CICS Transaction Server for z/OS
Version 5 Release 4

Debugging Tools Interface Reference

IBM
Note

Before using this information and the product it supports, read the information in “Notices” on page 27.
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<tbody>
<tr>
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</table>

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</table>
This PDF describes the debugging tools interfaces for CICS Transaction Server for z/OS: the debugging tools socket interfaces and the debugging tools pattern matching interface. These interfaces are assembler language programming interfaces that allow debugging tools to use CICS functions that are not available in the application programming interface.

For details of the terms and notation used in this book, see Conventions and terminology used in the CICS documentation in IBM Knowledge Center.

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Chapter 1. The debugging tools sockets interface

The debugging tools sockets interface is an interface that debugging tools can use to communicate with a debugger client. It uses the support for TCP/IP provided by the CICS sockets domain.

The interface supports a limited number of socket calls used in a restricted way, and is not a full function application programming interface. The interface is not optimized for concurrent use.

The client set of functions that are explained in the interface support both IPv4 and IPv6 addressing; however, the server set of functions support IPv4 addressing only.

Setting up CICS to use the debugging tools sockets interface

To use the debugging tools sockets interface, you must set a system initialization parameter.

About this task

To use the debugging tools sockets interface:

- Specify TCPIP=YES in your system initialization parameters.

The debugging tools sockets interface does not use a TCPIPSERVICE definition; however, you must ensure that the port numbers that you use for the sockets interface are different from those that you define in your TCPIPSERVICEs.

Using the debugging tools sockets interface

The debugging tools sockets interface supports the protocols between a TCP/IP client and a TCP/IP server.

About this task

The protocols are shown in Figure 1 on page 2.
In addition, the client and the server can issue the following calls:

- `GETHOSTID`
- `GETHOSTBYNAME`
- `GETSOCKNAME`

The WRITE and READ calls can be repeated as often as required, and can be used to send data in either direction.

### Code page conversion

The debugging tools sockets interface does not provide data conversion between ASCII and EBCDIC code pages.

It is your responsibility to provide the necessary conversion between the EBCDIC code page use in your CICS system and the code page used in the debugging client.

### Environmental restrictions and programming requirements

Environmental restrictions and programming requirements apply to the debugging tools sockets interface.

**SRB mode**

The interface can only be invoked in TCB mode (task mode).

**Cross-memory mode**

The interface can only be invoked in a non-cross-memory environment (PASN=SASN=HASN).

**Functional Recovery Routine (FRR)**

The interface cannot be invoked this interface with an FRR set. Doing so will cause system recovery routines to be bypassed and severely damage the system.

**Storage**

Storage acquired for the purpose of containing data returned from a socket call must be obtained in the same key as the program status word (PSW) at the time of the socket call.
Nested socket calls
You can not issue nested socket calls within the same task. That is, if a request block (RB) issues a
socket call and is interrupted by an interrupt request block (IRB) in an STIMER exit, any additional
socket calls that the IRB attempts to issue are detected and flagged as an error.

CALL instruction programming interface
These topics describe the general form of the CALL instruction for programs written in Assembler. The
format and parameters are described for each socket call.

The entry point for the CICS Sockets Extended module (DFHSOKET) is within the DFHSOCI module, which
should be included explicitly in your link-editing JCL.

Assembler language Call Format
Use the following 'DFHSOKET' call format for assembler language programs in order to meet the CICS
requirement for quasi-reentrant programming.

\[
\text{CALL DFHSOKET},(\text{SOC\_FUNCTION, parm1, parm2, ... \longrightarrow \text{ERRNO RETCODE)),VL,MF=(E, PARMLIST)}}
\]

\[
\text{PARMLIST}
\]
A remote parameter list defined in dynamic storage DFHEISTG. This list contains addresses of the
parameters that are referenced by the CALL.

Code CALL Instructions
These topics contain the description, syntax, parameters, and other related information for each call
instruction included in the debugging tools sockets interface.

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 performs these functions:
1. Accepts the first connection on a queue of pending connections.
2. Creates a new socket with the same properties as an existing socket, 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.

Note:
1. If the queue has no pending connection requests, ACCEPT blocks the socket.
2. The interface does not screen clients. As a result, the program must control which connection
   requests it accepts, but it can close a connection immediately after discovering the identity of the
   client.

Example of ACCEPT call

<table>
<thead>
<tr>
<th>SOC_FUNCTION</th>
<th>DC</th>
<th>CL16 'ACCEPT'</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>NAME</td>
<td>DS</td>
<td>OXL16</td>
</tr>
<tr>
<td>FAMILY</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>PORT</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>IP_ADDRESS</td>
<td>DS</td>
<td>F</td>
</tr>
<tr>
<td>RESERVED</td>
<td>DS</td>
<td>CL8</td>
</tr>
<tr>
<td>ERRNO</td>
<td>DS</td>
<td>F</td>
</tr>
</tbody>
</table>
Input parameters

**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, the server listens on this socket.

Output parameters

**NAME**
A socket address structure that contains the client socket address.

**FAMILY**
A halfword binary field specifying the addressing family. The call returns 2 for the AF_INET socket. For more information on AF_INET and AF_INET6, see the z/OS Communications Server: IP Configuration Guide.

**PORT**
A halfword binary field that is set to the client port number.

**IP_ADDRESS**
A fullword binary field that is set to the 32-bit IPv4 address, in network byte order, of the client host machine. IPv6 addressing is not supported.

**RESERVED**
Specifies 8 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 “Return codes” on page 18 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 always binds to the same well-known port, so that clients know which socket address to use when attempting to connect.

The BIND call can specify the networks from which it will accept connection requests. The program can fully specify the network interface by setting the ADDRESS field to the internet address of a network interface. Alternatively, the program can use a wildcard to specify that it will receive connection requests from any network interface. Set the ADDRESS field to a fullword of zeros for a wildcard.

Example of BIND call

<table>
<thead>
<tr>
<th>SOC_FUNCTION</th>
<th>DC</th>
<th>CL16 'BIND'</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>NAME</td>
<td>DS</td>
<td>0XL16</td>
</tr>
<tr>
<td>FAMILY</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>PORT</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>IP_ADDRESS</td>
<td>DS</td>
<td>F</td>
</tr>
<tr>
<td>RESERVED</td>
<td>DS</td>
<td>CL8</td>
</tr>
<tr>
<td>ERRNO</td>
<td>DS</td>
<td>F</td>
</tr>
<tr>
<td>RETCODE</td>
<td>DS</td>
<td>F</td>
</tr>
</tbody>
</table>
CALL DFHSOKET,(SOC_FUNCTION,S,NAME,ERRNO,RETCODE)

Input parameters

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 call returns 2 for the AF_INET socket. For more information on AF_INET and AF_INET6, see the z/OS Communications Server: IP Configuration Guide.

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 program 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 IPv4 address (network byte order) of the socket to be bound. IPv6 addressing is not supported.

RESERVED
Specifies an 8-byte character field that is required but not used.

Output parameters

ERRNO
A fullword binary field. If RETCODE is negative, this field contains an error number. See “Return codes” on page 18, 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 shuts down a socket and frees all resources allocated to it. If the socket refers to an open TCP connection, the connection is closed.

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.

Example of CLOSE call

<table>
<thead>
<tr>
<th>SOC_FUNCTION</th>
<th>DC</th>
<th>CL16 'CLOSE'</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>ERRNO</td>
<td>DS</td>
<td>F</td>
</tr>
<tr>
<td>RETCODE</td>
<td>DS</td>
<td>F</td>
</tr>
</tbody>
</table>
CALL DFHSOKET, (SOC_FUNCTION, S, ERRNO, RETCODE)

Input parameters

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.

Output parameters

ERRNO
A fullword binary field. If RETCODE is negative, this field contains an error number. See “Return codes” on page 18, for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code</td>
</tr>
</tbody>
</table>

CONNECT

The CONNECT call is issued by a client to establish connection with a server.

The call performs the following two tasks:

1. Completes the binding process if a BIND call has not been previously issued.
2. Attempts to make a connection to a remote socket. This connection is necessary before data can be transferred.

The following call sequence is issued by the client and server:

1. The server issues BIND and LISTEN calls to create a passive open socket.
2. The client issues a CONNECT call to request the connection.
3. The server accepts the connection on the passive open socket, creating a new connected socket.

The CONNECT call blocks the calling program until the connection is established or until an error is received. The completion cannot be checked by issuing a second CONNECT call.

Example of CONNECT call

SOC_FUNCTION DC CL16 'CONNECT'
S DS H
NAME DS OXL28
FAMILY DS H
PORT DS H
IP_ADDRESS DS CL16
RESERVED DS CL8
ERRNO DS F
RETCODE DS F

CALL DFHSOKET, (SOC_FUNCTION, S, NAME, ERRNO, RETCODE)

Input parameters

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. FAMILY must match the value assigned to the AF field used in the SOCKET function request.

PORT
A halfword binary field that is set to the server 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 16-byte field that is set to the IPv4 or IPv6 internet address of the socket to be bound. If FAMILY is set to 2 (denoting an AF_INET socket), the address is an IPv4 address and the first 4 bytes of IP_ADDRESS are used. For more information on AF_INET and AF_INET6, see the z/OS Communications Server: IP Configuration Guide.

RESERVED
Specifies an 8-byte reserved field. This field is required, but is not used.

Output parameters

ERRNO
A fullword binary field. If RETCODE is negative, this field contains an error number. See “Return codes” on page 18 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code</td>
</tr>
</tbody>
</table>

FREEADDRINFO
The FREEADDRINFO call frees the storage that was acquired by the z/OS Communications Server when the GETADDRINFO call was issued.

Example of FREEADDRINFO call

```
SOC_FUNCTION DC CL16 'FREEADDRINFO'
RESULTS DS A
ERRNO DS F
RETCODE DS F

CALL DFHSOKET,(SOC_FUNCTION,RESULTS,ERRNO,RETCODE)
```

Input parameters

SOC_FUNCTION
A 16-byte character field containing FREEADDRINFO. Left-justify the field and pad it on the right with blanks.
RESULTS

The name of a fullword field that contains a pointer to an `Addr_Info` structure or a linked list of `Addr_Info` structures returned by the GETADDRINFO command issued by the z/OS Communications Server.

Output parameters

ERRNO

A fullword binary field. If RETCODE is negative, the field contains an error number. For a list of return code values for FREEADDRINFO, see z/OS Communications Server: IP and SNA Codes.

RETCODE

A fullword binary field that returns one of the following values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>An error occurred.</td>
</tr>
</tbody>
</table>

GETADDRINFO

The GETADDRINFO call returns the 32-bit internet address for the current host from the GETADDRINFO command that is issued by z/OS Communications Server to resolve host or service name information. This command translates the name of a service location (host name) or a service name.

Example of GETADDRINFO call

```
SOC_FUNCTION DC CL16 'GETADDRINFO'
NAME         DS CL255
NAMELEN      DS F
SERVICE      DS CL32
SERVICELEN   DS F
HINTS        DS A
RESULTS      DS A
CANONICALLEN DS F
ERRNO        DS F
RETCODE      DS F

CALL DFHSOKET,(SOC_FUNCTION,NAME,NAMELEN,SERVICE,SERVICELEN,HINTS,
RESULTS,CANONICALLEN,ERRNO,RETCODE)
```

Input parameters

SOC_FUNCTION

A 16-byte character field containing GETADDRINFO. The field is left-justified and padded on the right with blanks.

NAME

NAME is returned as one of the following strings:

- An EBCDIC character string, up to 255 characters long, set to the node name (host name) that is being queried.
- An EBCDIC character string set to the IP address of the node (host) where the service resides.

NAMELEN

The name of a fullword that contains the length of the NAME parameter.

SERVICE

SERVICE is returned as one of the following strings:

- An EBCDIC character string, up to 32 characters long, set to the service name that is being queried.
- An EBCDIC character string set to the port number of the required service.
**SERVICELEN**

The name of a fullword that contains the length of the SERVICE parameter.

**HINTS**

The name of a field that contains a pointer to a z/OS Communications Server input Addr_Info structure. The following fields can be specified in the Addr_Info structure:

- A set of flags (ai_flags) for interpreting the request. Here are the flags:
  - AI_PASSIVE
  - AI_CANONNAMEOK
  - AI_NUMERICHOST
  - AI_NUMERICSERV
  - AI_V4MAPPED
  - AI_ALL
  - AI_ADDRCONFIG

For more information about ai_flags, see the Parameters topic in the z/OS Communications Server: IP CICS Sockets Guide.

- The address family (ai_family) that the caller expects to be returned by the resolver. Here are the address families:
  - AF_UNSPEC
  - AF_INET
  - AF_INET6

- The socket type (ai_socktype) that the caller can accept as a response.
- The protocol (ai_protocol) that the caller can accept as a response.

All other fields in the Addr_Info structure must be set to zero.

If the HINTS parameter is not specified; that is, HINT is set to zero, the following settings are used:

- All flags are set to off.
- Address family is set to AF_UNSPEC.
- Socket type is set to 0.
- Protocol is set to 0.

**Output parameters**

**RESULTS**

The name of a field that contains a pointer to an output Addr_Info structure. If more than one address is returned, this field contains a linked list of output Addr_Info structures. Each output Addr_Info structure contains the following information about the information returned in the Addr_Info structure:

- A set of flags (ai_flags) for interpreting the address.
- The address family (ai_family) for the address.
- The socket type (ai_socktype) for the address.
- The protocol (ai_protocol) for the address.
- The length (ai_addrlen) of the sock_inet_sockaddr or sock_inet6_sockaddr structure returned in the ai_addr field.
- The canonical name (ai_canonname) associated with the NAME input parameter, if NAME was requested using the input AI_CANONNAMEOK flag. If more than one Addr_Info structure is returned, the canonical name is supplied in the first Addr_Info structure only.
CANONICALLEN
The name of a fullword binary field that contains the length of the canonical name that was returned in the first Addr_Info structure pointed to by the RESULTS parameter.

ERRNO
A fullword binary field. If RETCODE is negative, ERRNO contains an error number. For a list of return code values for GETADDRINFO, see z/OS Communications Server: IP and SNA Codes.

RETCODE
A fullword binary field that returns one of the following values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>An error occurred</td>
</tr>
</tbody>
</table>

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 host can have multiple alias names and multiple host internet addresses.

The debugging tools sockets interface tries to resolve the host name through a name server.

Example of GETHOSTBYNAME call

```assembly
SOC_FUNCTION DC CL16 'GETHOSTBYNAME'
NAMELEN DS F
NAME  DS  CL255
HOSTENT DS F
RETCODE DS F

CALL DFHSOKET,(SOC_FUNCTION,NAMELEN,NAME,HOSTENT,RETCODE)
```

Input parameters

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 255 characters, set to a host name. This call returns the address of the HOSTENT structure for this name.

Output parameters

HOSTENT
A fullword binary field that contains the address of the HOSTENT structure.

RETCODE
A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>An error occurred</td>
</tr>
</tbody>
</table>
The HOSTENT structure

Figure 2. HOSTENT structure returned by the GETHOSTBYNAME call

GETHOSTBYNAME returns the HOSTENT structure shown in Figure 2 on page 11. 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.

GETHOSTID

The GETHOSTID call returns the 32-bit internet address for the current host.

Example of GETHOSTID call

SOC_FUNCTION DC   CL16'GETHOSTID'
RETCODE      DS   F
CALL DFHSOKET,(SOC_FUNCTION,RETCODE)

Input parameters

SOC_FUNCTION
A 16-byte character field containing 'GETHOSTID'. The field is left-justified and padded on the right with blanks.

Output parameters

RETCODE
Returns a fullword binary field containing the 32-bit internet address of the host. There is no ERRNO parameter for this call.
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 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.

Example of GETSOCKNAME call

```
SOC_FUNCTION DC   CL16'GETSOCKNAME'
S            DS   H
NAME         DS   0XL16
FAMILY       DS   H
PORT         DS   H
IP_ADDRESS   DS   F
RESERVED     DS   CL8
ERRNO        DS   F
RETCODE      DS   F
CALL DFHSOKET,(SOC_FUNCTION,S,NAME,ERRNO,RETCODE)
```

Input parameters

**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.

Output parameters

**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 “Return codes” on page 18 for information about ERRNO return codes.

**RETCODE**

A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code</td>
</tr>
</tbody>
</table>
**INITAPI**

The INITAPI call connects a program to the debugging tools sockets interface. All sockets programs must issue the INITAPI call before they issue other sockets calls.

**Example of INITAPI call**

```plaintext
SOC_FUNCTION DC   CL16'INITAPI'
MAXSOC       DS   H
IDENT        DS   0CL16
TCPNAME      DS   CL8
ADSNAME      DS   CL8
SUBTASK      DS   CL8
MAXSNO       DS   F
ERRNO        DS   F
RETCODE      DS   F

CALL DFHSOKET,(SOC_FUNCTION,MAXSOC,IDENT,SUBTASK,MAXSNO,ERRNO,RETCODE)
```

**Input parameters**

**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 program 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 fewer than 50 sockets are requested, MAXSOC defaults to 50.

**Note:** This is not the same as the MAXSOCKETS system initialization parameter.

**IDENT**

A structure containing the identities of the address space and the calling program’s address space. Specify IDENT on the INITAPI call from an address space.

**TCPNAME**

Reserved — do not specify a value in this field.

**ADSNAME**

An 8-byte character field. Specify the name of the CICS startup job.

**SUBTASK**

Specify a null value (X'00000000') for this parameter.

**Output parameters**

**MAXSNO**

A fullword binary field that contains the highest socket number assigned to this program. 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 “Return codes” on page 18 for information about ERRNO return codes.

**RETCODE**

A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code</td>
</tr>
</tbody>
</table>
LISTEN

The LISTEN call completes the bind, if BIND has not already been called for the socket, and creates a connection-request queue of a specified length for incoming connection requests.

Restriction: The LISTEN call is not supported for datagram sockets or raw sockets.

The LISTEN call is 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.

Example of LISTEN call

<table>
<thead>
<tr>
<th>SOC_FUNCTION</th>
<th>DC</th>
<th>CL16 'LISTEN'</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>DS</td>
<td>H</td>
</tr>
<tr>
<td>BACKLOG</td>
<td>DS</td>
<td>F</td>
</tr>
<tr>
<td>ERRNO</td>
<td>DS</td>
<td>F</td>
</tr>
<tr>
<td>RETCODE</td>
<td>DS</td>
<td>F</td>
</tr>
</tbody>
</table>

CALL DFHSOKET,(SOC_FUNCTION,S,BACKLOG,ERRNO,RETCODE)

Input parameters

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. Specify a value of 5 for this parameter.

Output parameters

ERRNO

A fullword binary field. If RETCODE is negative, the field contains an error number. See “Return codes” on page 18 for information about ERRNO return codes.

RETCODE

A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code</td>
</tr>
</tbody>
</table>

READ

The READ call reads the data on a socket.

Data is processed as streams of information with no boundaries separating the data. For example, if programs A and B are connected 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 should place this call in a loop that repeats until all data has been received.
Example of READ call

```
SOC_FUNCTION  DC  CL16 'READ'
S              DS   H
NBYTE         DS   F
BUF           DS   CL(length of buffer).
ERRNO         DS   F
RETCODE       DS   F

CALL DFHSOKET,(SOC_FUNCTION,S,NBYTE,BUF,ERRNO,RETCODE)
```

Input parameters

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.

Output parameters

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 “Return codes” on page 18 for information about ERRNO return codes.

RETCODE
A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A 0 return code indicates that the connection is closed and no data is available.</td>
</tr>
<tr>
<td>&gt;0</td>
<td>A positive value indicates the number of bytes copied into the buffer.</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code.</td>
</tr>
</tbody>
</table>

SHUTDOWN

One way to terminate a network connection is to issue the CLOSE call which attempts to complete all outstanding data transmission requests before 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.

If you issue SHUTDOWN for a socket that currently has outstanding socket calls pending, see Table 1 on page 15 to determine the effects of this operation on the outstanding socket calls.

<table>
<thead>
<tr>
<th>Call</th>
<th>Local program</th>
<th>Remote program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socket calls in local program</td>
<td>Shutdown END_TO</td>
<td>Shutdown END_FROM</td>
</tr>
<tr>
<td></td>
<td>Shutdown END_FROM</td>
<td>Shutdown END_TO</td>
</tr>
</tbody>
</table>
Table 1. Effect of Shutdown Socket Call (continued)

<table>
<thead>
<tr>
<th>Call</th>
<th>Local program</th>
<th>Remote program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write calls</td>
<td>Error number EPIPE on first call</td>
<td>Error number EPIPE on second call*</td>
</tr>
<tr>
<td>Read calls</td>
<td>Zero length return code</td>
<td>Zero length return code</td>
</tr>
</tbody>
</table>

* 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.

Example of SHUTDOWN call

```
SOC_FUNCTION DC CL16 'SHUTDOWN'
S DS H
HOW DS F
END_FROM EQU 0
END_TO EQU 1
END_BOTH EQU 2
ERRNO DS F
RETCODE DS F
CALL DFHSOKET,(SOC_FUNCTION,S,HOW,ERRNO,RETCODE)
```

Input parameters

**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:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (END_FROM)</td>
<td>Ends further receive operations.</td>
</tr>
<tr>
<td>1 (END_TO)</td>
<td>Ends further send operations.</td>
</tr>
<tr>
<td>2 (END_BOTH)</td>
<td>Ends further send and receive operations.</td>
</tr>
</tbody>
</table>

Output parameters

**ERRNO**

A fullword binary field. If RETCODE is negative, the field contains an error number. See "Return codes" on page 18 for information about ERRNO return codes.

**RETCODE**

A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful call</td>
</tr>
</tbody>
</table>
SOCKET

The SOCKET call creates an endpoint for communication and returns a socket descriptor representing the endpoint.

Example of SOCKET call

```
SOC_FUNCTION DC   CL16 'SOCKET'
AF           DC   F'19'
SOCTYPE      DS   F
STREAM       EQU  1
PROTO        DS   F
ERRNO        DS   F
RETCODE      DS   F

CALL DFHSOKET,(SOC_FUNCTION,AF,SOCTYPE,PROTO,ERRNO,RETCODE)
```

Input parameters

**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. Specify a value of 19, denoting an AF_INET6 socket. You can specify a value of 2 for migration purposes however, the socket will be limited to IPv4 connections only. A halfword binary field specifying the addressing family. For more information on AF_INET and AF_INET6, see the z/OS Communications Server: IP Configuration Guide.

**SOCTYPE**
A fullword binary field set to the type of socket required. Specify 1, denoting stream sockets. Stream sockets provide sequenced, 2-way byte streams that are reliable and connection-oriented. They support a mechanism for out-of-band data.

**PROTO**
Reserved. Do not specify a value in this field. The interface uses a protocol of TCP.

Output parameters

**ERRNO**
A fullword binary field. If RETCODE is negative, the field contains an error number. See “Return codes” on page 18 for information about ERRNO return codes.

**RETCODE**
A fullword binary field that returns one of the following values:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥0</td>
<td>Contains the new socket descriptor</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code</td>
</tr>
</tbody>
</table>

WRITE

The WRITE call writes data on a connected socket.

Sockets act like streams of information with no boundaries separating data. For example, if a program wants 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 should place this call in a loop, calling this function until all data has been sent.
Example of WRITE call

```plaintext
SOC_FUNCTION DC CL16'WRITE'
S      DS   H
NBYTE  DS   F
BUF    DS   CL(length of buffer)
ERRNO  DS   F
RETCODE DS   F

CALL DFHSOKET,(SOC_FUNCTION,S,NBYTE,BUF,ERRNO,RETCODE)
```

Input parameters

**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.

Output parameters

**ERRNO**
A fullword binary field. If RETCODE is negative, the field contains an error number. See "Return codes" on page 18 for information about ERRNO return codes.

**RETCODE**
A fullword binary field that returns one of the following:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥0</td>
<td>A successful call. A return code greater than zero indicates the number of bytes of data written.</td>
</tr>
<tr>
<td>-1</td>
<td>Check ERRNO for an error code.</td>
</tr>
</tbody>
</table>

Return codes

A table of the error numbers, error descriptions, and the suggested programmer's response.

<table>
<thead>
<tr>
<th>Error number</th>
<th>Error description</th>
<th>Programmer's response</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>Unknown session token</td>
<td>Call your IBM® Software Support Center</td>
</tr>
<tr>
<td>30002</td>
<td>Insufficient storage</td>
<td>Retry the request when CICS is not short on storage</td>
</tr>
<tr>
<td>30003</td>
<td>I/O error</td>
<td>Retry the request. Data might not be available at this time.</td>
</tr>
<tr>
<td>30004</td>
<td>Connection closed</td>
<td>Determine why the partner system has closed the connection, and retry the request</td>
</tr>
<tr>
<td>30005</td>
<td>No socket available</td>
<td>Retry the request when more sockets are available</td>
</tr>
<tr>
<td>Error number</td>
<td>Error description</td>
<td>Programmer's response</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>30006</td>
<td>Client error</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30007</td>
<td>Invalid option</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30008</td>
<td>Missing option</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30009</td>
<td>Not authorized</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30010</td>
<td>State error</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30011</td>
<td>Never associated</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30012</td>
<td>Notification unavailable</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30013</td>
<td>Already associated</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30014</td>
<td>TCP not active</td>
<td>Ensure TCP/IP is active in your CICS region</td>
</tr>
<tr>
<td>30015</td>
<td>Scheduled</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30016</td>
<td>No connection</td>
<td>Retry the request when the partner system can accept connections</td>
</tr>
<tr>
<td>30017</td>
<td>Connection refused</td>
<td>Retry the request when the partner system can accept connections</td>
</tr>
<tr>
<td>30018</td>
<td>Address in use</td>
<td>Retry the request when the partner system can accept connections</td>
</tr>
<tr>
<td>30019</td>
<td>Address not available</td>
<td>Retry the request when the partner system can accept connections</td>
</tr>
<tr>
<td>30020</td>
<td>Insufficient threads</td>
<td>Increase the number of threads for each OMVS process</td>
</tr>
<tr>
<td>30021</td>
<td>Notified</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30022</td>
<td>Not pending</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30023</td>
<td>Lock failure</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30024</td>
<td>Socket in use</td>
<td>Retry the request when the partner system can accept connections</td>
</tr>
<tr>
<td>Error number</td>
<td>Error description</td>
<td>Programmer's response</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>30025</td>
<td>Timed out</td>
<td>Determine why the request timed out and retry the request</td>
</tr>
<tr>
<td>30026</td>
<td>Task canceled</td>
<td>Determine why the task was canceled, and retry the request</td>
</tr>
<tr>
<td>30027</td>
<td>CEEPIPI error</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30028</td>
<td>Listener attach failure</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30029</td>
<td>TCP/IP unavailable</td>
<td>Ensure TCP/IP is active in your CICS region</td>
</tr>
<tr>
<td>30030</td>
<td>TCP/IP already open</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30031</td>
<td>TCP/IP already closed</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30032</td>
<td>Unknown listen token</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30033</td>
<td>Unknown session token</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30034</td>
<td>Unknown client token</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30035</td>
<td>Unknown server address</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30036</td>
<td>Unknown client hostname</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30037</td>
<td>Unknown server hostname</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30038</td>
<td>Hostname truncated</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30039</td>
<td>Repository error</td>
<td>Should not occur. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30040</td>
<td>MAXSOCKETS hard limit</td>
<td>Retry the request when more sockets are available</td>
</tr>
<tr>
<td>30041</td>
<td>At MAXSOCKETS</td>
<td>Retry the request when more sockets are available</td>
</tr>
<tr>
<td>30042</td>
<td>Unknown socket token</td>
<td>Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30043</td>
<td>I/O error</td>
<td>Retry the request. Data might not be available at this time.</td>
</tr>
<tr>
<td>30045</td>
<td>INITAPI getmain array fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30046</td>
<td>HOSTENT getmain fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>Error number</td>
<td>Error description</td>
<td>Programmer's response</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>30047</td>
<td>SOCKNAME getmain fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30048</td>
<td>Alias struct getmain fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30049</td>
<td>Inet struct getmain fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30050</td>
<td>Alias getmain fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30051</td>
<td>Inet getmain fail</td>
<td>CICS internal error. Call your IBM Software Support Center</td>
</tr>
<tr>
<td>30052</td>
<td>No room in sock array</td>
<td>Increase the value of the MAXSOC parameter on the INITAPI request</td>
</tr>
</tbody>
</table>
Chapter 2. The debugging tools pattern matching interface

Use the debugging tools pattern matching interface to determine if a program instance that you specify matches an active debugging profile. The interface returns information about the profile that is the best match for the program instance you specify.

Invoking the pattern matching interface

To invoke the pattern matching interface, LINK to program DFHDPCP, with a commarea.

Procedure

Use a commarea with a length of 699 bytes or longer and the following structure:

<table>
<thead>
<tr>
<th>Offset Hex</th>
<th>Offset Decimal</th>
<th>Type</th>
<th>Length</th>
<th>Name</th>
<th>Type of data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'00'</td>
<td>0</td>
<td>Reserved</td>
<td>16</td>
<td></td>
<td></td>
<td>X'01' The specified program instance matches an active debugging profile.</td>
</tr>
<tr>
<td>X'10'</td>
<td>16</td>
<td>Input</td>
<td>1</td>
<td></td>
<td></td>
<td>X'02' The specified program instance does not match an active debugging profile.</td>
</tr>
<tr>
<td>X'11'</td>
<td>17</td>
<td>Reserved</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X'12'</td>
<td>18</td>
<td>UNSIGNED</td>
<td>1</td>
<td>DPCC_RESPONSE</td>
<td>Output</td>
<td></td>
</tr>
<tr>
<td>X'13'</td>
<td>19</td>
<td>CHARACTER</td>
<td>4</td>
<td>DPCC_TRANID</td>
<td>Input</td>
<td>Specify the transaction ID that is used to identify matching profiles</td>
</tr>
<tr>
<td>X'17'</td>
<td>23</td>
<td>CHARACTER</td>
<td>4</td>
<td>DPCC_TERMD</td>
<td>Input</td>
<td>Specify the terminal ID that is used to identify matching profiles</td>
</tr>
<tr>
<td>X'1B'</td>
<td>27</td>
<td>CHARACTER</td>
<td>8</td>
<td>DPCC_PROGID</td>
<td>Input</td>
<td>Specify the program name that is used to identify matching profiles</td>
</tr>
<tr>
<td>X'23'</td>
<td>35</td>
<td>CHARACTER</td>
<td>30</td>
<td>DPCC_COMP_UNIT</td>
<td>Input</td>
<td>Specify the name of the compilation unit that is used to identify matching profiles</td>
</tr>
<tr>
<td>X'41'</td>
<td>65</td>
<td>CHARACTER</td>
<td>8</td>
<td>DPCC_USERID</td>
<td>Input</td>
<td>Specify the user ID that is used to identify matching profiles</td>
</tr>
<tr>
<td>X'49'</td>
<td>73</td>
<td>CHARACTER</td>
<td>8</td>
<td>DPCC_NETNAME</td>
<td>Input</td>
<td>Specify the terminal Netname that is used to identify matching profiles</td>
</tr>
<tr>
<td>Offset</td>
<td>Type</td>
<td>Length</td>
<td>Name</td>
<td>Type of data</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>---------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>X'51'</td>
<td>CHARACTER</td>
<td>8</td>
<td>DPCC_APPLID</td>
<td>Input</td>
<td>Specify the APPLID that is used to identify matching profiles</td>
<td></td>
</tr>
<tr>
<td>X'59'</td>
<td>CHARACTER</td>
<td>1</td>
<td>DPCC_SESSION_TYPE</td>
<td>Output</td>
<td>X'01' The best matching debugging profile specifies a session type of 3270</td>
<td></td>
</tr>
<tr>
<td>X'5A'</td>
<td>CHARACTER</td>
<td>255</td>
<td>DPCC_IP_NAME_OR_ADDR</td>
<td>Output</td>
<td>X'02' The best matching debugging profile specifies a session type of TCP</td>
<td></td>
</tr>
<tr>
<td>X'159'</td>
<td>CHARACTER</td>
<td>5</td>
<td>DPCC_PORT</td>
<td>Output</td>
<td>For a session type of TCP, returns the port number specified in the best matching profile</td>
<td></td>
</tr>
<tr>
<td>X'15E'</td>
<td>CHARACTER</td>
<td>4</td>
<td>DPCC_3270_DISPLAY</td>
<td>Output</td>
<td>For a session type of 3270, returns the terminal Id of the 3270 terminal specified in the best matching profile</td>
<td></td>
</tr>
<tr>
<td>X'162'</td>
<td>UNSIGNED</td>
<td>1</td>
<td>DPCC_TEST_LEVEL</td>
<td>Output</td>
<td>If the best matching profile is for a Language Environment® program, returns the Test Level specified in the profile</td>
<td></td>
</tr>
<tr>
<td>X'163'</td>
<td>CHARACTER</td>
<td>44</td>
<td>DPCC_COMMAND_FILE</td>
<td>Output</td>
<td>If the best matching profile is for a Language Environment program, returns the name of the Command File specified in the profile</td>
<td></td>
</tr>
<tr>
<td>X'18F'</td>
<td>UNSIGNED</td>
<td>1</td>
<td>DPCC_PROMPT</td>
<td>Output</td>
<td>If the best matching profile is for a Language Environment program, returns the Prompt Level specified in the profile</td>
<td></td>
</tr>
<tr>
<td>X'190'</td>
<td>CHARACTER</td>
<td>44</td>
<td>DPCC_PREFERENCE_FILE</td>
<td>Output</td>
<td>If the best matching profile is for a Language Environment program, returns the name of the Preference File specified in the profile</td>
<td></td>
</tr>
<tr>
<td>Offset Hex</td>
<td>Offset Decimal</td>
<td>Type</td>
<td>Length</td>
<td>Name</td>
<td>Type of data</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>------------</td>
<td>--------</td>
<td>-------------------</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>X'1BC'</td>
<td>444</td>
<td>CHARACTER</td>
<td>255</td>
<td>DPCC_LE_OPTIONS</td>
<td>Output</td>
<td>If the best matching profile is for a Language Environment program, returns the Language Environment options specified in the profile</td>
</tr>
</tbody>
</table>
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