on page 204. The format of the COBOL call for the SHUTDOWN function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S FZERO HOW ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
FZERO	F	PIC 9(8) BINARY
HOW	F	PIC 9(8) BINARY
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `24` for the SHUTDOWN command

S The descriptor of the socket to be shut down

FZERO
Set to zeros

HOW Set this to specify whether all or part of a connection is to be shut down, as follows:

Value	**Meaning**
0	Ends communication from the socket
1	Ends communication to the socket
2	Ends communication both to and from the socket

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
A return value of 0 indicates a successful call. A return value of −1 indicates an error.

SOCKET

This call functions in the same way as the equivalent call described on page 206. The format of the COBOL call for the SOCKET function is:

```
CALL 'EZACICAL'
     USING TOKEN COMMAND HZERO AF TYPE PROTOCOL SOCKNO ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
HZERO	H	PIC 9(4) BINARY
AF	F	PIC 9(8) BINARY
TYPE	F	PIC 9(8) BINARY
PROTOCOL	F	PIC 9(8) BINARY
SOCKNO	F	PIC 9(8) BINARY
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `25` for the SOCKET command

HZERO
Set to binary zeros or low values

AF Must be set to 2 (AF-INET)

TYPE Set to `1` for TCP sockets; `2` for UDP sockets.

PROTOCOL
Set to `0`. (The system will select the appropriate protocol for the TYPE specified above.)

SOCKNO
Set to −1. The system will return the socket number in the RETCODE field.

Note: Be sure to use **only** the socket number returned by the system.

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in "Appendix B. Return Codes" on page 249.

RETCODE
The socket number for the new socket is returned. A RETCODE of −1 indicates an error.

TAKESOCKET

This call functions in the same way as the equivalent call described on page 208. The format of the COBOL call for the TAKESOCKET function is:

```
CALL 'EZACICAL'
    USING TOKEN COMMAND HZERO CLIENTID L-DESC SOCKNO ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY

HZERO	H	PIC 9(4) BINARY
CLIENTID STRUCTURE:		
Domain	F	PIC 9(8) BINARY
Name	CL8	PIC X(8)
Task	CL8	PIC X(8)
Reserved	CL20	PIC X(20)
L-DESC	F	PIC 9(8) BINARY
SOCKNO	F	PIC 9(8) BINARY
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC 9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `32` for the TAKESOCKET command

HZERO
Set to zeros

CLIENTID
Structure specifying the client ID of this program:

Domain
Must be set to 2 (AF-INET)

Name Set to address space identifier, obtained from GETCLIENTID

Task Set to CICS task number with `L` at the right end

Reserved
Set to binary zeros or LOW VALUES

L-DESC
Set to the descriptor (as used by the socket-giving program) of the socket being passed.

SOCKNO
Set to −1. The system will return the socket number in the RETCODE field.

Note: Be sure to use **only** the socket number returned by the system.

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
The socket number for the new socket is returned. A RETCODE of −1 indicates an error.

WRITE

This call functions in the same way as the equivalent call described on page 210. The format of the COBOL call for the WRITE function is:

```
CALL 'EZACICAL' USING TOKEN COMMAND S NBYTE FZERO SZERO BUF ERRNO RETCODE.
```

In assembler language, issue the macro call `CALL EZACICAL`, using standard assembler call syntax (for the call format, see page 224).

Parameter Lengths in Assembler Language and COBOL

TOKEN	CL16	PIC X(16)
COMMAND	H	PIC 9(4) BINARY
S	H	PIC 9(4) BINARY
NBYTE	F	PIC 9(8) BINARY
FZERO	F	PIC 9(8) BINARY
SZERO	XL16	PIC X(16)
BUF	NBYTE or larger	NBYTE or larger
ERRNO	F	PIC 9(8) BINARY
RETCODE	F	PIC S9(8) BINARY

Parameter Values to Be Set by the Application

TOKEN
Must be set to 'TCPIPIUCVSTREAMS'

COMMAND
Must be set to `26` for the WRITE command

S The descriptor of the socket from which data is to be transmitted

NBYTE
Set to the number of bytes of data to be transmitted. This value cannot exceed 32 768 bytes.

FZERO
Set to binary zeros or LOW VALUES

SZERO
Set to binary zeros or LOW VALUES

BUF Buffer containing data to be transmitted

Parameter Values Returned to the Application

ERRNO
If RETCODE is negative, this contains an error number. Error numbers are described in “Appendix B. Return Codes” on page 249.

RETCODE
The number of bytes written is returned. A RETCODE of −1 indicates an error.

See “EZACIC04” on page 214 for a subroutine that will translate EBCDIC data to ASCII.

Appendix B. Return Codes

This appendix covers the following return codes and error messages

- Error numbers from MVS TCP/IP
- Error codes from the Sockets Extended interface.

Sockets Return Codes (ERRNOs)

This section provides the system-wide message numbers and codes set by the system calls. These message numbers and codes are in the TCPERRNO.H include file supplied with TCP/IP Services.

Table 14. Sockets ERRNOs

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
1	EPERM	All	Permission is denied. No owner exists.	Check that TPC/IP is still active; check protocol value of socket () call.
1	EDOM	All	Argument too large.	Check parameter values of the function call.
2	ENOENT	All	The data set or directory was not found.	Check files used by the function call.
2	ERANGE	All	The result is too large.	Check parameter values of the function call.
3	ESRCH	All	The process was not found. A table entry was not located.	Check parameter values and structures pointed to by the function parameters.
4	EINTR	All	A system call was interrupted.	Check that the socket connection and TCP/IP are still active.
5	EIO	All	An I/O error occurred.	Check status and contents of source database if this occurred during a file access.
6	ENXIO	All	The device or driver was not found.	Check status of the device attempting to access.
7	E2BIG	All	The argument list is too long.	Check the number of function parameters.
8	ENOEXEC	All	An EXEC format error occurred.	Check that the target module on an exec call is a valid executable module.
9	EBADF	All	An incorrect socket descriptor was specified.	Check socket descriptor value. It might be currently not in use or incorrect.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
9	EBADF	Givesocket	The socket has already been given. The socket domain is not AF_INET.	Check the validity of function parameters.
9	EBADF	Select	One of the specified descriptor sets is an incorrect socket descriptor.	Check the validity of function parameters.
9	EBADF	Takesocket	The socket has already been taken.	Check the validity of function parameters.
10	ECHILD	All	There are no children.	Check if created subtasks still exist.
11	EAGAIN	All	There are no more processes.	Retry the operation. Data or condition might not be available at this time.
12	ENOMEM	All	There is not enough storage.	Check validity of function parameters.
13	EACCES	All	Permission denied, caller not authorized.	Check access authority of file.
13	EACCES	Takesocket	The other application (listener) did not give the socket to your application. Permission denied, caller not authorized.	Check access authority of file.
14	EFAULT	All	An incorrect storage address or length was specified.	Check validity of function parameters.
15	ENOTBLK	All	A block device is required.	Check device status and characteristics.
16	EBUSY	All	Listen has already been called for this socket. Device or file to be accessed is busy.	Check if the device or file is in use.
17	EEXIST	All	The data set exists.	Remove or rename existing file.
18	EXDEV	All	This is a cross-device link. A link to a file on another file system was attempted.	Check file permissions.
19	ENODEV	All	The specified device does not exist.	Check file name and if it exists.
20	ENOTDIR	All	The specified directory is not a directory.	Use a valid file that is a directory.
21	EISDIR	All	The specified directory is a directory.	Use a valid file that is not a directory.
22	EINVAL	All types	An incorrect argument was specified.	Check validity of function parameters.
23	ENFILE	All	Data set table overflow occurred.	Reduce the number of open files.
24	EMFILE	All	The socket descriptor table is full.	Check the maximum sockets specified in MAXDESC().

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
25	ENOTTY	All	An incorrect device call was specified.	Check specified IOCTL() values.
26	ETXTBSY	All	A text data set is busy.	Check the current use of the file.
27	EFBIG	All	The specified data set is too large.	Check size of accessed dataset.
28	ENOSPC	All	There is no space left on the device.	Increase the size of accessed file.
29	ESPIPE	All	An incorrect seek was attempted.	Check the offset parameter for seek operation.
30	EROFS	All	The data set system is Read only.	Access data set for read only operation.
31	EMLINK	All	There are too many links.	Reduce the number of links to the accessed file.
32	EPIPE	All	The connection is broken. For socket write/send, peer has shut down one or both directions.	Reconnect with the peer.
33	EDOM	All	The specified argument is too large.	Check and correct function parameters.
34	ERANGE	All	The result is too large.	Check function parameter values.
35	EWOULDBLOCK	Accept	The socket is in nonblocking mode and connections are not queued. This is not an error condition.	Reissue Accept().
35	EWOULDBLOCK	Read Recvfrom	The socket is in nonblocking mode and read data is not available. This is not an error condition.	Issue a select on the socket to determine when data is available to be read or reissue the Read()/Recvfrom().
35	EWOULDBLOCK	Send Sendto Write	The socket is in nonblocking mode and buffers are not available.	Issue a select on the socket to determine when data is available to be written or reissue the Send(), Sendto(), or Write().
36	EINPROGRESS	Connect	The socket is marked nonblocking and the connection cannot be completed immediately. This is not an error condition.	See the Connect() description for possible responses.
37	EALREADY	Connect	The socket is marked nonblocking and the previous connection has not been completed.	Reissue Connect().
37	EALREADY	Maxdesc	A socket has already been created calling Maxdesc() or multiple calls to Maxdesc().	Issue Getablesize() to query it.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
37	EALREADY	Setibmopt	A connection already exists to a TCP/IP image. A call to SETIBMOPT (IBMTCP_IMAGE), has already been made.	Only call Setibmopt() once.
38	ENOTSOCK	All	A socket operation was requested on a nonsocket connection. The value for socket descriptor was not valid.	Correct the socket descriptor value and reissue the function call.
39	EDESTADDRREQ	All	A destination address is required.	Fill in the destination field in the correct parameter and reissue the function call.
40	EMSGSIZE	Sendto Sendmsg Send Write	The message is too long. It exceeds the IP limit of 64K or the limit set by the setsockopt() call.	Either correct the length parameter, or send the message in smaller pieces.
41	EPROTOTYPE	All	The specified protocol type is incorrect for this socket.	Correct the protocol type parameter.
42	ENOPROTOOPT	Getsockopt Setsockopt	The socket option specified is incorrect or the level is not SOL_SOCKET. Either the level or the specified optname is not supported.	Correct the level or optname.
42	ENOPROTOOPT	Getibmsockopt Setibmsockopt	Either the level or the specified optname is not supported.	Correct the level or optname.
43	EPROTONOSUPPORT	Socket	The specified protocol is not supported.	Correct the protocol parameter.
44	ESOCKTNOSUPPORT	All	The specified socket type is not supported.	Correct the socket type parameter.
45	EOPNOTSUPP	Accept Givesocket	The selected socket is not a stream socket.	Use a valid socket.
45	EOPNOTSUPP	Listen	The socket does not support the Listen call.	Change the type on the Socket() call when the socket was created. Listen() only supports a socket type of SOCK_STREAM.
45	EOPNOTSUPP	Getibmopt Setibmopt	The socket does not support this function call. This command is not supported for this function.	Correct the command parameter. See Getibmopt() for valid commands. Correct by ensuring a Listen() was not issued before the Connect().
46	EPFNOSUPPORT	All	The specified protocol family is not supported or the specified domain for the client identifier is not AF_INET=2.	Correct the protocol family.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
47	EAFNOSUPPORT	Bind Connect Socket	The specified address family is not supported by this protocol family.	For Socket(), set the domain parameter to AF_INET. For Bind() and Connect(), set Sin_Family in the socket address structure to AF_INET.
47	EAFNOSUPPORT	Getclient Givesocket	The socket specified by the socket descriptor parameter was not created in the AF_INET domain.	The Socket() call used to create the socket should be changed to use AF_INET for the domain parameter.
48	EADDRINUSE	Bind	The address is in a timed wait because a LINGER delay from a previous close or another process is using the address.	If you want to reuse the same address, use Setsockopt() with SO_REUSEADDR. See Setsockopt(). Otherwise, use a different address or port in the socket address structure.
49	EADDRNOTAVAIL	Bind	The specified address is incorrect for this host.	Correct the function address parameter.
49	EADDRNOTAVAIL	Connect	The calling host cannot reach the specified destination.	Correct the function address parameter.
50	ENETDOWN	All	The network is down.	Retry when the connection path is up.
51	ENETUNREACH	Connect	The network cannot be reached.	Ensure that the target application is active.
52	ENETRESET	All	The network dropped a connection on a reset.	Reestablish the connection between the applications.
53	ECONNABORTED	All	The software caused a connection abend.	Reestablish the connection between the applications.
54	ECONNRESET	All	The connection to the destination host is not available.	N/A
54	ECONNRESET	Send Write	The connection to the destination host is not available.	The socket is closing. Issue Send() or Write() before closing the socket.
55	ENOBUFS	All	No buffer space is available.	Check the application for massive storage allocation call.
55	ENOBUFS	Accept	Not enough buffer space is available to create the new socket.	Call your system administrator.
55	ENOBUFS	Send Sendto Write	Not enough buffer space is available to send the new message.	Call your system administrator.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
55	ENOBUFS	Takesocket	Not enough buffer space is available to create the new socket.	Call your system administrator.
56	EISCONN	Connect	The socket is already connected.	Correct the socket descriptor on Connect() or do not issue a Connect() twice for the socket.
57	ENOTCONN	All	The socket is not connected.	Connect the socket before communicating.
58	ESHUTDOWN	All	A Send cannot be processed after socket shutdown.	Issue read/receive before shutting down the read side of the socket.
59	ETOOMANYREFS	All	There are too many references. A splice cannot be completed.	Call your system administrator.
60	ETIMEDOUT	Connect	The connection timed out before it was completed.	Ensure the server application is available.
61	ECONNREFUSED	Connect	The requested connection was refused.	Ensure server application is available and at specified port.
62	ELOOP	All	There are too many symbolic loop levels.	Reduce symbolic links to specified file.
63	ENAMETOOLONG	All	The file name is too long.	Reduce size of specified file name.
64	EHOSTDOWN	All	The host is down.	Restart specified host.
65	EHOSTUNREACH	All	There is no route to the host.	Set up network path to specified host and verify that host name is valid.
66	ENOTEMPTY	All	The directory is not empty.	Clear out specified directory and reissue call.
67	EPROCLIM	All	There are too many processes in the system.	Decrease the number of processes or increase the process limit.
68	EUSERS	All	There are too many users on the system.	Decrease the number of users or increase the user limit.
69	EDQUOT	All	The disk quota has been exceeded.	Call your system administrator.
70	ESTALE	All	An old NFS** data set handle was found.	Call your system administrator.
71	EREMOTE	All	There are too many levels of remote in the path.	Call your system administrator.
72	ENOSTR	All	The device is not a stream device.	Call your system administrator.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
73	ETIME	All	The timer has expired.	Increase timer values or reissue function.
74	ENOSR	All	There are no more stream resources.	Call your system administrator.
75	ENOMSG	All	There is no message of the desired type.	Call your system administrator.
76	EBADMSG	All	The system cannot read the message.	Verify that z/OS CSinstallation was successful and that message files were properly loaded.
77	EIDRM	All	The identifier has been removed.	Call your system administrator.
78	EDEADLK	All	A deadlock condition has occurred.	Call your system administrator.
78	EDEADLK	Select Selectex	None of the sockets in the socket desriptor sets are either AF_NET or AF_IUCV sockets and there is not timeout or no ECB specified. The select/selectex would never complete.	Correct the socket descriptor sets so that an AF_NET or AF_IUCV socket is specified. A timeout or ECB value can also be added to avoid the select/selectex from waiting indefinitely.
79	ENOLCK	All	No record locks are available.	Call your system administrator.
80	ENONET	All	The requested machine is not on the network.	Call your system administrator.
81	ERREMOTE	All	The object is remote.	Call your system administrator.
82	ENOLINK	All	The link has been severed.	Release the sockets and reinitialize the client-server connection.
83	EADV	All	An ADVERTISE error has occurred.	Call your system administrator.
84	ESRMNT	All	An SRMOUNT error has occurred.	Call your system administrator.
85	ECOMM	All	A communication error has occurred on a Send call.	Call your system administrator.
86	EPROTO	All	A protocol error has occurred.	Call your system administrator.
87	EMULTIHOP	All	A multihop address link was attempted.	Call your system administrator.
88	EDOTDOT	All	A cross-mount point was detected. This is not an error.	Call your system administrator.
89	EREMCHG	All	The remote address has changed.	Call your system administrator.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
90	ECONNCLOSED	All	The connection was closed by a peer.	Check that the peer is running.
113	EBADF	All	Socket descriptor is not in correct range. The maximum number of socket descriptors is set by MAXDESC(). The default range is 0–49.	Reissue function with corrected socket descriptor.
113	EBADF	Bind socket	The socket descriptor is already being used.	Correct the socket descriptor.
113	EBADF	Givesocket	The socket has already been given. The socket domain is not AF_INET.	Correct the socket descriptor.
113	EBADF	Select	One of the specified descriptor sets is an incorrect socket descriptor.	Correct the socket descriptor. Set on Select() or Selectex().
113	EBADF	Takesocket	The socket has already been taken.	Correct the socket descriptor.
113	EBADF	Accept	A Listen() has not been issued before the Accept().	Issue Listen() before Accept().
121	EINVAL	All	An incorrect argument was specified.	Check and correct all function parameters.
145	E2BIG	All	The argument list is too long.	Eliminate excessive number of arguments.
156	EMVSINITIAL	All	Process initialization error. This indicates an z/OS UNIX process initialization failure. This is usually an indication that a proper OMVS RACF® segment is not defined for the user ID associated with application. The RACF OMVS segment may not be defined or may contain errors such as an improper HOME() directory specification.	Attempt to initialize again.
1002	EIBMSOCKOUTOFRANGE	Socket	A socket number assigned by the client interface code is out of range.	Check the socket descriptor parameter.
1003	EIBMSOCKINUSE	Socket	A socket number assigned by the client interface code is already in use.	Use a different socket descriptor.
1004	EIBMIUCVERR	All	The request failed because of an IUCV error. This error is generated by the client stub code.	Ensure IUCV/VMCF is functional.
1008	EIBMCONFLICT	All	This request conflicts with a request already queued on the same socket.	Cancel the existing call or wait for its completion before reissuing this call.
1009	EIBMCANCELLED	All	The request was canceled by the CANCEL call.	Informational, no action needed.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
1011	EIBMBADTCPNAME	All	A TCP/IP name that is not valid was detected.	Correct the name specified in the IBM_TCPIMAGE structure.
1011	EIBMBADTCPNAME	Setibmopt	A TCP/IP name that is not valid was detected.	Correct the name specified in the IBM_TCPIMAGE structure.
1011	EIBMBADTCPNAME	INITAPI	A TCP/IP name that is not valid was detected.	Correct the name specified on the IDENT option TCPNAME field.
1012	EIBMBADREQUESTCODE	All	A request code that is not valid was detected.	Contact your system administrator.
1013	EIBMBADCONNECTIONSTATE	All	A connection token that is not valid was detected; bad state.	Verify TCP/IP is active.
1014	EIBMUNAUTHORIZEDCALLER	All	An unauthorized caller specified an authorized keyword.	Ensure user ID has authority for the specified operation.
1015	EIBMBADCONNECTIONMATCH	All	A connection token that is not valid was detected. There is no such connection.	Verify TCP/IP is active.
1016	EIBMTCPABEND	All	An abend occurred when TCP/IP was processing this request.	Verify that TCP/IP has restarted.
1023	EIBMTERMERROR	All	Encountered a terminating error while processing.	Call your system administrator.
1026	EIBMINVDELETE	All	Delete requestor did not create the connection.	Delete the request from the process that created it.
1027	EIBMINVSOCKET	All	A connection token that is not valid was detected. No such socket exists.	Call your system programmer.
1028	EIBMINVTCPCONNECTION	All	Connection terminated by TCP/IP. The token was invalidated by TCP/IP.	Reestablish the connection to TCP/IP.
1032	EIBMCALLINPROGRESS	All	Another call was already in progress.	Reissue after previous call has completed.
1036	EIBMNOACTIVETCP	All	TCP/IP is not installed or not active.	Correct TCP/IP name used.
1036	EIBMNOACTIVETCP	Select	EIBMNOACTIVETCP	Ensure TCP/IP is active.
1036	EIBMNOACTIVETCP	Getibmopt	No TCP/IP image was found.	Ensure TCP/IP is active.
1037	EIBMINVTSRBUSERDATA	All	The request control block contained data that is not valid.	Call your system programmer.
1038	EIBMINVUSERDATA	All	The request control block contained user data that is not valid.	Check your function parameters and call your system programmer.

Table 14. Sockets ERRNOs (continued)

Error Number	Message Name	Socket Type	Error Description	Programmer's Response
1040	EIBMSELECTEXPOST	SELECTEX	SELECTEX passed an ECB that was already posted.	Check whether the user's ECB was already posted.
2001	EINVALIDRXSOCKETCALL	REXX	A syntax error occurred in the RXSOCKET parameter list.	Correct the parameter list passed to the REXX socket call.
2002	ECONSOLEINTERRUPT	REXX	A console interrupt occurred.	Retry the task.
2003	ESUBTASKINVALID	REXX	The subtask ID is incorrect.	Correct the subtask ID on the INITIALIZE call.
2004	ESUBTASKALREADYACTIVE	REXX	The subtask is already active.	Only issue the INITIALIZE call once in your program.
2005	ESUBTASKALNOTACTIVE	REXX	The subtask is not active.	Issue the INITIALIZE call before any other socket call.
2006	ESOCKNETNOTALLOCATED	REXX	The specified socket could not be allocated.	Increase the user storage allocation for this job.
2007	EMAXSOCKETSREACHED	REXX	The maximum number of sockets has been reached.	Increase the number of allocate sockets, or decrease the number of sockets used by your program.
2009	ESOCKETNOTDEFINED	REXX	The socket is not defined.	Issue the SOCKET call before the call that fails.
2011	EDOMAINSERVERFAILURE	REXX	A Domain Name Server failure occurred.	Call your MVS system programmer.
2012	EINVALIDNAME	REXX	An incorrect *name* was received from the TCP/IP server.	Call your MVS system programmer.
2013	EINVALIDCLIENTID	REXX	An incorrect *clientid* was received from the TCP/IP server.	Call your MVS system programmer.
2014	ENIVALIDFILENAME	REXX	An error occurred during NUCEXT processing.	Specify the correct translation table file name, or verify that the translation table is valid.
2016	EHOSTNOTFOUND	REXX	The host is not found.	Call your MVS system programmer.
2017	EIPADDRNOTFOUND	REXX	Address not found.	Call your MVS system programmer.

Sockets Extended ERRNOs

Table 15. Sockets Extended ERRNOs

Error Code	Problem Description	System Action	Programmer's Response
10100	An ESTAE macro did not complete normally.	End the call.	Call your MVS system programmer.
10101	A STORAGE OBTAIN failed.	End the call.	Increase MVS storage in the application's address space.
10108	The first call from TCP/IP was not INITAPI or TAKESOCKET.	End the call.	Change the first TCP/IP call to INITAPI or TAKESOCKET.
10110	LOAD of EZBSOH03 (alias EZASOH03) failed.	End the call.	Call the IBM Software Support Center.
10154	Errors were found in the parameter list for an IOCTL call.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the IOCTL call. You might have incorrect sequencing of socket calls.
10155	The length parameter for an IOCTL call is less than or equal to 0.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the IOCTL call. You might have incorrect sequencing of socket calls.
10156	The length parameter for an IOCTL call is 3200 (32 x 100).	Disable the subtask for interrupts. Return an error code to the caller.	Correct the IOCTL call. You might have incorrect sequencing of socket calls.
10159	A 0 or negative data length was specified for a READ or READV call.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the length in the READ call.
10161	The REQARG parameter in the IOCTL parameter list is 0.	End the call.	Correct the program.
10163	A 0 or negative data length was found for a RECV, RECVFROM, or RECVMSG call.	Disable the subtask for interrupts. Sever the DLC path. Return an error code to the caller.	Correct the data length.
10167	The descriptor set size for a SELECT or SELECTEX call is less than or equal to 0.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the SELECT or SELECTEX call. You might have incorrect sequencing of socket calls.
10168	The descriptor set size *in bytes* for a SELECT or SELECTEX call is greater than 252. A number greater than the maximum number of allowed sockets (2000 is maximum) has been specified.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the descriptor set size.
10170	A 0 or negative data length was found for a SEND or SENDMSG call.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the data length in the SEND call.

Table 15. Sockets Extended ERRNOs (continued)

Error Code	Problem Description	System Action	Programmer's Response
10174	A 0 or negative data length was found for a SENDTO call.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the data length in the SENDTO call.
10178	The SETSOCKOPT option length is less than the minimum length.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the OPTLEN parameter.
10179	The SETSOCKOPT option length is greater than the maximum length.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the OPTLEN parameter.
10184	A data length of 0 was specified for a WRITE call.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the data length in the WRITE call.
10186	A negative data length was specified for a WRITE or WRITEV call.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the data length in the WRITE call.
10190	The GETHOSTNAME option length is less than 24 or greater than the maximum length.	Disable the subtask for interrupts. Return an error code to the caller.	Correct the length parameter.
10193	The GETSOCKOPT option length is less than the minimum or greater than the maximum length.	End the call.	Correct the length parameter.
10197	The application issued an INITAPI call after the connection was already established.	Bypass the call.	Correct the logic that produces the INITAPI call that is not valid.
10198	The maximum number of sockets specified for an INITAPI exceeds 2000.	Return to the user.	Correct the INITAPI call.
10200	The first call issued was not a valid first call.	End the call.	For a list of valid first calls, refer to the section on special considerations in the chapter on general programming.
10202	The RETARG parameter in the IOCTL call is 0.	End the call.	Correct the parameter list. You might have incorrect sequencing of socket calls.
10203	The requested socket number is a negative value.	End the call.	Correct the requested socket number.
10205	The requested socket number is a duplicate.	End the call.	Correct the requested socket number.
10208	The NAMELEN parameter for a GETHOSTBYNAME call was not specified.	End the call.	Correct the NAMELEN parameter. You might have incorrect sequencing of socket calls.
10209	The NAME parameter on a GETHOSTBYNAME call was not specified.	End the call.	Correct the NAME parameter. You might have incorrect sequencing of socket calls.

Table 15. Sockets Extended ERRNOs (continued)

Error Code	Problem Description	System Action	Programmer's Response
10210	The HOSTENT parameter on a GETHOSTBYNAME or GETHOSTBYADDR call was not specified.	End the call.	Correct the HOSTENT parameter. You might have incorrect sequencing of socket calls.
10211	The HOSTADDR parameter on a GETHOSTBYNAME or GETHOSTBYADDR call is incorrect.	End the call.	Correct the HOSTADDR parameter. You might have incorrect sequencing of socket calls.
10212	The resolver program failed to load correctly for a GETHOSTBYNAME or GETHOSTBYADDR call.	End the call.	Check the JOBLIB, STEPLIB, and linklib datasets and rerun the program.
10213	Not enough storage is available to allocate the HOSTENT structure.	End the call.	Increase the user storage allocation for this job.
10214	The HOSTENT structure was not returned by the resolver program.	End the call.	Ensure that the domain name server is available. This can be a nonerror condition indicating that the name or address specified in a GETHOSTBYADDR or GETHOSTBYNAME call could not be matched.
10215	The APITYPE parameter on an INITAPI call instruction was not 2 or 3.	End the call.	Correct the APITYPE parameter.
10218	The application programming interface (API) cannot locate the specified TCP/IP.	End the call.	Ensure that an API that supports the performance improvements related to CPU conservation is installed on the system and verify that a valid TCP/IP name was specified on the INITAPI call. This error call might also mean that EZASOKIN could not be loaded.
10219	The NS parameter is greater than the maximum socket for this connection.	End the call.	Correct the NS parameter on the ACCEPT, SOCKET or TAKESOCKET call.
10221	The AF parameter of a SOCKET call is not AF_INET.	End the call.	Set the AF parameter equal to AF_INET.
10222	The SOCTYPE parameter of a SOCKET call must be stream, datagram, or raw (1, 2, or 3).	End the call.	Correct the SOCTYPE parameter.
10223	No ASYNC parameter specified for INITAPI with APITYPE=3 call.	End the call.	Add the ASYNC parameter to the INITAPI call.
10224	The IOVCNT parameter is less than or equal to 0, for a READV, RECVMSG, SENDMSG, or WRITEV call.	End the call.	Correct the IOVCNT parameter.
10225	The IOVCNT parameter is greater than 120, for a READV, RECVMSG, SENDMSG, or WRITEV call.	End the call.	Correct the IOVCNT parameter.
10226	Not valid COMMAND parameter specified for a GETIBMOPT call.	End the call.	Correct the COMMAND parameter of the GETIBMOPT call.

Table 15. Sockets Extended ERRNOs (continued)

Error Code	Problem Description	System Action	Programmer's Response
10229	A call was issued on an APITYPE=3 connection without an ECB or REQAREA parameter.	End the call.	Add an ECB or REQAREA parameter to the call.
10300	Termination is in progress for either the CICS transaction or the sockets interface.	End the call.	None.
10330	A SELECT call was issued without a MAXSOC value and a TIMEOUT parameter.	End the call.	Correct the call by adding a TIMEOUT parameter.
10331	A call that is not valid was issued while in SRB mode.	End the call.	Get out of SRB mode and reissue the call.
10332	A SELECT call is invoked with a MAXSOC value greater than that which was returned in the INITAPI function (MAXSNO field).	End the call.	Correct the MAXSOC parameter and reissue the call.
10334	An error was detected in creating the data areas required to process the socket call.	End the call.	Call the IBM Software Support Center.
10999	An abend has occurred in the subtask.	Write message EZY1282E to the system console. End the subtask and post the TRUE ECB.	If the call is correct, call your system programmer.
20000	An unknown function code was found in the call.	End the call.	Correct the SOC-FUNCTION parameter.
20001	The call passed an incorrect number of parameters.	End the call.	Correct the parameter list.
20002	The CICS Sockets Interface is not in operation.	End the call.	Start the CICS Sockets Interface before executing this call.

Appendix C. CICS Sockets Messages

This section contains CICS socket interface messages.

EZY1218—EZY1347

EZY1218E *mm/dd/yy hh:mm:ss* **PROGRAM** *progname* **DISABLED TRANID=** *xxxx* **PARTNER INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: The Listener checked the status of the program associated with the transaction. It was not enabled.

System Action: Listener continues.

User Response: Use CEMT to determine and correct the status of the program.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1220E *mm/dd/yy hh:mm:ss* **READ FAILURE ON CONFIGURATION FILE PHASE=***xx* **EIBRESP2=***rrrrrr*

Explanation: EZACIC21 was unable to read the configuration file.

System Action: Terminate the transaction.

User Response: Notify the CICS Systems Programmer.

System Programmer Response: Use the EIBRESP2 value to determine the problem and correct the file. See the *CICS User's Handbook* for information about EIBRESP2 values. If the EIBRESP2 value is zero, then the EZACONFG file has been defined as remote. If this is the configuration file you want, then verify that no CICS Sockets programs can run directly in the file owning region. This can cause the file to become disabled. Ensure that EZACIC20 is not in the file owning region PLT, and that the EZAC and EZAO transactions are unable to run directly in the file owning region. Attempts to open the file will fail if the file is defined with a value of YES specified in the ADD, DELETE, or UPDATE parameters in the CICS file definition in more than one CICS region.

Module: EZACIC21

Destination: INITIALIZATION

EZY1221E *mm/dd/yy hh:mm:ss* **CICS SOCKETS ENABLE FAILURE EIBRCODE BYTE2 = rrr**

Explanation: The attempt to enable the task related user exit (TRUE) failed.

System Action: Terminate the transaction.

User Response: Notify the CICS Systems Programmer.

System Programmer Response: Use the EIBRESP2 value to determine the problem and correct the file. An EIBRCODE BYTE2 value of 20 indicates the TRUE is already enabled. See the *CICS User's Handbook* for information about EIBRCODEs.

Module: EZACIC21

Destination: INITIALIZATION

EZY1222E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS REGISTRATION FAILURE RETURN code=** *return_code*

Explanation: The attempt to register the CICS Sockets Feature to OS/390 failed.

System Action: Terminate the transaction.

User Response: Contact your OS/390 System Administrator.

System Programmer Response: See the *z/OS MVS Programming: Product Registration* for information about the values for *return_code*.

Module: EZACIC21

Destination: INITIALIZATION

EZY1223E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS ATTACH FAILURE RETURN CODE =** *return_code* **REASON CODE =** *reason_code*

Explanation: An attempt to attach one of the pool subtasks failed.

System Action: Stop attaching pool subtasks. The size of the pool is determined by the number of subtasks successfully attached.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: See the *z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN* for information about the values for *return_code* and *reason_code* and make appropriate adjustments to your CICS environment.

Module: EZACIC21

Destination: INITIALIZATION

EZY1224I *mm/dd/yy hh:mm:ss* **CICS/SOCKETS INITIALIZATION SUCCESSFUL**

Explanation: The CICS Sockets Interface has completed initialization successfully.

System Action: Continue with execution.

User Response: None.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1225E *mm/dd/yy hh:mm:ss* **STARTBR FAILURE ON CICS/SOCKETS CONFIGURATION FILE PHASE=***xx* **EIBRESP2=***rrrrrr*

Explanation: The STARTBR command used for the configuration file has failed.

System Action: Terminate the transaction.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Use the EIBRESP2 value to determine the problem. Check the CICS definition of the Configuration file to ensure the browse operation is permitted. See the *CICS User's Handbook* for information about EIBRESP2 values.

Module: EZACIC21

Destination: INITIALIZATION

EZY1226E *mm/dd/yy hh:mm:ss* **READNEXT FAILURE ON CICS/SOCKETS CONFIGURATION FILE PHASE=***xx* **EIBRESP2=***rrrrrr*

Explanation: The READNEXT command used for the configuration file has failed.

System Action: Terminate the transaction.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Use the EIBRESP2 value to determine the problem. Check the CICS definition of the Configuration file to ensure the browse operation is permitted. See the *CICS User's Handbook* for information about EIBRESP2 values.

Module: EZACIC21

Destination: INITIALIZATION

EZY1227E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS INVALID LISTENER TRANID =** *tran*

Explanation: The Listener transaction *tran* was not defined to CICS.

System Action: Terminate Listener Initialization.

User Response: Use CICS facilities to define the listener transaction and program. Then use EZAO to start the listener.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1228E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS LISTENER TRANSACTION** *tran* **DISABLED**

Explanation: The Listener transaction *tran* could not be started because it was disabled.

System Action: Terminate Listener Initialization.

User Response: Use CICS facilities to enable the transaction and then start the listener using EZAO.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1229E *mm/dd/yy hh:mm:ss* **CICS SOCKETS LISTENER TRANSACTION** *tran* **NOT AUTHORIZED**

Explanation: The Listener transaction *tran* could not be started because it was not authorized.

System Action: Terminate Listener Initialization.

User Response: Use CICS facilities to authorize starting the listener transaction and then start the listener using EZAO.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1246E *mm/dd/yy hh:mm:ss* **CICS SOCKETS LISTENER PROGRAM ID** *mmmmmmmm* **INVALID**

Explanation: The Listener transaction could not be started because program *mmmmmmmm* is not defined.

System Action: Terminate Listener Initialization.

User Response: If the program ID is correct, use CICS facilities to define it. If it is not correct, use the EZAC transaction to correct the CICS Sockets Configuration file.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1247E *mm/dd/yy hh:mm:ss* **CICS SOCKETS LISTENER PROGRAM ID** *mmmmmmmm* **DISABLED**

Explanation: The Listener transaction could not be started because program *mmmmmmmm* is disabled.

System Action: Terminate Listener Initialization.

User Response: Use CICS facilities to enable the program and then use EZAO to start the listener.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1250E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS LISTENER** *tran* **NOT ON CONFIGURATION FILE**

Explanation: The Listener transaction *tran* is not defined on the CICS Sockets configuration file.

System Action: Terminate Listener Initialization.

User Response: If the listener transaction name is correct, use the EZAC transaction to define it on the CICS Configuration file. If the name is not correct, correct it on the EZAO transaction.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1251E *mm/dd/yy hh:mm:ss* **CICS SOCKETS MODULE** *mmmmmmmm* **ABEND** *xxxx*

Explanation: The CICS Sockets module *mmmmmmmm* has abended.

System Action: Terminate the transaction.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

EZY1252E *mm/dd/yy hh:mm:ss* **UNABLE TO LOAD EZASOH03 ERROR CODE=** *error_code* **REASON CODE=** *reason_code*

Explanation: During CICS Sockets initialization, the attempt to load module EZASOH03 failed.

System Action: Terminate Initialization.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: See the *z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDU* for information about the values for *error_code* and *reason_code* to determine why the module would not load. Also, look for associated MVS messages.

Module: EZACIC21

EZY1253E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS LISTENER** *tran* **NOT ON CONFIGURATION FILE**

Explanation: An EZAO STOP LISTENER transaction was run with an invalid listener name.

System Action: Present the panel to correct the name.

User Response: Correct the name and retry termination.

System Programmer Response: None.

Module: EZACIC22

Destination: TERMINATION

EZY1254E *mm/dd/yy hh:mm:ss* **CACHE FILE ERROR RESP2 VALUE ****** CALL # ***

Explanation: An error occurred on a cache file operation.

System Action: Return to the calling program with an error response.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Use the RESP2 value to determine the error and correct the cache file. See the *CICS User's Handbook* for information about RESP2 values.

Module: EZACIC25

Destination: DOMAIN NAME SERVER FUNCTION

EZY1255E *mm/dd/yy hh:mm:ss* **TEMPORARY STORAGE ERROR RESP2 VALUE ****** CALL # ***

Explanation: An error occurred on a temporary storage operation in EZACIC25.

System Action: Return to the calling program with an error response.

User Response: Use the RESP2 value to determine the error. Contact the IBM Software Support Center. See the *CICS User's Handbook* for information about RESP2 values.

System Programmer Response: None.

Module: EZACIC25

Destination: DOMAIN NAME SERVER FUNCTION

EZY1256E *mm/dd/yy hh:mm:ss* **CICS SOCKETS INTERFACE NOT ENABLED PRIOR TO LISTENER STARTUP**

Explanation: An attempt to start a listener was made when the CICS Sockets Interface was inactive.

System Action: Return error and terminate transaction EZAO.

User Response: Use transaction EZAO to start the CICS Sockets Interface prior to starting the Listener.

System Programmer Response: None.

Module: EZACIC21

Destination: INITIALIZATION

| **EZY1258I** *module* **ENTRY POINT IS** *address*

| **Explanation:** This message displays the entry point address of a module.

| *module* is the name of the module.

| *address* is the entry point address of the module.

| **System Action:** Processing continues.

| **User Response:** None.

| **System Programmer Response:** None.

| **Module:** EZACIC01, EZACIC02

EZY1259E *mm/dd/yy hh:mm:ss* **IOCTL CALL FAILURE TRANSACTION=***transactionid* **TASKID=***tasknumber* **ERRNO=***errno*

Explanation: Listener transaction *transactionid* experienced a failure on the IOCTL call.

In the message text:

mm/dd/yy
The date (month/day/year) of the message.

hh:mm:ss
The time (hours:minutes:seconds) of the message.

transactionid
The name of the transaction under which the Listener is executing.

tasknumber
The CICS task number of the Listener task.

| *errno* The UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX*
| *System Services Messages and Codes*.

System Action: If the error is during initialization of the Listener, then the Listener transaction *transactionid* terminates. Otherwise, the Listener closes the socket that was being processed and resumes normal processing.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1260E *mm/dd/yy hh:mm:ss* **EZACIC03 ATTACH FAILED GPR15=***xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: An ATTACH for an MVS subtask has failed. The reason code is in GPR 15.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The task related user exit (TRUE) for this transaction is disabled. The transaction abends with an AEY9.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Determine the cause for the ATTACH failure and correct.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1261I *mm/dd/yy hh:mm:ss* **EZACIC03 ATTACH SUCCESSFUL, TCB ADDRESS=** *xxxxxxxx* **TERM=***term* **TRAN=***tran* **TASK=***cicstask*

Explanation: An ATTACH for an MVS subtask was successful. This message is produced only for listeners and for those tasks which cannot be accommodated within the pool of reusable tasks.

System Action: Processing continues.

User Response: If this message happens frequently, increase the size of the reusable task pool for this CICS.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1262E *mm/dd/yy hh:mm:ss* **GWA ADDRESS INVALID UEPGAA=***xxxxxxxx* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid GWA address.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Use EZAO to stop (immediate) and start the CICS Sockets Interface. If the problem repeats, contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1263E *mm/dd/yy hh:mm:ss* **TIE ADDRESS INVALID UEPGAA=***xxxxxxxx* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid TIE address.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Use EZAO to stop (immediate) and start the CICS Sockets Interface. If the problem repeats, contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1264E *mm/dd/yy hh:mm:ss* **FLAG WORD ADDRESS INVALID UEPFLAGS=** *xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid flag word address.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Use EZAO to stop (immediate) and start the CICS Sockets Interface. If the problem repeats, contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1265E *mm/dd/yy hh:mm:ss* **CICS VERSION UNSUPPORTED GWACIVRM=***xxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected a version of CICS which it does not support. The CICS version must be 3 or above.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: The CICS Sockets Interface requires CICS V3R3 or later.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1267E *mm/dd/yy hh:mm:ss* **ROUTING TASK FUNCTION INVALID UERTIFD=xx ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid routing task function.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: If this happens repeatedly, use EZAO to STOP (immediate) the CICS Sockets Interface and then START it. If it still happens, contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1268E *mm/dd/yy hh:mm:ss* **SAVE AREA ADDRESS INVALID UEPHSMA=** *xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid save area address.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1269E *mm/dd/yy hh:mm:ss* **PARM LIST ADDRESS INVALID GPR1=** *xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid parameter list on a call request from the CICS application program.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Check the application program calls to the CICS Sockets Interface to ensure that each call has the correct number and type of parameters.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1270E *mm/dd/yy hh:mm:ss* **PARM nn ADDRESS INVALID ADDRESS=** *xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an invalid parameter address on a call request from the CICS application program. nn is the number of the parameter.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Check the application program calls to the CICS Sockets Interface to ensure that the parameter addresses are valid (not zero). This problem is most common in assembler language and C applications.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1271E *mm/dd/yy hh:mm:ss* **TOKERR=***xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected a token error on an internal token used to coordinate CICS transaction activity with TCP/IP activity.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1272E *mm/dd/yy hh:mm:ss* **INVALID SOCKET/FUNCTION CALL FUNCTION= xxxx ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: A call to EZASOKET specified in invalid function.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Correct the call and retry.

System Programmer Response: None.

Module: EZACIC01

Destination: task related user exit (TRUE)

EZY1273E *mm/dd/yy hh:mm:ss* **IUCV SOCK/FUNC TABLE INVALID FUNCTION= xxxx ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: A call to EZACICAL specified in invalid function.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Correct the call and retry.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1274E *mm/dd/yy hh:mm:ss* **INCORRECT EZASOKET PARM COUNT FUNCTION= xxxx ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: A call to EZASOKET specified in invalid number of parameters.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Correct the call and retry.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1275E *mm/dd/yy hh:mm:ss* **MONITOR CALLS NOT SUPPORTED UERTFID=xx ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected a monitor call which is not supported for this version of CICS.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1276E *mm/dd/yy hh:mm:ss* **EDF CALLS NOT SUPPORTED UERTFID=xx ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) detected an EDF (Execute Diagnostic Facility) call. This TRUE does not support EDF calls.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE is disabled and the task abends with an AEY9.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1277I *mm/dd/yy hh:mm:ss* **EZACIC03 DETACHED TCB ADDRESS=***xxxxxxxx* **ERRNO=***errno* **TRAN=***tran* **TASK=***cicstask*

Explanation: An attached subtask is terminating.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The TRUE detaches the MVS subtask.

User Response: None.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1278I *mm/dd/yy hh:mm:ss* **EZACIC03 DETACH SUCCESSFUL TCB ADDRESS=** *xxxxxxxx* **TRAN=***tran* **TASK=***cicstask*

Explanation: An attached subtask is terminating.

System Action: The TRUE detaches the MVS subtask.

User Response: None.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1279E *mm/dd/yy hh:mm:ss* **INVALID SYNC PT COMMAND DISP=xx TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) Detected an invalid Sync Point command.

System Action: Disable the TRUE and return to the caller.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

Destination: TASK RELATED USER EXIT (TRUE)

EZY1280E *mm/dd/yy hh:mm:ss* **INVALID RESYNC COMMAND DISP=xx TRAN=***tran* **TASK=***cicstask*

Explanation: The task related user exit (TRUE) Detected an invalid Resync command.

System Action: Disable the TRUE and return to the caller.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC01

EZY1282E *mm/dd/yy hh:mm:ss* **10999 ABEND** *reasonxx*

Explanation: The ESTAE processing in EZACIC03 could not be completed because of *reasonxx*.

System Action: Allow the ABEND to percolate.

User Response: Contact the IBM Software Support Center. See the *CICS User's Handbook* for information about abend codes.

System Programmer Response: None.

Module: EZACIC03

Destination: MVS SUBTASK

EZY1285E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS LISTENER TRANSACTION** *tran* **NOT ON CONFIGURATION FILE**

Explanation: The listener attempting to start does not have a description record on the CICS Sockets configuration file.

System Action: Listener terminates.

User Response: Contact CICS Systems Programmer.

System Programmer Response: Add the listener to the Configuration file using EZAC and retry.

Module: EZACIC02

Destination: LISTENER

EZY1286E *mm/dd/yy hh:mm:ss* **READ FAILURE ON CICS/SOCKETS CONFIGURATION FILE TRANSACTION=** *tran* **EIBRESP2= rrrrr**

Explanation: The listener could not read the configuration file.

System Action: Listener terminates.

User Response: Contact CICS Systems Programmer.

System Programmer Response: Use the CICS APR to interpret the value of EIBRESP2. If the file is not known to CICS, perform the installation steps for the configuration file.

See the *CICS User's Handbook* for information about EIBRESP2 values.

Module: EZACIC02

Destination: LISTENER

EZY1287E *mm/dd/yy hh:mm:ss* **EZYCIC02 GETMAIN FAILURE FOR VARIABLE STORAGE TRANSACTION=** *tran* **EIBRESP2=***rrrrr*

Explanation: EZACIC02 could not obtain the variable storage it requires to execute.

System Action: Listener terminates.

User Response: Contact CICS Systems Programmer.

System Programmer Response: Use the CICS APR to interpret the value of EIBRESP2. Correct your CICS configuration as indicated.

See the *CICS User's Handbook* for information about EIBRESP2 values.

Module: EZACIC02

Destination: LISTENER

EZY1288E *mm/dd/yy hh:mm:ss* **CICS SOCKETS MODULE** *mmmmmmmm* **ABEND** *aaaa*

Explanation: An abend has occurred in module *mmmmmmmm* of the CICS Sockets Interface.

System Action: Listener terminates.

User Response: See the *CICS User's Handbook* for information about abend codes. Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1289E *mm/dd/yy hh:mm:ss* **CICS LISTENER TRANSACTION** *tran* **TERMINATING**

Explanation: The listener is terminating. This could be a normal shutdown situation or a failure related to the listener socket. If it is the latter, a previous message will describe the failure.

System Action: Continue termination of the listener.

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1290I *mm/dd/yy hh:mm:ss* **LISTENER TRANSACTION** *tran* **STARTING**

Explanation: Transaction *tran*, Listener program EZACIC02 has been given control.

System Action: Listener *tran* continues.

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1291I *mm/dd/yy hh:mm:ss* **LISTENER TRANSACTION** *tran* **TASKID=** *cicstask* **ACCEPTING REQUESTS VIA PORT** *pppppp*

Explanation: Listener transaction *tran* is now available to receive connection requests on port *pppppp*.

System Action: Listener *tran* continues

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1292E *mm/dd/yy hh:mm:ss* **CANNOT START LISTENER, TRUE NOT ACTIVE TRANSACTION=** *tran* **TASKID=** *cicstask* **EIBRCODE BYTE3=rr**

Explanation: The initialization of the CICS Sockets Interface did not complete successfully and this listener cannot continue.

System Action: Listener transaction *tran* terminates.

User Response: If EZAO is being used to start the listener, ensure that the CICS Sockets interface has successfully completed initialization first. If this happens during automatic initialization, look for other messages which would indicate why the initialization of the CICS Sockets Interface failed.

See the *CICS User's Handbook* for information about EIBRCODEs.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1293E *mm/dd/yy hh:mm:ss* **INITAPI CALL FAILURE TRANSACTION=***tran* **TASKID=** *cicstask* **ERRNO=***errno*

Explanation: Listener transaction *tran* experienced a failure on the INITAPI call.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX*
| *System Services Messages and Codes*.

System Programmer Response: None.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

Module: EZACIC02

Destination: LISTENER

EZY1294E *mm/dd/yy hh:mm:ss* **SOCKET CALL FAILURE TRANSACTION=** *tran* **TASKID=** *cicstask* **ERRNO=** *errno*

Explanation: Listener transaction *tran* experienced a failure on the SOCKET call.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX*
| *System Services Messages and Codes*.

System Programmer Response: None.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

Module: EZACIC02

Destination: LISTENER

EZY1295E *mm/dd/yy hh:mm:ss* **BIND CALL FAILURE TRANSACTION=** *tran* **TASKID=** *cicstask* **ERRNO=** *errno*

Explanation: Listener transaction *tran* experienced a failure on the BIND call.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX*
| *System Services Messages and Codes*.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

Note: An ERRNO=48 could indicate that the port is not reserved in *hlq*.TCPIP.PROFILE.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1296E *mm/dd/yy hh:mm:ss* **LISTEN CALL FAILURE TRANSACTION=** *tran* **TASKID=** *cicstask* **ERRNO=** *errno*

Explanation: Listener transaction *tran* experienced a failure on the LISTEN call.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1297E *mm/dd/yy hh:mm:ss* **GETCLIENTID CALL FAILURE TRANSACTION=***tran* **TASKID=** *cicstask* **ERRNO=***errno*

Explanation: Listener transaction *tran* experienced a failure on the GETCLIENTID call.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1298E *mm/dd/yy hh:mm:ss* **CLOSE FAILURE TRANID=** *tran* **TASKID=** *cicstask* **ERRNO=** *errno*

Explanation: Listener transaction *tran* experienced a failure on the CLOSE call.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction *tran* continues.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1299E *mm/dd/yy hh:mm:ss* **SELECT CALL FAILURE TRANSACTION=** *tran* **TASKID= xxxxx ERRNO=** *errno*

Explanation: Listener transaction *tran* experienced a failure on the SELECT call.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1300E *mm/dd/yy hh:mm:ss* **READ FAILURE TRANSID=** *tran* **TASKID=** *cicstran* **ERRNO=** *errno* **INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: Listener transaction *tran* experienced a failure on the READ call.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction *tran* continues.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1301E *mm/dd/yy hh:mm:ss* **READ CALL RECEIVED NULL DATA TRANSID=** *tran* **PARTNER INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: Listener transaction *tran* received null data from the client. Either the client issued a close socket call or it issued a send with a length of zero.

System Action: Listener transaction xxxx continues.

User Response: Correct the client program.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1302I *mm/dd/yy hh:mm:ss* **READ TIMEOUT PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=***xxxxxx*

Explanation: The initial message from the client did not arrive within the read timeout value specified for this listener in the CICS Sockets configuration file.

System Action: The listener closes the connection socket and does not attempt to start a server transaction.

User Response: Determine the cause of the delay and correct it.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1303I *mm/dd/yy hh:mm:ss* **EZACIC02 GIVESOCKET TIMEOUT TRANS** *tran* **PARTNER INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: The started server transaction did not perform the takesocket within the timeout value specified for this listener in the CICS Sockets configuration file.

System Action: Send an error message to the client and close the socket.

User Response: Determine the reason for the delay in the server transaction. Possible causes are an overloaded CICS system or excessive processing in the server transaction before the takesocket is issued. Correct the situation and retry.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1304I *mm/dd/yy hh:mm:ss* **UNEXPECTED INPUT EVENT TRANSACTION** *tran* **PARTNER INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: The listener received data from the client after the end of the transaction input message.

System Action: The listener ignores this data.

User Response: Ensure that the minimum message length specification for this listener in the CICS Sockets Configuration file is correct. If it is, determine why the client is sending this additional data.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1305E *mm/dd/yy hh:mm:ss* **UNEXPECTED EXCEPTION EVENT TRANS** *tran* **PARTNER INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: The listener received an exception event on this connection other than the event showing a successful takesocket was issued by the server.

System Action: Ignore the event.

User Response: Ensure the client is not doing anything that would cause an exception event such the use of out-of-band data.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1306E *mm/dd/yy hh:mm:ss* **SECURITY EXIT** *mmmmmmmm* **IS NOT DEFINED TRANID=** *tran* **TASKID=***xxxxxxxx*

Explanation: The security exit specified for this listener in the CICS Sockets configuration file is not defined to CICS.

System Action: Close the socket and terminate the connection.

User Response: Use CICS RDO to define the security exit.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1307E *mm/dd/yy hh:mm:ss* **MAXIMUM # OF SOCKETS USED TRANS=** *tran* **TASKID=** *cicstask* **ERRNO=** *errno*

Explanation: All of the sockets allocated to listener transaction xxxx are in use.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: The ACCEPT call is delayed until a socket is available.

User Response: Use the EZAC transaction to increase the number of sockets allocated listener *tran* and then stop and restart listener transaction *tran*.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1308E *mm/dd/yy hh:mm:ss* **ACCEPT CALL FAILURE TRANSACTION=** *tran* **TASKID=** *cicstask* **ERRNO=** *errno*

Explanation: Listener transaction *tran* experienced a failure on the ACCEPT call.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX*
| *System Services Messages and Codes*.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1309E *mm/dd/yy hh:mm:ss* **GIVESOCKET FAILURE TRANS** *tran* **TASKID=** *xxxxxxxx* **ERRNO=** *errno* **INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: Listener transaction *tran* experienced a failure on the GIVESOCKET call.

| *errno* is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX*
| *System Services Messages and Codes*.

System Action: Listener transaction *tran* terminates.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1310E *mm/dd/yy hh:mm:ss* **IC VALUE NOT NUMERIC TRANID=** *tran* **PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: The interval specified in the transaction input message contains one or more non-numeric characters.

System Action: The interval is ignored, i.e. the transaction is started immediately.

User Response: Correct the client program which is sending this transaction input message.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1311E *mm/dd/yy hh:mm:ss* **CICS TRANID** *tran* **NOT AUTHORIZED PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: The transaction name specified in the transaction input message is not RSL authorized.

System Action: The transaction is not started.

User Response: Correct the CICS transaction definition if the transaction should be authorized or the client program if it is sending the wrong transaction name.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1312E *mm/dd/yy hh:mm:ss* **SECURITY EXIT** *mmmmmmmm* **CANNOT BE LOADED TRANID=** *tran* **TASKID=***cicstask*

Explanation: Listener transaction *tran* experienced a failure when it attempted to load security exit program *mmmmmmmm*.

System Action: Listener transaction *tran* continues but the server transaction associated with this transaction input message is not started.

User Response: Use CEMT to determine the status of the exit program and correct whatever problems are found.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1313E *mm/dd/yy hh:mm:ss* **LISTENER NOT AUTHORIZED TO ACCESS SECURITY EXIT** *mmmmmmmm* **TRANID=** *tran* **TASKID=***xxxxxxxx*

Explanation: Listener transaction *tran* is not authorized to access security exit program *mmmmmmmm*.

System Action: Listener transaction *tran* continues but the server transaction associated with this transaction input message is not started.

User Response: If the security exit program name is incorrect, use EZAC to correct the definition of this listener on the CICS Sockets Configuration file. If the security exit program is correct, use the CICS RDO facility to authorize listener transaction xxxx to use security exit program *mmmmmmmm*.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1314E *mm/dd/yy hh:mm:ss* **SECURITY EXIT** *mmmmmmmm* **IS DISABLED TRANID=** *tran* **TASKID=***xxxxxxxx*

Explanation: Security exit program *mmmmmmmm* is disabled.

System Action: Listener transaction *tran* continues but the server transaction associated with this transaction input message is not started.

User Response: Use CEMT to enable the security exit program.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1315E *mm/dd/yy hh:mm:ss* **INVALID TRANSID** *tran* **PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: The transaction input message from the client specified transaction *tran* but this transaction is not defined to CICS.

System Action: Listener transaction *tran* continues but the server transaction associated with this transaction input message is not started.

User Response: If the transaction name is incorrect, correct the client program. If the transaction name is correct, correct the CICS transaction definition.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1316E *mm/dd/yy hh:mm:ss* **TRANSID** *tran* **IS DISABLED PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Transaction xxxxxxxx is disabled.

System Action: Listener transaction *tran* continues but the server transaction associated with this transaction input message is not started.

User Response: Use CEMT to enable the server transaction.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1317E *mm/dd/yy hh:mm:ss* **TRANSID** *tran* **IS NOT AUTHORIZED PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction *tran* is not authorized to start the transaction name specified in the transaction input message.

System Action: The transaction is not started.

User Response: Authorize listener transaction *tran* to start the transaction.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1318E *mm/dd/yy hh:mm:ss* **TD START SUCCESSFUL QUEUEID= qqqq**

Explanation: The Listener transaction started a server transaction through transient data queue qqqq.

System Action: Listener transaction continues and the server transaction is ready to start.

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1319E *mm/dd/yy hh:mm:ss* **QIDER FOR TD DESTINATION qqqq PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: The listener transaction was unable to start CICS transaction through transient data queue qqqq. DFHRESP was QIDERR.

System Action: The listener transaction continues.

User Response: If the queue name is incorrect, correct the client program sending this transaction input message. If the queue name is correct, correct the CICS Destination Control Table.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1320E *mm/dd/yy hh:mm:ss* **I/O ERROR FOR TD DESTINATION xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction through transient data queue xxxx. DFHRESP was IOERR.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1321E *mm/dd/yy hh:mm:ss* **LENGTH ERROR FOR TD DESTINATION xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction through transient data queue xxxx. DFHRESP was LENGERR.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer. The minimum length for this queue should be greater than 72.

System Programmer Response: Change definition of Transient Data Queue to accommodate length of this message.

Module: EZACIC02

Destination: LISTENER

EZY1322E *mm/dd/yy hh:mm:ss* **TD DESTINATION xxxx DISABLED PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction through transient data queue xxxx. DFHRESP was DISABLED.

System Action: Listener transaction xxxx continues.

User Response: Use CEMT to enable the destination.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1323E *mm/dd/yy hh:mm:ss* **TD DESTINATION xxxx OUT OF SPACE PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction through transient data queue xxxx. DFHRESP was NOSPACE.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Allocate space for this Transient Data Queue.

Module: EZACIC02

Destination: LISTENER

EZY1324E *mm/dd/yy hh:mm:ss* **TD START FAILED QUEUE ID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction through transient data queue xxxx. DFHRESP was 99.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Determine the problem with the Transient Data Queue and correct it.

Module: EZACIC02

Destination: LISTENER

EZY1325I *mm/dd/yy hh:mm:ss* **START SUCCESSFUL TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was able to start CICS transaction xxxx transient data queue xxxx.

System Action: Listener transaction xxxx continues.

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1326E *mm/dd/yy hh:mm:ss* **START I/O ERROR TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was IOERR.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Determine the cause of the I/O error and correct it.

Module: EZACIC02

Destination: LISTENER

EZY1327E *mm/dd/yy hh:mm:ss* **START TRANSACTION ID xxxx INVALID PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was TRANSIDERR.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Check the transaction definition in RDO to ensure it is correct.

Module: EZACIC02

Destination: LISTENER

EZY1328E *mm/dd/yy hh:mm:ss* **START TRANSACTION ID xxxx NOT AUTHORIZED PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was NOTAUTH.

System Action: Listener transaction xxxx continues.

User Response: If the transaction ID is incorrect, correct the client program which sent this transaction input message. If the transaction ID is correct, authorize listener transaction xxxx to start this transaction.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1329E *mm/dd/yy hh:mm:ss* **START FAILED (99) TRANSID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was 99.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Check the transaction definition in RDO. Look for associated messages which might indicate why the transaction would not start.

Module: EZACIC02

Destination: LISTENER

EZY1330E *mm/dd/yy hh:mm:ss* **IC START SUCCESSFUL TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was able to start CICS transaction xxxx.

System Action: Listener transaction xxxx continues.

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1331E *mm/dd/yy hh:mm:ss* **IC START I/O ERROR TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was IOERR.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Look for other messages that provide specific information on the I/O error and correct the problem.

Module: EZACIC02

Destination: LISTENER

EZY1332E *mm/dd/yy hh:mm:ss* **IC START INVALID REQUEST TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was INVREQ.

System Action: Listener transaction xxxx continues.

User Response: Contact the IBM Software Support Center.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1333E *mm/dd/yy hh:mm:ss* **IC START FAILED (99) TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: Listener transaction xxxx was unable to start CICS transaction xxxx. DFHRESP was 99.

System Action: Listener transaction xxxx continues.

User Response: Contact the CICS Systems Programmer.

System Programmer Response: Check the RDO definition of the transaction. Contact the IBM Software Support Center.

Module: EZACIC02

Destination: LISTENER

EZY1334E *mm/dd/yy hh:mm:ss* **INVALID USER TRANID=xxxx PARTNER INET ADDR = xxx.xxx.xxx.xxx PORT = xxxxxx**

Explanation: This message is issued only for CICS 4.1 and above. It indicates that the user security exit has given the Listener an invalid USERID field.

System Action: The server transaction does not start.

User Response: Correct the invalid USERID in the security exit.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1335E *mm/dd/yy hh:mm:ss* **WRITE FAILED ERRNO=** *errno* **TRANID=** *xxxxx.* **PARTNER INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: Listener transaction xxxx had a failure on a WRITE command.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction xxxx continues.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1336E *mm/dd/yy hh:mm:ss* **TAKESOCKET FAILURE TRANS** *xxxx* **TASKID=** *cicstran* **ERRNO=** *errno* **INET ADDR=***xxx.xxx.xxx.xxx* **PORT=***xxxxxx*

Explanation: Listener transaction *xxxx* had a failure on a TAKESOCKET command.

errno is the UNIX System Services Return Code. These return codes are listed and described in the *z/OS UNIX System Services Messages and Codes*.

System Action: Listener transaction *xxxx* continues.

User Response: Use the *errno* value to determine the cause of the failure.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1337E *mm/dd/yy hh:mm:ss* **CICS IN QUIESCE, LISTENER TERMINATING TRANSID=** *tran* **TASKID=** *cicstask*

Explanation: Listener transaction *tran* is terminating because it detected a CICS quiesce in progress.

System Action: Listener transaction *tran* terminates.

User Response: None.

System Programmer Response: None.

Module: EZACIC02

Destination: LISTENER

EZY1338E *mm/dd/yy hh:mm:ss* **PROGRAM xxxxxxxx NOT FOUND TRANID= xxxx PARTNER INET ADDR=xxx.xxx.xxx.xxx PORT=xxxxxx**

Explanation: The Listener checked the status of the program associated with the transaction. It was not found.

System Action: Listener continues.

User Response: If the transaction ID is incorrect, correct the client program that sent the transaction input message. If the transaction ID is correct, check the transaction and program definitions in CICS.

System Programmer Response: None.

Module: EZACIC02

EZY1339E *mm/dd/yy hh:mm:ss* **EXIT PROGRAM (EZACIC01) IS NOT ENABLED. DISABLE IGNORED TERM=***term* **TRAN=***tranxxx*

Explanation: A termination of the CICS Sockets Interface was requested but the interface is not enabled.

System Action: The termination request is ignored.

User Response: None.

System Programmer Response: None.

Module: EZACIC22

Destination: TERMINATION

EZY1340E *mm/dd/yy hh:mm:ss* **API ALREADY QUIESCING DUE TO PREVIOUS REQ. EZAO IGNORED TERM=***term* **TRAN=***tranxxx*

Explanation: A request for a quiesce of the CICS Sockets interface has been made but one is already is progress.

System Action: Ignore the second request.

User Response: None.

System Programmer Response: None.

Module: EZACIC22

Destination: TERMINATION

EZY1341E *mm/dd/yy hh:mm:ss* **API ALREADY IN IMMED MODE DUE TO PREV. REQ. EZAO IGNORED TERM=***term* **TRAN=***tranxxx*

Explanation: A request for an immediate of the CICS Sockets interface has been made but one is already is progress.

System Action: Ignore the second request.

User Response: None.

System Programmer Response: None.

Module: EZACIC22

Destination: TERMINATION

EZY1342I *mm/dd/yy hh:mm:ss* **DISABLE DELAYED UNTIL ALL USING TASKS COMPLETE TERM=***term* **TRAN=***tranxxx*

Explanation: A quiesce is in progress and is waiting for the completion of all outstanding CICS tasks using the CICS sockets interface.

System Action: Continue with the quiesce.

User Response: None.

System Programmer Response: None.

Module: EZACIC22

Destination: TERMINATION

EZY1343I *mm/dd/yy hh:mm:ss* **CICS/SOCKETS INTERFACE IMMEDIATELY DISABLED TERM=***term* **TRAN=***tranxxx*

Explanation: A request for immediate termination of the CICS Sockets Interface has been successfully completed.

System Action: Terminate the CICS Sockets Interface.

User Response: None.

System Programmer Response: None.

Module: EZACIC22

Destination: TERMINATION

EZY1344I *mm/dd/yy hh:mm:ss* **CICS/SOCKETS INTERFACE QUIESCENTLY DISABLED TERM=***term* **TRAN=***tranxxx*

Explanation: A request for deferred termination of the CICS Sockets Interface has been successfully completed.

System Action: Terminate the CICS Sockets Interface.

User Response: None.

System Programmer Response: None.

Module: EZACIC22

EZY1345E *mm/dd/yy hh:mm:ss* **CICS/SOCKETS WLM REGISTER FAILURE. RETURN CODE =** *return_code***, GROUP =** *groupname***, LISTNER =** *list*

Explanation: The CICS listener received an error response when attempting to register WLM group with the Workload manager.

mm/dd/yy hh:mm:ss
Date and time of the message.

return_code
The return code from the WLM registration.

groupname
Name of the WLM group.

list Name of the CICS listener.

System Action: The listener continues initialization but will not use *groupname* to participate in workload connection balancing.

User Response: Verify that the WLM group name is correct and correctly defined to the Workload manager. If it is incorrect, either change it in the EZACICD TYPE=LISTENER macro that was used to define the listener, or change it via the EZAC transaction. See the *z/OS MVS Programming: Workload Management Services* for more information about *return_code*.

System Programmer Response: None

Module: EZACIC12

EZY1346E *mm/dd/yy hh:mm:ss* **CICS SOCKETS WLM DEREGISTER FAILED RETURN CODE =** *return_code***, GROUP =** *groupname***, LISTNER =** *list*

Explanation: The CICS listener received an error response when attempting to deregister WLM group with the Workload manager.

mm/dd/yy hh:mm:ss
Date and time of the message.

return_code
The return code from the WLM deregistration.

groupname
Name of the WLM group.

list Name of the CICS listener.

System Action: The listener continues termination.

User Response: See the *z/OS MVS Programming: Workload Management Services* for more information about *return_code*.

System Programmer Response: None.

Module: EZACIC12

EZY1347I *mm/dd/yy hh:mm:ss* **PROGRAM** *programname* **ASSUMED TO BE AUTOINSTALLED TRANID=***transactionid* **IP ADDR=***inetaddress* **PORT=***portnumber*

Explanation: The Listener checked the status of the program associated with the transaction. It was not found. Since program autoinstall is active in the CICS region, the Listener assumes that the program definition will automatically be installed by CICS.

mm/dd/yy
The date (month/day/year) of the message.

hh:mm:ss
The time (hours:minutes:seconds) of the message.

programname
The name of the undefined program which is associated with the transaction requested by the connecting client.

transactionid
The name of the transaction that was requested by the connecting client.

inetaddress
The internet address of the connecting client.

portnumber
The connecting client's port number.

System Action: Listener continues.

User Response: None.

System Programmer Response: Verify that the program name in the transaction definition is correct. Verify that the program is intended to be autoinstalled rather than explicitly defined in the PPT.

Module: EZACIC02

Destination: LISTENER

Appendix D. Sample Programs

This appendix contains samples of EZACICSC and EZACICSS.

EZACICSC

The following COBOL socket program is in the *hlq*.SEZAINST data set.

```
* $SEG(EZACICSC)
*---------------------------------------------------------------*
*                                                               *
*   Module Name : EZACICSC                                      *
*                                                               *
*   Description :                                               *
*                                                               *
*      This is a sample CICS/TCP application program. It issues*
*      TAKESOCKET to obtain the socket passed from MASTER      *
*      SERVER and perform dialog function with CLIENT program. *
*                                                               *
*  COPYRIGHT = LICENSED MATERIALS - PROPERTY OF IBM            *
*              5655-HAL (C) COPYRIGHT IBM CORP. 1993           *
*              This module is restricted materials of IBM      *
*              REFER TO IBM COPYRIGHT INSTRUCTIONS.            *
*                                                               *
*   Status :  Version 3, Release 0, Mod 0                       *
*                                                               *
*                                                               *
*---------------------------------------------------------------*
*
 IDENTIFICATION DIVISION.
 PROGRAM-ID. EZACICSC.
 ENVIRONMENT DIVISION.
 DATA DIVISION.
*
 WORKING-STORAGE SECTION.
 77  TASK-START                     PIC X(40)
      VALUE IS 'TASK STARTING THRU CICS/TCPIP INTERFACE '.
 77  TAKE-ERR                       PIC X(24)
      VALUE IS ' TAKESOCKET FAIL       '.
 77  TAKE-SUCCESS                    PIC X(24)
      VALUE IS ' TAKESOCKET SUCCESSFUL '.
 77  READ-ERR                        PIC X(24)
      VALUE IS ' READ SOCKET FAIL       '.
 77  READ-SUCCESS                    PIC X(24)
      VALUE IS ' READ SOCKET SUCCESSFUL '.
 77  WRITE-ERR                       PIC X(24)
      VALUE IS ' WRITE SOCKET FAIL      '.
 77  WRITE-END-ERR                       PIC X(32)
      VALUE IS ' WRITE SOCKET FAIL - PGM END MSG'.
 77  WRITE-SUCCESS                   PIC X(25)
      VALUE IS ' WRITE SOCKET SUCCESSFUL '.
 77  CLOS-ERR                        PIC X(24)
      VALUE IS ' CLOSE SOCKET FAIL      '.
 77  CLOS-SUCCESS                   PIC X(24)
      VALUE IS 'CLOSE SOCKET SUCCESSFUL '.
 77  INVREQ-ERR                     PIC X(24)
      VALUE IS 'INTERFACE IS NOT ACTIVE '.
 77  IOERR-ERR                     PIC X(24)
      VALUE IS 'IOERR OCCURRS           '.
 77  LENGERR-ERR                   PIC X(24)
```

```
     VALUE IS 'LENGERR ERROR           '.
 77  ITEMERR-ERR                   PIC X(24)
     VALUE IS 'ITEMERR ERROR           '.
 77  NOSPACE-ERR                   PIC X(24)
     VALUE IS 'NOSPACE CONDITION       '.
 77  QIDERR-ERR                   PIC X(24)
     VALUE IS 'QIDERR  CONDITION       '.
 77  ENDDATA-ERR                  PIC X(30)
     VALUE IS 'RETRIEVE DATA CAN NOT BE FOUND'.
 77  WRKEND                       PIC X(20)
     VALUE 'CONNECTION END      '.
 77  WRITE-SW                     PIC X(1)
     VALUE 'N'.
 01  SOKET-FUNCTIONS.
     02 SOKET-ACCEPT          PIC X(16) VALUE 'ACCEPT          '.
     02 SOKET-BIND            PIC X(16) VALUE 'BIND            '.
     02 SOKET-CLOSE           PIC X(16) VALUE 'CLOSE           '.
     02 SOKET-CONNECT         PIC X(16) VALUE 'CONNECT         '.
     02 SOKET-FCNTL           PIC X(16) VALUE 'FCNTL           '.
     02 SOKET-GETCLIENTID     PIC X(16) VALUE 'GETCLIENTID     '.
     02 SOKET-GETHOSTBYADDR   PIC X(16) VALUE 'GETHOSTBYADDR   '.
     02 SOKET-GETHOSTBYNAME   PIC X(16) VALUE 'GETHOSTBYNAME   '.
     02 SOKET-GETHOSTID       PIC X(16) VALUE 'GETHOSTID       '.
     02 SOKET-GETHOSTNAME     PIC X(16) VALUE 'GETHOSTNAME     '.
     02 SOKET-GETPEERNAME     PIC X(16) VALUE 'GETPEERNAME     '.
     02 SOKET-GETSOCKNAME     PIC X(16) VALUE 'GETSOCKNAME     '.
     02 SOKET-GETSOCKOPT      PIC X(16) VALUE 'GETSOCKOPT      '.
     02 SOKET-GIVESOCKET      PIC X(16) VALUE 'GIVESOCKET      '.
     02 SOKET-INITAPI         PIC X(16) VALUE 'INITAPI         '.
     02 SOKET-IOCTL           PIC X(16) VALUE 'IOCTL           '.
     02 SOKET-LISTEN          PIC X(16) VALUE 'LISTEN          '.
     02 SOKET-READ            PIC X(16) VALUE 'READ            '.
     02 SOKET-RECV            PIC X(16) VALUE 'RECV            '.
     02 SOKET-RECVFROM        PIC X(16) VALUE 'RECVFROM        '.
     02 SOKET-SELECT          PIC X(16) VALUE 'SELECT          '.
     02 SOKET-SEND            PIC X(16) VALUE 'SEND            '.
     02 SOKET-SENDTO          PIC X(16) VALUE 'SENDTO          '.
     02 SOKET-SETSOCKOPT      PIC X(16) VALUE 'SETSOCKOPT      '.
     02 SOKET-SHUTDOWN        PIC X(16) VALUE 'SHUTDOWN        '.
     02 SOKET-SOCKET          PIC X(16) VALUE 'SOCKET          '.
     02 SOKET-TAKESOCKET      PIC X(16) VALUE 'TAKESOCKET      '.
     02 SOKET-TERMAPI         PIC X(16) VALUE 'TERMAPI         '.
     02 SOKET-WRITE           PIC X(16) VALUE 'WRITE           '.

 01  WRKMSG.
     02 WRKM                         PIC X(14)
        VALUE IS 'DATA RECEIVED '.
*----------------------------------------------------------------*
*    program's variables                                         *
*----------------------------------------------------------------*

 77  SUBTRACE                PIC X(8)  VALUE 'CONTRACE'.
 77  BITMASK-TOKEN           PIC X(16) VALUE 'TCPIPBITMASKCOBL'.
 77  TOEBCDIC-TOKEN          PIC X(16) VALUE 'TCPIPTOEBCDICXLT'.
 77  TOASCII-TOKEN           PIC X(16) VALUE 'TCPIPTOASCIIXLAT'.
 77  RESPONSE                       PIC 9(9) COMP.
 77  TASK-FLAG                      PIC X(1) VALUE '0'.
 77  TAKE-SOCKET                    PIC 9(8) COMP.
 77  SOCKID                         PIC 9(4) COMP.
 77  SOCKID-FWD                     PIC 9(8) COMP.
 77  ERRNO                          PIC 9(8) COMP.
```

```
 77  RETCODE                        PIC S9(8) COMP.
 77  AF-INET                        PIC 9(8) COMP VALUE 2.
 01  TCP-BUF.
     05 TCP-BUF-H                   PIC X(3) VALUE IS SPACES.
     05 TCP-BUF-DATA                PIC X(197) VALUE IS SPACES.
 77  TCPLENG                        PIC 9(8) COMP.
 77  RECV-FLAG                      PIC 9(8) COMP.
 77  CLENG                          PIC 9(4) COMP.
 77  CNT                            PIC 9(4) COMP.

 01  ZERO-PARM                  PIC X(16) VALUE LOW-VALUES.
 01  DUMMY-MASK REDEFINES ZERO-PARM.
     05 DUMYMASK                PIC X(8).
     05 ZERO-FLD-8              PIC X(8).
 01  ZERO-FLD REDEFINES ZERO-PARM.
     05 ZERO-FWRD               PIC 9(8)  COMP.
     05 ZERO-HWRD               PIC 9(4)  COMP.
     05 ZERO-DUM                PIC X(10).

 01  TD-MSG.
     03 TASK-LABEL              PIC X(07) VALUE 'TASK # '.
     03 TASK-NUMBER             PIC 9(07).
     03 TASK-SEP                PIC X     VALUE ' '.
     03  CICS-MSG-AREA          PIC X(70).
 01  CICS-ERR-AREA.
     03  ERR-MSG            PIC X(24).
     03  SOCK-HEADER        PIC X(08) VALUE ' SOCKET='.
     03  ERR-SOCKET         PIC 9(05).
     03  RETC-HEADER        PIC X(09) VALUE ' RETCDE=-'.
     03  ERR-RETCODE        PIC 9(05).
     03  ERRN-HEADER        PIC X(07) VALUE ' ERRNO='.
     03  ERR-ERRNO          PIC 9(05).
*
 01  CLIENTID-LSTN.
     05 CID-DOMAIN-LSTN               PIC 9(8) COMP.
     05 CID-NAME-LSTN                 PIC X(8).
     05 CID-SUBTASKNAME-LSTN          PIC X(8).
     05 CID-RES-LSTN                  PIC X(20).

 01  CLIENTID-APPL.
     05 CID-DOMAIN-APPL               PIC 9(8) COMP.
     05 CID-NAME-APPL                 PIC X(8).
     05 CID-SUBTASKNAME-APPL          PIC X(8).
     05 CID-RES-APPL                  PIC X(20).

 01  TCPSOCKET-PARM.
     05 GIVE-TAKE-SOCKET              PIC 9(8) COMP.
     05 LSTN-NAME                     PIC X(8).
     05 LSTN-SUBTASKNAME              PIC X(8).
     05 CLIENT-IN-DATA                PIC X(35).
     05 FILLER                        PIC X(1).
     05 SOCKADDR-IN.
       10  SIN-FAMILY                 PIC 9(4) COMP.
       10  SIN-PORT                   PIC 9(4) COMP.
       10  SIN-ADDR                   PIC 9(8) COMP.
       10  SIN-ZERO                   PIC X(8).


 PROCEDURE DIVISION.
```

```
           EXEC CICS HANDLE CONDITION INVREQ  (INVREQ-ERR-SEC)
                                      IOERR   (IOERR-SEC)
                                      ENDDATA (ENDDATA-SEC)
                                      LENGERR (LENGERR-SEC)
                                      NOSPACE (NOSPACE-ERR-SEC)
                                      QIDERR  (QIDERR-SEC)
                                      ITEMERR (ITEMERR-SEC)
                END-EXEC.

           PERFORM INITIAL-SEC     THRU   INITIAL-SEC-EXIT.
           PERFORM TAKESOCKET-SEC  THRU   TAKESOCKET-SEC-EXIT.

           MOVE '0' TO TASK-FLAG.
           PERFORM CLIENT-TASK     THRU   CLIENT-TASK-EXIT
               VARYING CNT FROM 1 BY 1  UNTIL TASK-FLAG = '1'.

       CLOSE-SOCK.
      *----------------------------------------------------------------*
      *                                                                *
      *   CLOSE 'accept descriptor'                                    *
      *                                                                *
      *----------------------------------------------------------------*

           CALL 'EZASOKET' USING SOKET-CLOSE SOCKID
                 ERRNO RETCODE.

           IF RETCODE <  0 THEN
              MOVE CLOS-ERR TO ERR-MSG
              MOVE SOCKID TO ERR-SOCKET
              MOVE RETCODE TO ERR-RETCODE
              MOVE ERRNO TO ERR-ERRNO
              MOVE CICS-ERR-AREA TO CICS-MSG-AREA
           ELSE
              MOVE CLOS-SUCCESS TO CICS-MSG-AREA.
           PERFORM WRITE-CICS  THRU WRITE-CICS-EXIT.

       PGM-EXIT.

           IF RETCODE < 0 THEN
              EXEC CICS ABEND ABCODE('TCPC') END-EXEC.

           MOVE SPACES TO CICS-MSG-AREA.
           MOVE 'END OF EZACICSC PROGRAM' TO CICS-MSG-AREA.
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
           EXEC CICS RETURN  END-EXEC.
           GOBACK.

      *----------------------------------------------------------------*
      *
      *  RECEIVE PASSED PARAMETER WHICH ARE CID                        *
      *
      *----------------------------------------------------------------*
       INITIAL-SEC.

           MOVE SPACES TO CICS-MSG-AREA.
           MOVE 50 TO CLENG.
           MOVE 'TCPC TRANSACTION START UP     ' TO CICS-MSG-AREA.
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.

           MOVE 72 TO CLENG.
```

```
     EXEC CICS RETRIEVE INTO(TCPSOCKET-PARM) LENGTH(CLENG)
                         END-EXEC.

 INITIAL-SEC-EXIT.
     EXIT.

*----------------------------------------------------------------*
*                                                                *
*  Perform TCP SOCKET functions by passing socket command to     *
*  EZASOKET routine.  SOCKET command are translated to pre-      *
*  define integer.                                               *
*                                                                *
*----------------------------------------------------------------*

 TAKESOCKET-SEC.

*----------------------------------------------------------------*
*                                                                *
*   Issue 'TAKESOCKET' call to acquire a socket which was        *
*   given by the LISTENER program.                               *
*                                                                *
*----------------------------------------------------------------*

     MOVE AF-INET TO CID-DOMAIN-LSTN CID-DOMAIN-APPL.

     MOVE LSTN-NAME TO CID-NAME-LSTN.
     MOVE LSTN-SUBTASKNAME TO CID-SUBTASKNAME-LSTN.
     MOVE GIVE-TAKE-SOCKET TO TAKE-SOCKET SOCKID SOCKID-FWD.
     CALL 'EZASOKET' USING SOKET-TAKESOCKET SOCKID
          CLIENTID-LSTN ERRNO RETCODE.


     IF RETCODE <  0 THEN
        MOVE 'Y' TO WRITE-SW
        MOVE TAKE-ERR TO ERR-MSG
        MOVE SOCKID TO ERR-SOCKET
        MOVE RETCODE TO ERR-RETCODE
        MOVE ERRNO TO ERR-ERRNO
        MOVE CICS-ERR-AREA TO CICS-MSG-AREA
        PERFORM WRITE-CICS THRU WRITE-CICS-EXIT
        GO TO PGM-EXIT
     ELSE
         MOVE SPACES TO CICS-MSG-AREA
         MOVE TAKE-SUCCESS TO CICS-MSG-AREA
         PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.

     MOVE RETCODE TO SOCKID.
     MOVE SPACES TO TCP-BUF.
     MOVE TASK-START TO TCP-BUF.
     MOVE 50  TO TCPLENG.
*
*    REMOVE FOLLOWING STATEMENT IF USING EBCDIC CLIENT
*
     CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG.

     CALL 'EZASOKET' USING SOKET-WRITE SOCKID TCPLENG
           TCP-BUF ERRNO RETCODE.

     IF RETCODE <  0 THEN
        MOVE 'Y' TO WRITE-SW
        MOVE WRITE-ERR TO ERR-MSG
```

```
           MOVE SOCKID TO ERR-SOCKET
           MOVE RETCODE TO ERR-RETCODE
           MOVE ERRNO TO ERR-ERRNO
           MOVE CICS-ERR-AREA TO CICS-MSG-AREA
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT
           GO TO PGM-EXIT
        ELSE
           MOVE WRITE-SUCCESS TO CICS-MSG-AREA
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
 TAKESOCKET-SEC-EXIT.
        EXIT.



 CLIENT-TASK.
*----------------------------------------------------------------*
*                                                                *
*  Issue 'READV' socket to receive input data from client       *
*                                                                *
*----------------------------------------------------------------*


        MOVE LOW-VALUES TO TCP-BUF.
        MOVE 200 TO TCPLENG.

        CALL 'EZASOKET' USING SOKET-RECV SOCKID
             RECV-FLAG TCPLENG TCP-BUF ERRNO RETCODE.

        IF RETCODE <  0 THEN
           MOVE 'Y' TO WRITE-SW
           MOVE READ-ERR TO ERR-MSG
           MOVE SOCKID TO ERR-SOCKET
           MOVE RETCODE TO ERR-RETCODE
           MOVE ERRNO TO ERR-ERRNO
           MOVE CICS-ERR-AREA TO CICS-MSG-AREA
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT
           GO TO PGM-EXIT
        ELSE
           MOVE READ-SUCCESS TO CICS-MSG-AREA
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.

        IF TCP-BUF-H = 'END' OR TCP-BUF-H = 'end' THEN
           MOVE '1' TO TASK-FLAG
           PERFORM CLIENT-TALK-END THRU CLIENT-TALK-END-EXIT
           GO TO CLIENT-TASK-EXIT.

        IF RETCODE = 0  THEN
           MOVE '1' TO TASK-FLAG
           GO TO CLIENT-TASK-EXIT.
*----------------------------------------------------------------*
**  ECHO RECEIVING DATA
*----------------------------------------------------------------*
        PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
*
*       REMOVE FOLLOWING STATEMENT IF USING EBCDIC CLIENT
*
        CALL 'EZACIC05' USING TOEBCDIC-TOKEN TCP-BUF TCPLENG.
        MOVE TCP-BUF TO CICS-MSG-AREA.

        MOVE RETCODE TO TCPLENG.
*
```

```
*    REMOVE FOLLOWING STATEMENT IF USING EBCDIC CLIENT
*
     CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG.
     CALL 'EZASOKET' USING SOKET-WRITE SOCKID TCPLENG
          TCP-BUF ERRNO RETCODE.


     IF RETCODE <  0 THEN
        MOVE 'Y' TO WRITE-SW
        MOVE WRITE-ERR TO ERR-MSG
        MOVE SOCKID TO ERR-SOCKET
        MOVE RETCODE TO ERR-RETCODE
        MOVE ERRNO TO ERR-ERRNO
        MOVE CICS-ERR-AREA TO CICS-MSG-AREA
        PERFORM WRITE-CICS THRU WRITE-CICS-EXIT
        GO TO PGM-EXIT
     ELSE
        MOVE WRITE-SUCCESS TO CICS-MSG-AREA
        PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.

 CLIENT-TASK-EXIT.
     EXIT.


 WRITE-CICS.
     IF WRITE-SW = 'Y' THEN
         MOVE 78 TO CLENG
         MOVE EIBTASKN TO TASK-NUMBER
         EXEC CICS WRITEQ TD QUEUE('CSMT') FROM(TD-MSG)
              LENGTH(CLENG) NOHANDLE
         END-EXEC
     ELSE
         NEXT SENTENCE.
     MOVE SPACES TO CICS-MSG-AREA.

 WRITE-CICS-EXIT.
     EXIT.

 CLIENT-TALK-END.
        MOVE LOW-VALUES TO TCP-BUF.
        MOVE WRKEND TO TCP-BUF CICS-MSG-AREA.

        MOVE 50 TO TCPLENG.
*
*    REMOVE FOLLOWING STATEMENT IF USING EBCDIC CLIENT
*
        CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG.
        CALL 'EZASOKET' USING SOKET-WRITE SOCKID TCPLENG
             TCP-BUF ERRNO RETCODE.

        IF RETCODE <  0 THEN
           MOVE 'Y' TO WRITE-SW
           MOVE WRITE-END-ERR TO ERR-MSG
           MOVE SOCKID TO ERR-SOCKET
           MOVE RETCODE TO ERR-RETCODE
           MOVE ERRNO TO ERR-ERRNO
           MOVE CICS-ERR-AREA TO CICS-MSG-AREA
           PERFORM WRITE-CICS THRU WRITE-CICS-EXIT
           GO TO PGM-EXIT.
```

```
CLIENT-TALK-END-EXIT.
    EXIT.

INVREQ-ERR-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE INVREQ-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
IOERR-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE IOERR-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
LENGERR-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE LENGERR-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
NOSPACE-ERR-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE NOSPACE-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
QIDERR-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE QIDERR-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
ITEMERR-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE ITEMERR-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
ENDDATA-SEC.
    MOVE 'Y' TO WRITE-SW
    MOVE ENDDATA-ERR TO CICS-MSG-AREA.
    PERFORM WRITE-CICS THRU WRITE-CICS-EXIT.
    GO TO PGM-EXIT.
```

EZACICSS

The following COBOL socket program is in the *hlq*.SEZAINST data set.

```
***************************************************************
*                                                             *
*        TCP/IP for MVS                                       *
*                                                             *
*   Licensed Materials - Property of IBM                      *
*   This product contains "Restricted Materials of IBM"       *
*   5735-FAL (C) Copyright IBM Corp. 1991                     *
*   5655-HAL (C) Copyright IBM Corp. 1992, 1994.              *
*   All rights reserved.                                      *
*   US Government Users Restricted Rights -                   *
*   Use, duplication or disclosure restricted by GSA ADP      *
*   Schedule                                                  *
*   Contract with IBM Corp.                                   *
*   See IBM Copyright Instructions.                           *
*                                                             *
***************************************************************
* $SEG(EZACICSS)
*-------------------------------------------------------------*
*                                                              *
*   Module Name    EZACICSS                                    *
```

```
*                                                              *
*   Description    This is a sample server program.  It       *
*                  establishes a connection between           *
*                  CICS and TCPIP to process client requests.*     *
*                  The server expects the data received       *
*                  from a host / workstation in ASCII.        *
*                  All responses sent by the server to the    *
*                  CLIENT are in ASCII.  This server is       *
*                  started using CECI or via the LISTENER.    *
*                  It processes request received from         *
*                  clients for updates to a DB2 database.     *
*                  A client connection is broken when the     *
*                  client transmits an 'END' token to the     *
*                  server.  All processing is terminated      *
*                  when an 'TRM' token is received from a     *
*                  client.                                    *
*                                                              *
*                                                              *
*--------------------------------------------------------------*
*                                                              *
*   LOGIC          1.  Establish server setup                 *
*                      a).  TRUE Active                       *
*                      b).  CAF Active                        *
*                  2.  Assign user specified port at          *
*                      start up or use the program            *
*                      declared default.                      *
*                  3.  Initialize the Socket.                 *
*                  4.  Bind the port.                         *
*                  5.  Set Bit Mask to accept incoming        *
*                      read request.                          *
*                  6.  Process request from clients.          *
*                      a)   Wait for connection               *
*                      b)   Process request until 'END'       *
*                           token is receive from client.     *
*                      c)   Close connection.                 *
*                      note   The current client request      *
*                             ends when the client closes     *
*                             the connection or sends an      *
*                             'END' token to the server.      *
*                      d)   If the last request received by   *
*                           the current client is not a       *
*                           request to the server to          *
*                           terminate processing ('TRM'),     *
*                           continue at step 6A.              *
*                  7.  Close the server's connection.         *
*                                                              *
*--------------------------------------------------------------*
 IDENTIFICATION DIVISION.
 PROGRAM-ID. EZACICSS.
 ENVIRONMENT DIVISION.
 DATA DIVISION.
 WORKING-STORAGE SECTION.
*---------------------------------------------------------------*
*   MESSAGES                                                    *
*---------------------------------------------------------------*
 77  BITMASK-ERR                     PIC X(30)
      VALUE IS 'BITMASK CONVERSION - FAILED   '.
 77  ENDDATA-ERR                     PIC X(30)
      VALUE IS 'RETRIEVE DATA CAN NOT BE FOUND'.
 77  INIT-MSG                        PIC X(30)
      VALUE IS 'INITAPI COMPLETE              '.
 77  IOERR-ERR                       PIC X(30)
      VALUE IS 'IOERR OCCURRS                 '.
 77  ITEMERR-ERR                     PIC X(30)
      VALUE IS 'ITEMERR ERROR                 '.
 77  KEYWORD-ERR                     PIC X(30)
      VALUE IS 'INPUT KEYWORD ERROR           '.
```

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77  LENGERR-ERR                     PIC X(30)
     VALUE IS 'LENGERR ERROR                 '.
77  NOSPACE-ERR                     PIC X(30)
     VALUE IS 'NOSPACE CONDITION             '.
77  NULL-DATA                       PIC X(30)
     VALUE IS 'READ NULL DATA                '.
77  QIDERR-ERR                      PIC X(30)
     VALUE IS 'TRANSIENT DATA QUEUE NOT FOUND'.
77  START-MSG                       PIC X(30)
     VALUE IS 'SERVER PROGRAM IS STARTING    '.
77  TCP-EXIT-ERR                    PIC X(30)
     VALUE IS 'SERVER STOPPED:TRUE NOT ACTIVE'.
77  TCP-SERVER-OFF                  PIC X(30)
     VALUE IS 'SERVER IS ENDING              '.
77  TS-INVREQ-ERR                   PIC X(30)
     VALUE IS 'WRITE TS FAILED  - INVREQ     '.
77  TS-NOTAUTH-ERR                  PIC X(30)
     VALUE IS 'WRITE TS FAILED  - NOTAUTH    '.
77  TS-IOERR-ERR                    PIC X(30)
     VALUE IS 'WRITE TS FAILED  - IOERR      '.
77  WRITETS-ERR                     PIC X(30)
     VALUE IS 'WRITE TS FAILED               '.
01  ACCEPT-ERR.
    05  ACCEPT-ERR-M                PIC X(25)
         VALUE IS 'SOCKET CALL FAIL - ACCEPT'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  ACCEPT-ERRNO                PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(13)
         VALUE IS SPACES.
01  BIND-ERR.
    05  BIND-ERR-M                  PIC X(25)
         VALUE IS 'SOCKET CALL FAIL  -  BIND'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  BIND-ERRNO                  PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(13)
         VALUE IS SPACES.
01  CLOSE-ERR.
    05  CLOSE-ERR-M                 PIC X(30)
         VALUE IS 'CLOSE SOCKET DESCRIPTOR FAILED'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  CLOSE-ERRNO                 PIC 9(8)  DISPLAY.
    05  FILLER                      PIC X(8)
         VALUE IS SPACES.
01  DB2END.
    05  FILLER                      PIC X(16)
         VALUE IS 'DB2 PROCESS ENDS'.
    05  FILLER                      PIC X(39)
         VALUE IS SPACES.
01  DB2-CAF-ERR.
    05  FILLER                      PIC X(24)
         VALUE IS 'CONNECT NOT ESTABLISHED '.
    05  FILLER                      PIC X(30)
         VALUE IS 'ATTACHMENT FACILITY NOT ACTIVE'.
    05  FILLER                      PIC X(1)
         VALUE IS SPACES.
01  DB2MSG.
    05  DB2-ACT                     PIC X(6)  VALUE SPACES.
        88 DAINSERT                           VALUE 'INSERT'.
        88 DADELETE                           VALUE 'DELETE'.
        88 DAUPDATE                           VALUE 'UPDATE'.
    05  DB2M                        PIC X(18)
         VALUE IS ' COMPLETE - #ROWS '.
    05  DB2M-VAR                    PIC X(10).
    05  FILLER                      PIC X(2)  VALUE SPACES.
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```
    05  DB2CODE                     PIC -(9)9.
    05  FILLER                      PIC X(11)
         VALUE IS SPACES.
01  INITAPI-ERR.
    05  INITAPI-ERR-M               PIC X(35)
         VALUE IS 'INITAPI FAILED - SERVER NOT STARTED'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  INIT-ERRNO                  PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(3)
         VALUE IS SPACES.
01  LISTEN-ERR.
    05  LISTEN-ERR-M                PIC X(25)
         VALUE IS 'SOCKET CALL FAIL - LISTEN'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  LISTEN-ERRNO                PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(13)
         VALUE IS SPACES.
01  LISTEN-SUCC.
    05  FILLER                      PIC X(34)
         VALUE IS 'READY TO ACCEPT REQUEST ON PORT:  '.
    05  BIND-PORT                   PIC X(4).
    05  FILLER                      PIC X(10)  VALUE SPACES.
    05  FILLER                      PIC X(7)
         VALUE IS SPACES.
01  PORTNUM-ERR.
    05  INVALID-PORT                PIC X(33)
         VALUE IS 'SERVER NOT STARTED - INVALID PORT'.
    05  FILLER                      PIC X(10)
         VALUE IS ' NUMBER = '.
    05  PORT-ERRNUM                 PIC X(4).
    05  FILLER                      PIC X(8)
         VALUE IS SPACES.
01  RECVFROM-ERR.
    05  RECVFROM-ERR-M              PIC X(24)
         VALUE IS 'RECEIVE SOCKET CALL FAIL'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  RECVFROM-ERRNO              PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(14)
         VALUE IS SPACES.
01  SELECT-ERR.
    05  SELECT-ERR-M                PIC X(24)
         VALUE IS 'SELECT CALL FAIL        '.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  SELECT-ERRNO                PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(14)
         VALUE IS SPACES.
01  SQL-ERROR.
    05  FILLER                      PIC X(35)
         VALUE IS 'SQLERR -PROG TERMINATION,SQLCODE = '.
    05  SQL-ERR-CODE                PIC -(9)9.
    05  FILLER                      PIC X(11)
         VALUE IS SPACES.
01  SOCKET-ERR.
    05  SOCKET-ERR-M                PIC X(25)
         VALUE IS 'SOCKET CALL FAIL - SOCKET'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  SOCKET-ERRNO                PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(13)
         VALUE IS SPACES.
01  TAKE-ERR.
    05  TAKE-ERR-M                  PIC X(17)
         VALUE IS 'TAKESOCKET FAILED'.
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    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  TAKE-ERRNO                  PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(21)
         VALUE IS SPACES.
 01  WRITE-ERR.
    05  WRITE-ERR-M                 PIC X(33)
         VALUE IS 'WRITE SOCKET FAIL'.
    05  FILLER                      PIC X(9)
         VALUE IS ' ERRNO = '.
    05  WRITE-ERRNO                 PIC 9(8) DISPLAY.
    05  FILLER                      PIC X(21)
         VALUE IS SPACES.
*----------------------------------------------------------------*
*    PROGRAM'S CONSTANTS                                          *
*----------------------------------------------------------------*
 77  TCP-TOKEN                PIC X(16) VALUE 'TCPIPIUCVSTREAMS'.
 77  BITMASK-TOKEN            PIC X(16) VALUE 'TCPIPBITMASKCOBL'.
 77  TOEBCDIC-TOKEN           PIC X(16) VALUE 'TCPIPTOEBCDICXLT'.
 77  TOASCII-TOKEN            PIC X(16) VALUE 'TCPIPTOASCIIXLAT'.
 77  CONTRACE                 PIC X(8)  VALUE 'CONTRACE'.
 77  CTOB                     PIC X(4)  VALUE 'CTOB'.
 77  DEL-ID                   PIC X(1)  VALUE ','.
 77  BACKLOG                  PIC 9(8)  VALUE 5 COMP.
 77  NONZERO-FWRD             PIC 9(8)  VALUE 256.
 77  TCP-FLAG                 PIC 9(8)  COMP VALUE 0.
 77  SOCK-TYPE                PIC 9(8)  COMP VALUE 1.
 77  AF-INET                  PIC 9(8)  COMP VALUE 2.
 77  NUM-FDS                  PIC 9(8)  COMP VALUE 5.
 77  LOM                      PIC 9(4)  COMP VALUE 4.
 77  CECI-LENG                PIC 9(8)  COMP VALUE 5.
 77  BUFFER-LENG              PIC 9(8)  COMP VALUE 55.
 77  GWLENG                   PIC 9(4)  COMP VALUE 256.
 77  DEFAULT-PORT             PIC X(4)  VALUE '????'.
    88  DEFAULT-SPECIFIED               VALUE '1950'.
 01  COMMAND.
    05  INITAPI-CMD           PIC 9(4)  COMP VALUE 0.
    05  ACCEPT-CMD            PIC 9(4)  COMP VALUE 1.
    05  BIND-CMD              PIC 9(4)  COMP VALUE 2.
    05  CLOSE-CMD             PIC 9(4)  COMP VALUE 3.
    05  CONNECT-CMD           PIC 9(4)  COMP VALUE 4.
    05  FCNTL-CMD             PIC 9(4)  COMP VALUE 5.
    05  GETHOSTID-CMD         PIC 9(4)  COMP VALUE 7.
    05  GETHOSTNAME-CMD       PIC 9(4)  COMP VALUE 8.
    05  GETPEERNAME-CMD       PIC 9(4)  COMP VALUE 9.
    05  GETSOCKNAME-CMD       PIC 9(4)  COMP VALUE 10.
    05  GETSOCKOPT-CMD        PIC 9(4)  COMP VALUE 11.
    05  IOCTL-CMD             PIC 9(4)  COMP VALUE 12.
    05  LISTEN-CMD            PIC 9(4)  COMP VALUE 13.
    05  READ-CMD              PIC 9(4)  COMP VALUE 14.
    05  RECVFROM-CMD          PIC 9(4)  COMP VALUE 16.
    05  SELECT-CMD            PIC 9(4)  COMP VALUE 19.
    05  SELECTX-CMD           PIC 9(4)  COMP VALUE 19.
    05  SEND-CMD              PIC 9(4)  COMP VALUE 20.
    05  SENDTO-CMD            PIC 9(4)  COMP VALUE 22.
    05  SETSOCKOPT-CMD        PIC 9(4)  COMP VALUE 23.
    05  SHUTDOWN-CMD          PIC 9(4)  COMP VALUE 24.
    05  SOCKET-CMD            PIC 9(4)  COMP VALUE 25.
    05  WRITE-CMD             PIC 9(4)  COMP VALUE 26.
    05  GETCLIENTID-CMD       PIC 9(4)  COMP VALUE 30.
    05  GIVESOCKET-CMD        PIC 9(4)  COMP VALUE 31.
    05  TAKESOCKET-CMD        PIC 9(4)  COMP VALUE 32.
*----------------------------------------------------------------*
*    PROGRAM'S VARIABLES                                          *
*----------------------------------------------------------------*
 77  PROTOCOL                 PIC 9(8)  COMP VALUE 0.
 77  SRV-SOCKID               PIC 9(4)  COMP VALUE 0.
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77  SRV-SOCKID-FWD          PIC 9(8)  COMP VALUE 0.
77  CLI-SOCKID              PIC 9(4)  COMP VALUE 0.
77  CLI-SOCKID-FWD          PIC 9(8)  COMP VALUE 0.
77  L-DESC                  PIC 9(8)  COMP VALUE 0.
77  LENG                    PIC 9(4)  COMP.
77  WSLENG                  PIC 9(4)  COMP.
77  RESPONSE                PIC 9(9)  COMP.
77  TSTAMP                  PIC 9(8).
77  TASK-FLAG               PIC X(1)  VALUE '0'.
    88  TASK-END            VALUE '1'.
    88  TASK-TERM           VALUE '2'.
77  GWPTR                   PIC S9(8) COMP.
77  WSPTR                   PIC S9(8) COMP.
77  TCP-INDICATOR           PIC X(1)  VALUE IS SPACE.
77  TAKESOCKET-SWITCH       PIC X(1)  VALUE IS SPACE.
    88  DOTAKESOCKET        VALUE '1'.
77  TCPLENG                 PIC 9(8)  COMP VALUE 0.
77  ERRNO                   PIC 9(8)  COMP.
77  RETCODE                 PIC S9(8) COMP.
77  TRANS                   PIC X(4).
01  CLIENTID-LSTN.
    05  CID-DOMAIN-LSTN     PIC 9(8)  COMP VALUE 2.
    05  CID-LSTN-INFO.
        10  CID-NAME-LSTN    PIC X(8).
        10  CID-SUBTNAM-LSTN PIC X(8).
    05  CID-RES-LSTN        PIC X(20) VALUE LOW-VALUES.
01  INITAPI-SOCKET.
    05  INIT-API2           PIC X(8)  VALUE 'IUCVAPI '.
    05  INIT-API3           PIC 9(4)  COMP VALUE 50.
    05  INIT-API4           PIC 9(4)  COMP VALUE 2.
    05  INIT-SUBTASKID.
        10  SUBTASKNO       PIC X(7)  VALUE LOW-VALUES.
        10  SUBT-CHAR       PIC A(1)  VALUE 'L'.
    05  INIT-API6           PIC 9(8)  COMP VALUE 0.
    05  NFDS                PIC 9(8)  COMP.
01  PORT-RECORD.
    05  PORT                PIC X(4).
    05  FILLER              PIC X(36).
01  SELECT-CSOCKET.
    05  READMASK            PIC X(4)  VALUE LOW-VALUES.
    05  DUMYMASK            PIC X(4)  VALUE LOW-VALUES.
    05  REPLY-RDMASK        PIC X(4)  VALUE LOW-VALUES.
    05  REPLY-RDMASK-FF     PIC X(4).
01  SOCKADDR-IN.
    05  SIN-FAMILY          PIC 9(4)  COMP VALUE 0.
    05  SIN-PORT            PIC 9(4)  COMP VALUE 0.
    05  SIN-ADDR            PIC 9(8)  COMP VALUE 0.
    05  SIN-ZERO            PIC X(8)  VALUE LOW-VALUES.
01  SOCKET-CONV.
    05  SOCKET-TBL  OCCURS 6 TIMES.
        10  SOCK-CHAR       PIC X(1)  VALUE '0'.
01  TCP-BUF.
    05  TCP-BUF-H           PIC X(3).
    05  TCP-BUF-DATA        PIC X(52).
01  TCPCICS-MSG-AREA.
    02  TCPCICS-MSG-1.
        05  MSGDATE         PIC 9(8).
        05  FILLER          PIC X(2)  VALUE SPACES.
        05  MSGTIME         PIC 9(8).
        05  FILLER          PIC X(2)  VALUE SPACES.
        05  MODULE          PIC X(10) VALUE 'EZACICSS: '.
    02  TCPCICS-MSG-2.
        05  MSG-AREA        PIC X(55) VALUE SPACES.
01  TCP-INPUT-DATA             PIC X(85) VALUE LOW-VALUES.
01  TCPSOCKET-PARM REDEFINES TCP-INPUT-DATA.
    05  GIVE-TAKE-SOCKET    PIC 9(8)  COMP.
    05  CLIENTID-PARM.
```

```
         10  LSTN-NAME        PIC X(8).
         10  LSTN-SUBTASKNAME PIC X(8).
     05  CLIENT-DATA-FLD.
         10  CLIENT-IN-DATA   PIC X(35).
         10  FILLER           PIC X(1).
     05  SOCKADDR-IN-PARM.
         10  SIN-FAMILY-PARM  PIC 9(4).
         10  SIN-PORT-PARM    PIC 9(4).
         10  SIN-ADDR-PARM    PIC 9(8)  COMP.
         10  SIN-ZERO-PARM    PIC X(8).
 01  TIMEVAL.
     02 TVSEC                 PIC 9(8)  COMP VALUE 180.
     02 TVUSEC                PIC 9(8)  COMP VALUE 0.
 01  ZERO-PARM                PIC X(16) VALUE LOW-VALUES.
 01  ZERO-FLD REDEFINES ZERO-PARM.
     02  ZERO-8               PIC X(8).
     02  ZERO-DUM             PIC X(2).
     02  ZERO-HWRD            PIC 9(4)  COMP.
     02  ZERO-FWRD            PIC 9(8)  COMP.
* ********************************************** *
*  INPUT FORMAT FOR UPDATING THE SAMPLE DB2 TABLE *
* ********************************************** *
 01  INPUT-DEPT.
     05  IN-ACT               PIC X(3).
     05  IN-DEPTNO            PIC X(3).
     05  IN-DEPTN             PIC X(36).
     05  IN-MGRNO             PIC X(6).
     05  IN-ADMRDEPT          PIC X(3).
*---------------------------------------------------------------*
*    SQL STATEMENTS:  SQL COMMUNICATION AREA                    *
*---------------------------------------------------------------*
     EXEC SQL INCLUDE SQLCA    END-EXEC.
*---------------------------------------------------------------*
*    SQL STATEMENTS:  DEPARTMENT TABLE CREATE STATEMENT FOR DB2 *
*                                                               *
*              CREATE TABLE TCPCICS.DEPT                        *
*                     (DEPTNO       CHAR(03),                   *
*                      DEPTNAME     CHAR(36),                   *
*                      MGRNO        CHAR(06),                   *
*                      ADMRDEPT     CHAR(03));                  *
*                                                               *
*---------------------------------------------------------------*
*    DCLGEN GENERATED FROM DB2 FOR THE DEPARTMENT TABLE.        *
*---------------------------------------------------------------*
*    EXEC SQL INCLUDE DCLDEPT  END-EXEC.
******************************************************************
* DCLGEN TABLE(TCPCICS.DEPT)                                     *
*        LIBRARY(SYSADM.CICS.SPUFI(DCLDEPT))                     *
*        LANGUAGE(COBOL)                                         *
*        QUOTE                                                   *
* ... IS THE DCLGEN COMMAND THAT MADE THE FOLLOWING STATEMENTS   *
******************************************************************
     EXEC SQL DECLARE TCPCICS.DEPT TABLE
     ( DEPTNO                         CHAR(3),
       DEPTNAME                       CHAR(36),
       MGRNO                          CHAR(6),
       ADMRDEPT                       CHAR(3)
     ) END-EXEC.
******************************************************************
* COBOL DECLARATION FOR TABLE TCPCICS.DEPT                       *
******************************************************************
 01  DCLDEPT.
     10 DEPTNO               PIC X(3).
     10 DEPTNAME             PIC X(36).
     10 MGRNO                PIC X(6).
     10 ADMRDEPT             PIC X(3).
******************************************************************
```

```
* THE NUMBER OF COLUMNS DESCRIBED BY THIS DECLARATION IS 4       *
******************************************************************
 PROCEDURE DIVISION.
     EXEC SQL WHENEVER SQLERROR    GO TO SQL-ERROR-ROU END-EXEC.
     EXEC SQL WHENEVER SQLWARNING  GO TO SQL-ERROR-ROU END-EXEC.
     EXEC CICS IGNORE CONDITION TERMERR
                                EOC
                                SIGNAL
     END-EXEC.
     EXEC CICS HANDLE CONDITION ENDDATA   (ENDDATA-SEC)
                                IOERR     (IOERR-SEC)
                                LENGERR   (LENGERR-SEC)
                                NOSPACE   (NOSPACE-ERR-SEC)
                                QIDERR    (QIDERR-SEC)
     END-EXEC.
     MOVE START-MSG                     TO MSG-AREA.
     PERFORM HANDLE-TCPCICS             THRU HANDLE-TCPCICS-EXIT.
*----------------------------------------------------------------*
*                                                                *
*  BEFORE SERVER  STARTS, TRUE MUST BE ACTIVE.  ISSUE 'EXTRACT  *
*  EXIT' COMMAND TO CHECK IF TRUE IS ACTIVE OR NOT              *
*                                                                *
*----------------------------------------------------------------*
     EXEC CICS PUSH HANDLE END-EXEC.
     EXEC CICS HANDLE CONDITION
          INVEXITREQ(TCP-TRUE-REQ)
     END-EXEC.
     EXEC CICS EXTRACT EXIT
          PROGRAM ('EZACIC01')
          GASET   (GWPTR)
          GALENGTH(GWLENG)
     END-EXEC.
     EXEC CICS POP HANDLE END-EXEC.
*----------------------------------------------------------------*
*                                                                *
*  CICS ATTACH FACILITY MUST BE STARTED FOR THE APPROPRIATE DB2 *
*  SUBSYSTEM BEFORE YOU EXECUTE CICS TRANSACTIONS REQUIRING     *
*  ACCESS TO DB2 DATABASES.                                     *
*                                                                *
*----------------------------------------------------------------*
     EXEC CICS PUSH HANDLE END-EXEC.
     EXEC CICS HANDLE CONDITION
          INVEXITREQ(DB2-TRUE-REQ)
     END-EXEC.
     EXEC CICS EXTRACT EXIT
          PROGRAM   ('DSNCEXT1')
          ENTRYNAME ('DSNCSQL')
          GASET     (WSPTR)
          GALENGTH  (WSLENG)
     END-EXEC.
     EXEC CICS POP HANDLE END-EXEC.
*----------------------------------------------------------------*
*                                                                *
*  AT START UP THE SERVER REQUIRES THE PORT NUMBER FOR TCP/IP   *
*  IT WILL USE.  THE PORT NUMBER SUPPORTED BY THIS SAMPLE IS    *
*  4 DIGITS IN LENGTH.                                          *
*                                                                *
*  INVOCATION:  <server>,<port number>                          *
*   LISTENER => SRV2,4000  - OR -  SRV2,4    -                  *
*   CECI     => CECI START TR(SRV2) FROM(4000)                  *
*                                                                *
*  THE LEADING SPACES ARE SIGNIFICANT.                          *
*                                                                *
*----------------------------------------------------------------*
     MOVE EIBTRNID                      TO TRANS.
     EXEC CICS RETRIEVE
          INTO   (TCP-INPUT-DATA)
```

```
         LENGTH (LENG)
     END-EXEC.
* ************************************************************ *
* THE PORT CAN SPECIFIED IN THE FROM(????) OPTION OF THE CECI   *
* COMMAND OR THE DEFAULT PORT IS USED.                          *
* THE PORT FOR THE LISTENER STARTED SERVER IS THE PORT          *
* SPECIFIED IN THE CLIENT-DATA-FLD OR THE DEFAULT PORT          *
* IS USED.                                                      *
* ************************************************************ *
*       THE DEFAULT PORT MUST BE SET, BY THE PROGRAMMER.        *
* ************************************************************ *
     IF LENG < CECI-LENG
        THEN MOVE TCP-INPUT-DATA      TO PORT
        ELSE
          MOVE CLIENT-DATA-FLD        TO PORT-RECORD
          MOVE '1'                    TO TAKESOCKET-SWITCH
     END-IF.
     INSPECT PORT REPLACING LEADING SPACES BY '0'.
     IF PORT IS NUMERIC
        THEN MOVE PORT                TO BIND-PORT
        ELSE
          IF DEFAULT-SPECIFIED
             THEN  MOVE DEFAULT-PORT  TO PORT
                                         BIND-PORT
             ELSE
               MOVE PORT              TO PORT-ERRNUM
               MOVE PORTNUM-ERR       TO MSG-AREA
               PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT
               GO TO PGM-EXIT
          END-IF
     END-IF.
     IF DOTAKESOCKET
        THEN PERFORM LISTENER-STARTED-TASK THRU
                LISTENER-STARTED-TASK-EXIT
        ELSE PERFORM INIT-SOCKET          THRU
                INIT-SOCKET-EXIT
     END-IF.
     PERFORM SCKET-BIND-LSTN          THRU SCKET-BIND-LSTN-EXIT.
     MOVE 2                           TO CLI-SOCKID
                                         CLI-SOCKID-FWD.
     MOVE LISTEN-SUCC                 TO MSG-AREA.
     PERFORM HANDLE-TCPCICS           THRU HANDLE-TCPCICS-EXIT.
     COMPUTE NFDS = NUM-FDS + 1.
     MOVE LOW-VALUES                  TO READMASK.
     MOVE 6                           TO TCPLENG.
     CALL 'EZACIC06' USING BITMASK-TOKEN CTOB    READMASK
                           SOCKET-CONV   TCPLENG RETCODE.
     IF RETCODE = -1
        THEN
          MOVE BITMASK-ERR            TO MSG-AREA
          PERFORM HANDLE-TCPCICS      THRU HANDLE-TCPCICS-EXIT
        ELSE
          PERFORM ACCEPT-CLIENT-REQ   THRU
                  ACCEPT-CLIENT-REQ-EXIT
                  UNTIL TASK-TERM
     END-IF.
     PERFORM CLOSE-SOCKET             THRU CLOSE-SOCKET-EXIT.
     MOVE TCP-SERVER-OFF              TO MSG-AREA.
     PERFORM HANDLE-TCPCICS           THRU HANDLE-TCPCICS-EXIT.
*---------------------------------------------------------------*
*                                                               *
*    END OF PROGRAM                                             *
*                                                               *
*---------------------------------------------------------------*
 PGM-EXIT.
     EXEC CICS
          RETURN
```

```
     END-EXEC.
     GOBACK.
*---------------------------------------------------------------*
*                                                               *
*          TRUE IS NOT ENABLED                                  *
*                                                               *
*---------------------------------------------------------------*
 TCP-TRUE-REQ.
     MOVE TCP-EXIT-ERR      TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
*---------------------------------------------------------------*
*                                                               *
*          DB2 CALL ATTACH FACILITY IS NOT ENABLED              *
*                                                               *
*---------------------------------------------------------------*
 DB2-TRUE-REQ.
     MOVE DB2-CAF-ERR       TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
*---------------------------------------------------------------*
*                                                               *
*  LISTENER STARTED TASK                                        *
*                                                               *
*---------------------------------------------------------------*
 LISTENER-STARTED-TASK.
     MOVE CLIENTID-PARM               TO CID-LSTN-INFO.
     MOVE -1 TO L-DESC.
     CALL 'EZACICAL' USING TCP-TOKEN  TAKESOCKET-CMD
                           ZERO-HWRD  CLIENTID-LSTN
                           GIVE-TAKE-SOCKET L-DESC
                           ERRNO      RETCODE.
     IF RETCODE < 0
        THEN
          MOVE ERRNO                  TO TAKE-ERRNO
          MOVE TAKE-ERR               TO MSG-AREA
          PERFORM HANDLE-TCPCICS      THRU HANDLE-TCPCICS-EXIT
          GO TO PGM-EXIT
        ELSE
          MOVE BUFFER-LENG            TO TCPLENG
          MOVE START-MSG              TO TCP-BUF
          MOVE RETCODE                TO SRV-SOCKID
          CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG
          CALL 'EZACICAL' USING TCP-TOKEN     WRITE-CMD
                                SRV-SOCKID    TCPLENG
                                ZERO-FWRD     ZERO-PARM
                                TCP-BUF       ERRNO
                                RETCODE
          IF RETCODE < 0
             THEN
               MOVE ERRNO             TO WRITE-ERRNO
               MOVE WRITE-ERR         TO MSG-AREA
               PERFORM HANDLE-TCPCICS THRU
                       HANDLE-TCPCICS-EXIT
               GO TO PGM-EXIT
             ELSE
               CALL 'EZACICAL' USING TCP-TOKEN   CLOSE-CMD
                                     SRV-SOCKID  ZERO-8
                                     ERRNO       RETCODE
               IF RETCODE < 0
                  THEN
                    MOVE ERRNO        TO CLOSE-ERRNO
                    MOVE CLOSE-ERR    TO MSG-AREA
                    PERFORM HANDLE-TCPCICS  THRU
                            HANDLE-TCPCICS-EXIT
                    GO TO PGM-EXIT
                  ELSE NEXT SENTENCE
```

```
               END-IF
           END-IF
     END-IF.
     MOVE LOW-VALUES                  TO TCP-BUF.
 LISTENER-STARTED-TASK-EXIT.
     EXIT.
*----------------------------------------------------------------*
*                                                                *
*  START SERVER  PROGRAM                                         *
*                                                                *
*----------------------------------------------------------------*
 INIT-SOCKET.
     MOVE EIBTASKN                TO SUBTASKNO.
     CALL 'EZACICAL' USING TCP-TOKEN  INITAPI-CMD  INIT-API2
                           INIT-API3  INIT-API4    INIT-SUBTASKID
                           INIT-API6  ERRNO        RETCODE.
*----------------------------------------------------------------*
*                          CONTRACE.                             *
*  NOTE:  The CONTRACE parameter places trace output for this    *
*         SERVER in your system log for debugging purposes.      *
*         The parameter should be removed from the INITAPI-CMD   *
*         Once you are comfortable that your server is working.  *
*                                                                *
*----------------------------------------------------------------*
     IF RETCODE < 0
        THEN
          MOVE ERRNO              TO INIT-ERRNO
          MOVE INITAPI-ERR        TO MSG-AREA
          PERFORM HANDLE-TCPCICS  THRU HANDLE-TCPCICS-EXIT
          GO TO PGM-EXIT
        ELSE
          MOVE INIT-MSG           TO MSG-AREA
          PERFORM HANDLE-TCPCICS  THRU HANDLE-TCPCICS-EXIT
        END-IF.
 INIT-SOCKET-EXIT.
     EXIT.
*---------------------------------------------------------------*
*                                                               *
*  PERFORM TCP SOCKET FUNCTIONS BY PASSING SOCKET COMMAND TO    *
*  EZACICAL ROUTINE.  SOCKET COMMAND ARE TRANSLATED TO PRE-     *
*  DEFINE INTEGER.                                              *
*                                                               *
*---------------------------------------------------------------*
 SCKET-BIND-LSTN.
     MOVE  -1                    TO SRV-SOCKID-FWD.
*---------------------------------------------------------------*
*                                                               *
*   CREATING A SOCKET (SOCKET CALL, INTEGER 17) TO ALLOCATE     *
*   AN OPEN SOCKET FOR INCOMING CONNECTIONS                     *
*                                                               *
*---------------------------------------------------------------*
     CALL 'EZACICAL' USING TCP-TOKEN       SOCKET-CMD  ZERO-HWRD
                           AF-INET         SOCK-TYPE   PROTOCOL
                           SRV-SOCKID-FWD  ERRNO       RETCODE.
     IF RETCODE < 0
        THEN
          MOVE ERRNO             TO SOCKET-ERRNO
          MOVE SOCKET-ERR        TO MSG-AREA
          PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT
          GO TO PGM-EXIT
        ELSE MOVE RETCODE        TO SRV-SOCKID
             MOVE  '1' TO SOCK-CHAR(RETCODE + 1)
     END-IF.
*---------------------------------------------------------------*
*                                                               *
*  BIND THE SOCKET (BIND CALL, INTEGER 02) TO THE SERVICE PORT *
*  TO ESTABLISH A LOCAL ADDRESS FOR PROCESSING INCOMING         *
```

```
*  CONNECTIONS.                                                *
*                                                              *
*--------------------------------------------------------------*
     MOVE AF-INET               TO SIN-FAMILY.
     MOVE 0                     TO SIN-ADDR.
     MOVE PORT                  TO SIN-PORT.
     CALL 'EZACICAL' USING TCP-TOKEN    BIND-CMD  SRV-SOCKID
                           SOCKADDR-IN  ERRNO     RETCODE.
     IF RETCODE < 0 THEN
        MOVE ERRNO              TO BIND-ERRNO
        MOVE BIND-ERR           TO MSG-AREA
        PERFORM HANDLE-TCPCICS   THRU HANDLE-TCPCICS-EXIT
        GO TO PGM-EXIT.
*--------------------------------------------------------------*
*                                                              *
*  CALL 'LISTEN' COMMAND (INTEGER 09) TO ALLOWS SERVERS TO     *
*  PREPARE A SOCKET FOR INCOMING CONNECTIONS AND SET MAXIMUM   *
*  CONNECTIONS.                                                *
*                                                              *
*--------------------------------------------------------------*
     CALL 'EZACICAL' USING TCP-TOKEN  LISTEN-CMD  SRV-SOCKID
                           ZERO-FWRD  BACKLOG     ERRNO
                           RETCODE.
     IF RETCODE < 0 THEN
        MOVE ERRNO              TO LISTEN-ERRNO
        MOVE LISTEN-ERR         TO MSG-AREA
        PERFORM HANDLE-TCPCICS   THRU HANDLE-TCPCICS-EXIT
        GO TO PGM-EXIT.
 SCKET-BIND-LSTN-EXIT.
     EXIT.
*--------------------------------------------------------------*
*                                                              *
*  SOCKET HAS BEEN SET UP, THEN CALL 'ACCEPT' (INTEGER 1) TO   *
*  ACCEPT A REQUEST WHEN A CONNECTION ARRIVES.                 *
*                                                              *
*  THIS SAMPLE PROGRAM WILL ONLY USE 5 SOCKETS.                *
*                                                              *
*--------------------------------------------------------------*
 ACCEPT-CLIENT-REQ.
     CALL 'EZACICAL' USING  TCP-TOKEN     SELECT-CMD
                            LOM           NFDS
                            NONZERO-FWRD  NONZERO-FWRD
                            ZERO-FWRD     ZERO-FWRD
                            TIMEVAL       READMASK
                            DUMYMASK      DUMYMASK
                            ZERO-8        REPLY-RDMASK
                            DUMYMASK      DUMYMASK
                            ERRNO         RETCODE.
     IF RETCODE < 0
        THEN
          MOVE ERRNO            TO SELECT-ERRNO
          MOVE SELECT-ERR       TO MSG-AREA
          PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT
          GO TO PGM-EXIT.
     IF RETCODE = 0
        THEN GO TO ACCEPT-CLIENT-REQ-EXIT.
*--------------------------------------------------------------*
*                                                              *
*  ACCEPT REQUEST                                              *
*                                                              *
*--------------------------------------------------------------*
     MOVE -1 TO CLI-SOCKID-FWD.
     CALL 'EZACICAL' USING TCP-TOKEN       ACCEPT-CMD
                           SRV-SOCKID      ZERO-FWRD
                           CLI-SOCKID-FWD  SOCKADDR-IN
                           ERRNO           RETCODE.
     IF RETCODE < 0 THEN
```

```
       MOVE ERRNO              TO ACCEPT-ERRNO
       MOVE ACCEPT-ERR         TO MSG-AREA
       PERFORM HANDLE-TCPCICS  THRU HANDLE-TCPCICS-EXIT
       GO TO PGM-EXIT.
    MOVE RETCODE TO CLI-SOCKID.
    PERFORM ACCEPT-RECV        THRU ACCEPT-RECV-EXIT
            UNTIL TASK-END OR TASK-TERM.
    MOVE DB2END                TO MSG-AREA.
    PERFORM HANDLE-TCPCICS     THRU HANDLE-TCPCICS-EXIT.
    CALL 'EZACICAL' USING TCP-TOKEN  CLOSE-CMD  CLI-SOCKID
                          ZERO-8     ERRNO      RETCODE.
    IF RETCODE < 0 THEN
       MOVE ERRNO              TO CLOSE-ERRNO
       MOVE CLOSE-ERR          TO MSG-AREA
       PERFORM HANDLE-TCPCICS  THRU HANDLE-TCPCICS-EXIT.
    IF NOT TASK-TERM
       MOVE '0'                TO TASK-FLAG.
ACCEPT-CLIENT-REQ-EXIT.
    EXIT.
*---------------------------------------------------------------*
*                                                               *
*  RECEIVING DATA THROUGH A SOCKET BY ISSUING 'RECVFROM'        *
*  COMMAND.                                                     *
*                                                               *
*---------------------------------------------------------------*
ACCEPT-RECV.
    MOVE 'T'                               TO TCP-INDICATOR.
    MOVE BUFFER-LENG                       TO TCPLENG.
    MOVE LOW-VALUES                        TO TCP-BUF.
    CALL 'EZACICAL' USING TCP-TOKEN    RECVFROM-CMD  CLI-SOCKID
                          ZERO-FWRD    TCP-FLAG      TCPLENG
                          SOCKADDR-IN  TCP-BUF       ERRNO
                          RETCODE.
    IF RETCODE EQUAL 0 AND TCPLENG EQUAL 0
       THEN NEXT SENTENCE
       ELSE
         IF RETCODE < 0
            THEN
              MOVE ERRNO                   TO RECVFROM-ERRNO
              MOVE RECVFROM-ERR            TO MSG-AREA
              PERFORM HANDLE-TCPCICS       THRU
                      HANDLE-TCPCICS-EXIT
              MOVE '1'                     TO TASK-FLAG
            ELSE
              CALL 'EZACIC05' USING TOEBCDIC-TOKEN
                                    TCP-BUF
                                    TCPLENG
              IF TCP-BUF-H = LOW-VALUES OR SPACES
                 THEN
                   MOVE NULL-DATA          TO MSG-AREA
                   PERFORM HANDLE-TCPCICS  THRU
                           HANDLE-TCPCICS-EXIT
                 ELSE
                   IF TCP-BUF-H =  'END'
                      THEN MOVE '1'        TO TASK-FLAG
                      ELSE IF TCP-BUF-H = 'TRM'
                              THEN MOVE '2' TO TASK-FLAG
                              ELSE PERFORM TALK-CLIENT THRU
                                           TALK-CLIENT-EXIT
                           END-IF
                   END-IF
              END-IF
         END-IF
    END-IF.
ACCEPT-RECV-EXIT.
    EXIT.
**********************************************************
```

```
**    PROCESSES TALKING TO CLIENT THAT WILL UPDATE DB2  **
**    TABLES.                                           **
**********************************************************
**    DATA PROCESS:                                     **
**                                                      **
**    INSERT REC -  INS,X81,TEST DEPT,A0213B,Y94        **
**    UPDATE REC -  UPD,X81,,A1234C,                    **
**    DELETE REC -  DEL,X81,,,                          **
**    END CLIENT -  END,{end client connection     }    **
**    END SERVER -  TRM,{terminate server          }    **
**                                                      **
**********************************************************
 TALK-CLIENT.
     UNSTRING TCP-BUF DELIMITED BY DEL-ID OR ALL '*'
         INTO IN-ACT
              IN-DEPTNO
              IN-DEPTN
              IN-MGRNO
              IN-ADMRDEPT.
     IF IN-ACT EQUAL 'END'
        THEN
          MOVE '1'                             TO TASK-FLAG
        ELSE
          IF IN-ACT EQUAL 'U' OR EQUAL 'UPD'
             THEN
               EXEC SQL UPDATE TCPCICS.DEPT
                 SET    MGRNO  = :IN-MGRNO
                 WHERE  DEPTNO = :IN-DEPTNO
               END-EXEC
               MOVE 'UPDATE'                   TO DB2-ACT
               MOVE 'UPDATED:  '               TO DB2M-VAR
             ELSE
               IF IN-ACT EQUAL 'I' OR EQUAL 'INS'
                  THEN
                    EXEC SQL INSERT
                      INTO TCPCICS.DEPT (DEPTNO,     DEPTNAME,
                                         MGRNO,      ADMRDEPT)
                      VALUES           (:IN-DEPTNO, :IN-DEPTN,
                                        :IN-MGRNO,  :IN-ADMRDEPT)
                    END-EXEC
                    MOVE 'INSERT'              TO DB2-ACT
                    MOVE 'INSERTED: '          TO DB2M-VAR
                  ELSE
                    IF IN-ACT EQUAL 'D' OR EQUAL 'DEL'
                       THEN
                         EXEC SQL DELETE
                           FROM  TCPCICS.DEPT
                           WHERE DEPTNO = :IN-DEPTNO
                         END-EXEC
                         MOVE 'DELETE'         TO DB2-ACT
                         MOVE 'DELETED: '      TO DB2M-VAR
                       ELSE
                         MOVE KEYWORD-ERR      TO MSG-AREA
                         PERFORM HANDLE-TCPCICS THRU
                                 HANDLE-TCPCICS-EXIT
                    END-IF
               END-IF
          END-IF
     END-IF.
     IF DADELETE OR DAINSERT OR DAUPDATE
        THEN
          MOVE SQLERRD(3)                      TO DB2CODE
          MOVE DB2MSG                          TO MSG-AREA
          MOVE LENGTH OF TCPCICS-MSG-AREA      TO LENG
          EXEC CICS SYNCPOINT END-EXEC
          EXEC CICS WRITEQ TD
               QUEUE    ('CSMT')
```

```
              FROM     (TCPCICS-MSG-AREA)
              LENGTH   (LENG)
              NOHANDLE
         END-EXEC
**********************************************************
**          WRITE THE DB2 MESSAGE TO CLIENT.            **
**********************************************************
         MOVE TCPCICS-MSG-2                    TO TCP-BUF
         CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG
         CALL 'EZACICAL' USING TCP-TOKEN  WRITE-CMD  CLI-SOCKID
                               TCPLENG    ZERO-FWRD  ZERO-PARM
                               TCP-BUF    ERRNO      RETCODE
         MOVE LOW-VALUES                       TO TCP-BUF
                                                  TCP-INDICATOR
                                                  DB2-ACT
         IF RETCODE < 0
            THEN
              MOVE ERRNO                       TO WRITE-ERRNO
              MOVE WRITE-ERR                   TO MSG-AREA
              PERFORM HANDLE-TCPCICS           THRU
                      HANDLE-TCPCICS-EXIT
              MOVE '1'                         TO TASK-FLAG
         END-IF
    END-IF.
 TALK-CLIENT-EXIT.
     EXIT.
*---------------------------------------------------------------*
*                                                               *
*   CLOSE ORIGINAL SOCKET DESCRIPTOR                            *
*                                                               *
*---------------------------------------------------------------*
 CLOSE-SOCKET.
     CALL 'EZACICAL' USING TCP-TOKEN  CLOSE-CMD  SRV-SOCKID
                           ZERO-8     ERRNO      RETCODE.
     IF RETCODE < 0 THEN
        MOVE ERRNO              TO CLOSE-ERRNO
        MOVE CLOSE-ERR          TO MSG-AREA
        PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
 CLOSE-SOCKET-EXIT.
     EXIT.
*---------------------------------------------------------------*
*                                                               *
*  SEND TCP/IP ERROR MESSAGE                                    *
*                                                               *
*---------------------------------------------------------------*
 HANDLE-TCPCICS.
     MOVE LENGTH OF TCPCICS-MSG-AREA TO LENG.
     EXEC CICS ASKTIME
          ABSTIME (TSTAMP)
          NOHANDLE
     END-EXEC.
     EXEC CICS FORMATTIME
          ABSTIME (TSTAMP)
          MMDDYY  (MSGDATE)
          TIME    (MSGTIME)
          DATESEP ('/')
          TIMESEP (':')
          NOHANDLE
     END-EXEC.
     EXEC CICS WRITEQ TD
          QUEUE  ('CSMT')
          FROM   (TCPCICS-MSG-AREA)
          RESP   (RESPONSE)
          LENGTH (LENG)
     END-EXEC.
     IF RESPONSE = DFHRESP(NORMAL)
        THEN NEXT SENTENCE
```

```
        ELSE
          IF RESPONSE = DFHRESP(INVREQ)
             THEN MOVE TS-INVREQ-ERR          TO MSG-AREA
             ELSE
               IF RESPONSE = DFHRESP(NOTAUTH)
                  THEN MOVE TS-NOTAUTH-ERR    TO MSG-AREA
                  ELSE
                    IF RESPONSE = DFHRESP(IOERR)
                       THEN MOVE TS-IOERR-ERR TO MSG-AREA
                       ELSE MOVE WRITETS-ERR  TO MSG-AREA
                    END-IF
               END-IF
          END-IF
     END-IF.
     IF TCP-INDICATOR = 'T' THEN
        MOVE BUFFER-LENG            TO TCPLENG
        MOVE LOW-VALUES             TO TCP-BUF
        MOVE TCPCICS-MSG-2          TO TCP-BUF
        CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG
        MOVE ' '                    TO TCP-INDICATOR
        CALL 'EZACICAL' USING TCP-TOKEN  WRITE-CMD  CLI-SOCKID
                              TCPLENG    ZERO-FWRD  ZERO-PARM
                              TCP-BUF    ERRNO      RETCODE
        IF RETCODE < 0
           THEN
             MOVE ERRNO             TO WRITE-ERRNO
             MOVE WRITE-ERR         TO MSG-AREA
             EXEC CICS WRITEQ TD
                  QUEUE  ('CSMT')
                  FROM   (TCPCICS-MSG-AREA)
                  LENGTH (LENG)
                  NOHANDLE
             END-EXEC
             IF TASK-TERM OR TASK-END
                THEN NEXT SENTENCE
                ELSE MOVE '1'       TO  TASK-FLAG
             END-IF
        END-IF.
     MOVE SPACES                    TO MSG-AREA.
 HANDLE-TCPCICS-EXIT.
     EXIT.
*---------------------------------------------------------------*
*                                                               *
*  SEND DB2    ERROR MESSAGE                                    *
*                                                               *
*---------------------------------------------------------------*
 SQL-ERROR-ROU.
     MOVE SQLCODE         TO SQL-ERR-CODE.
     MOVE SPACES          TO MSG-AREA.
     MOVE SQL-ERROR       TO MSG-AREA.
     EXEC CICS WRITEQ TD
          QUEUE  ('CSMT')
          FROM   (TCPCICS-MSG-AREA)
          RESP   (RESPONSE)
          LENGTH (LENG)
     END-EXEC.
     MOVE LOW-VALUES      TO TCP-BUF.
     MOVE TCPCICS-MSG-2   TO TCP-BUF.
     CALL 'EZACIC04' USING TOASCII-TOKEN TCP-BUF TCPLENG.
     CALL 'EZACICAL' USING TCP-TOKEN  WRITE-CMD  CLI-SOCKID
                           TCPLENG    ZERO-FWRD  ZERO-PARM
                           TCP-BUF    ERRNO      RETCODE.
     IF RETCODE < 0 THEN
        MOVE ERRNO        TO WRITE-ERRNO
        MOVE WRITE-ERR    TO MSG-AREA
        PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
```

```
 SQL-ERROR-ROU-EXIT.
     EXIT.
*----------------------------------------------------------------*
*                                                                *
*  OTHER ERRORS (HANDLE CONDITION)                               *
*                                                                *
*----------------------------------------------------------------*
 INVREQ-ERR-SEC.
     MOVE TCP-EXIT-ERR      TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
 IOERR-SEC.
     MOVE IOERR-ERR         TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
 LENGERR-SEC.
     MOVE LENGERR-ERR       TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
 NOSPACE-ERR-SEC.
     MOVE NOSPACE-ERR       TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
 QIDERR-SEC.
     MOVE QIDERR-ERR        TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
 ITEMERR-SEC.
     MOVE ITEMERR-ERR       TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
 ENDDATA-SEC.
     MOVE ENDDATA-ERR       TO MSG-AREA.
     PERFORM HANDLE-TCPCICS THRU HANDLE-TCPCICS-EXIT.
     GO TO PGM-EXIT.
```

Appendix E. Information Apars

This appendix lists information apars for IP and SNA books.

Notes:

1. Information apars contain updates to previous editions of the manuals listed below. Books updated for V1R2 are complete except for the updates contained in the information apars that may be issued after V1R2 books went to press.
2. Information apars are predefined for z/OS V1R2 Communications Server and may not contain updates.

IP Information Apars

Table 16 lists information apars for IP books.

Table 16. IP Information Apars

Title	z/OS CS V1R2	CS for OS/390 2.10 and z/OS CS V1R1	CS for OS/390 2.8	CS for OS/990 2.7	CS for OS/390 2.6	CS for OS/390 2.5
IP API Guide	ii12861	ii12371	ii11635	ii11558	ii11405	ii11144
IP CICS Sockets Guide	ii12862		ii11626	ii11559	ii11406	ii11145
IP Configuration			ii11620 ii12068 ii12353 ii12649	ii11555 ii11637 ii11995 ii12325	ii11402 ii11619 ii12066 ii12455	ii11159 ii11979 ii12315
IP Configuration Guide	ii12498	ii12362 ii12493				
IP Configuration Reference	ii12499	ii12363 ii12494 ii12712				
IP Diagnosis	ii12503	ii12366 ii12495	ii11628	ii11565	ii11411	ii11160 ii11414
IP Messages Volume 1	ii12857	ii12367	ii11630	ii11562	ii11408	ii11636
IP Messages Volume 2	ii12858	ii12368	ii11631	ii11563	ii11409	ii11281
IP Messages Volume 3	ii12859	ii12369	ii11632 ii12883	ii11564 ii12884	ii11410 ii12885	ii11158
IP Messages Volume 4	ii12860					
IP Migration	ii12497	ii12361	ii11618	ii11554	ii11401	ii11204
IP Network Print Facility	ii12864		ii11627	ii11561	ii11407	ii11150
IP Programmer's Reference	ii12505		ii11634	ii11557	ii11404	ii12496

Table 16. IP Information Apars (continued)

Title	z/OS CS V1R2	CS for OS/390 2.10 and z/OS CS V1R1	CS for OS/390 2.8	CS for OS/990 2.7	CS for OS/390 2.6	CS for OS/390 2.5
IP and SNA Codes	ii12504	ii12370	ii11917	Added TCP/IP codes to VTAM codes V2R6 ii11611	ii11361	ii11146 ii11097
IP User's Guide		ii12365	ii11625	ii11556	ii11403	ii11143
IP User's Guide and Commands	ii12501					
IP System Admin Guide	ii12502					
Quick Reference	ii12500	ii12364				

SNA Information Apars

Table 17 lists information apars for SNA books.

Table 17. SNA Information Apars

Title	z/OS CS V1R2	CS for OS/390 2.10 and z/OS CS V1R1	CS for OS/390 2.8	CS for OS/390 2.7	CS for OS/390 2.6	CS for OS/390 2.5
Anynet SNA over TCP/IP			ii11922	ii11633	ii11624	ii11623
Anynet Sockets over SNA			ii11921	ii11622	ii11519	ii11518
CSM Guide						
IP and SNA Codes		ii12370	ii11917	ii11611	ii11361	ii11097
SNA Customization	ii12872	ii12388	ii11923	ii11925 ii12008	ii11924 ii12007	ii11092 ii11621 ii12006
SNA Diagnosis	ii12490	ii12389	ii11915	ii11615	ii11357	ii11585
SNA Messages	ii12491	ii12382	ii11916	ii11610	ii11358	ii11096
SNA Network Implementation Guide	ii12487	ii12381	ii11911	ii11609 ii12683	ii11353 ii11493	ii11095
SNA Operation	ii12489	ii12384	ii11914	ii11612	ii11355	ii11098
SNA Migration	ii12486	ii12386	ii11910	ii11614	ii11359	ii11100
SNA Programming		ii12385	ii11920	ii11613	ii11360	ii11099
Quick Reference	ii12500	ii12364	ii11913	ii11616	ii11356	
SNA Resource Definition Reference	ii12488	ii12380 ii12567	ii11912 ii12568	ii11608 ii12569	ii11354 ii12259 ii12570	ii11094 ii11151 ii12260 ii12571
SNA Resource Definition Samples						

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