z/OS

Documentation Updates for APAR OA49089: IOS Read Diagnostic Parameters

Contents

About this information

This document provides specific updates for certain publications in the z/OS® product library, as required by APAR OA49089. Each part of this document pertains to a different publication affected by the APAR. The information in each part consists of pages excerpted from the upcoming editions of the respective publications.

Technical updates are indicated by a vertical bar to the left of the change. (You might also notice revision bars for other unrelated technical updates that occur in the vicinity of the updates for this APAR.)

Currency of this information: These updates appear in the next editions of the official publications, which are scheduled to be published in June 2016. Thereafter, the information in the official publications supersedes the information in this APAR document. If you are reading this APAR document after June 2016, refer instead to the official publications for the most recent information. You can find the current publications in the z/OS Internet Library (http://www.ibm.com/systems/z/os/zos/library/bkserv/).

The APAR requires updates the following publications:

Part 1. Updates for z/OS Introduction and Release Guide

This part contains updates to the information in *z/OS Introduction and Release Guide* (GA32-0887).

This information introduces the IOS read diagnostics parameters (RDP) functionality provided by the APAR.

Improved z/OS Discovery and Auto Configuration (zDAC) function

Description: z/OS Discovery and Auto Configuration (zDAC) has improved processing of device number-constrained configurations and those with constrained unit addresses for specific channels. It is also enhanced with the capability to allow you to specify switch and CHPID maps to guide path selection and to discover directly attached devices, in addition to those connected to a switch. There is improved toleration of inactive or incapable systems identified in an LPAR group and the discovery policy enhancements allow you to forego automatic device numbering so you can provide your own device numbers. In addition, the policy refresh capability allows some policy options to be dynamically refreshed without requiring a new fabric discovery.

When change was introduced: z/OS V2R1.

Reference information: *z/OS HCD User's Guide*

IOS read diagnostic parameters

Description:

Advances in fiber optic technology allow enterprises to move to faster link speeds in their I/O topology. But faster link speeds are more sensitive to optical signal degradation, as might occur because of twisted or damaged cables, dirty optics, or improperly seated or misaligned connectors. When link errors occur, it can be difficult to determine the source of the problem. For instance, is it a transceiver, connector, or fiber issue, and at which point in the link?

The input/output supervisor (IOS) component of z/OS now provides information to help clients and support personnel to diagnose and resolve issues with fibre channel links. The diagnostic information can help distinguish between errors that occur because of dirty connections and those that occur because of faulty optics.

With this support, IOS provides the following new functions:

- A new LINKINFO parameter on the DISPLAY M=DEV command to display fiber optic link information, which eliminates the need to collect this information from individual channels, switches, and control units in a disruptive manner (such as by connecting a light meter)
- New health checks for IBM Health Checker for z/OS to monitor mismatched link speeds for a control unit and inadequate buffer credits for the path
- SMF record type 124 subtype 1, which contains optical link information

Release introduced:

z/OS V2R1 with APAR OA49089 and supporting processor, DASD, and switch hardware

Reference information:

z/OS MVS System Commands

IBM Health Checker for z/OS User's Guide

z/OS MVS System Management Facilities (SMF)

Predictive Failure Analysis considerations

This topic describes things to consider when using Predictive Failure Analysis (PFA) in z/OS.

Part 2. Updates for z/OS MVS System Commands

This part contains updates to the information in *z/OS MVS System Commands* (SA38-0666).

The LINKINFO parameter has been added to the **DISPLAY M=DEV** command.

Syntax

D LOGREC
D LOGREC[,{CURRENT|CURR}|{DATASET|DSN}|{ALL|A}] [,L={a|name|name-a}]

The parameters are:

CURRENT or CURR
Indicates that the system is to display the current logrec medium. CURRENT is the default. The possible current mediums are as follows:

- LOGSTREAM, which displays the log stream name and status.
- DATASET, which displays the logrec data set name and status.
- IGNORE, which indicates that there is no logrec medium.

DATASET or DSN
Indicates that the system is to display only the logrec data set name and status. If a data set name is displayed, then it is defined. The displayed data set, however, might not be the current logrec recording medium. To determine the current recording medium, use the CURRENT option. If there is no data set defined, the system displays the text NOT DEFINED.

ALL or A
Indicates that the system is to display all, both current and alternate, logrec medium and data set names and status.

L=*a*, *name*, *or* *name-a*
Specifies the display area (*a*), console name (*name*), or both (*name-a*) where the display is to appear.

If you omit this operand, the display is presented in the first available display area or the message area of the console through which you enter the command.

Example:

To display information for all the logrec medium settings:

```
DISPLAY LOGREC,ALL
```

Displaying system configuration information

Use the DISPLAY M command to display the status of sides, processors, ICRFs, channel paths, devices, storage-class memory (SCM) and central storage, or to compare the current hardware configuration to the configuration in a CONFIGxx parmlib member.

The DISPLAY M command can accept the subchannel set number to qualify the input device number. The output of message IEE097I includes the applicable subchannel set number.

When you specify a device number that might be mistaken for the device name, precede the device number with a slash. The slash is optional with a 3-digit device number.

Syntax

```
D M

D M[=CHP[(xx)|(xx-xx)|(list)]
    |=CONFIG[(xx)]
    |=CORE[(x)|(list)]
    |={CPUAD|CPU}[(x)|(list)]
    |=CU(xxxx)
    |={DEVICE|DEV}[([/]devnum)|([/]lowdevnum-[/]highdevnum)|(list)]
    |={DEVICE|DEV}([/]devnum,(chp))[,ROUTE={TODEV|FROMDEV|BOTH}[,HEALTH]]
                                    [,LINKINFO={FIRST|LAST|REFRESH|COMPARE}]
    |={DEVICE|DEV}(([/]devnum),chp)[,ROUTE={TODEV|FROMDEV|BOTH}[,HEALTH]]
                                    [,LINKINFO={FIRST|LAST|REFRESH|COMPARE}]
    |=HIGH
    |=HSA
    |=SCM(DETAIL)
    |=SIDE[(id)]
    |={STORAGE|STOR}[(ddddM-ddddM)|(list)|(E[=id])]
    |=SWITCH(sssss [,pp[-pp] [,pp[-pp]]...])
    |=(parm[,parm]...)

   [,L={a|name|name-a}]
```

Parameters

M The system is to display information about system configuration. When you enter DISPLAY M with no operands, the system displays the starting address and length of each portion of the hardware system area (HSA). The system also displays the status of all processors, ICRFs, central storage, channel paths, storage-class memory (SCM) and devices, depending on the type of processor or processor complex.

If the processor complex is partitioned, the system does not provide information about resources that are not part of the configuration on which you issue the command. Message IEE174I gives you the status of resources on the side from which you issue the command and tells you that information about the other side is unavailable. If you are running your processor complex in single-image mode with all resources in one side offline, message IEE174I identifies the other side as being offline but gives you the information about those resources. For example, to partition a processor complex, you configure offline the resources on one side. To verify that those resources are offline, issue the DISPLAY M=SIDE command. The display lists the side as offline and gives the status of the resources.

CHP
The system is to display the online and offline status of channel paths. If you do not specify any channel path, the system displays the status of all channel paths, as well as a status of either “managed and online” or “managed and offline” as part of the support of dynamic channel path management. For a description of the display format, see message IEE174I.

(xx)
A single channel path identified by *xx*. The channel path identifier can have a value from 0 to FF.

(xx-xx)
A range of channel path identifiers. The starting and ending channel path identifiers can have a value from 0 to FF.

(*list*)
One or more single channel path identifiers, or a combination of single channel path identifiers and ranges of channel path identifiers, each separated by a comma.

CONFIG[(*xx*)]
The system is to display the differences between the current configuration and the configuration described in the CONFIGxx parmlib member. If you omit *xx*, the system assumes that you mean CONFIG00.

For a description of the display format, see message IEE097I.

You can also start this function from the HCD dialog. For details refer to the section "Process Display M=CONFIG(xx) Command" in *z/OS HCD User's Guide*.

CORE
The system is to display the online or offline status of one or more cores. If you do not specify any core identifiers, the system displays the online or offline status of all cores.

(*x*)
A single core identified by a core identifier in hexadecimal format.

(*list*)
One or more core identifiers, each separated by a comma.

Note: When you issue the DISPLAY M=CORE command from a PR/SM partition, the system displays the status for the logical cores and ICRFs defined to the partition.

Note: When you issue the DISPLAY M=CORE command from a system where PROCVIEW CPU is in effect, the command is rejected.

CPUAD *or* **CPU**
The system is to display the online or offline status of one or more processors and any ICRFs attached to those processors. See message IEE174I.

If you do not specify any processor identifiers, the system displays the online or offline status of all processors and any ICRFs attached to them. Whether you specify a processor identifier or not, the system displays "N" when a processor is neither online or offline, but is recognized by the machine.

Note: When you issue the DISPLAY M=CPU command from a PR/SM partition, the system displays the status for the logical processors, and ICRFs defined to the partition.

(*x*)
A single processor identified by processor identifier in hexadecimal format.

(*list*)
One or more processor identifiers, each separated by a comma.

Note: When you issue the DISPLAY M=CPU command from a PR/SM partition, the system displays the status for the logical CPUs, and ICRFs defined to the partition.

Note: When you issue the DISPLAY M=CPU command from a system where PROCVIEW CORE is in effect, the command is rejected. With LOADxx PROCVIEW CORE,CPU_OK, CPU is accepted and treated as an alias for CORE.

CU The system is to display the information for a specific control unit. For a description of the display format, see message IEE174I.

(*xxxx*)
The control unit number.

Note: The D M=CU command does not support displaying information for CTC control units.

DEVICE *or* **DEV**
The system is to display the number of online channel paths to devices (including special devices) or a single channel path to a single device.

For a description of the display format, see message IEE583I.

([/]*devnum*)
A single device number.

([/]*lowdevnum*-[/]*highdevnum*)
The lower device number *lowdevnum* and the upper device number *highdevnum* of a range of devices.

([/]*devnum*,(*chp*))
A single device number and single channel path identifier.

(([/]*devnum*),*chp*)
A single device number and single channel path identifier.

ROUTE
The ROUTE parameter displays the route through the fabric between the channel and the device.

Specify one of the following keywords on the ROUTE parameter:

TODEV
Displays the route through the fabric, starting with the channel and going to the device.

FROMDEV
Displays displays the route through the fabric, starting with the device and going to the channel.

BOTH
Displays the route through the fabric in both directions.

Routing and health information will only be determined and displayed when the channel is connected to a switch and the control unit definition for the channel path is defined in the I/O configuration with a two-byte link address.

For a description of the display format, see message IEE583I in *z/OS MVS System Messages, Vol 7 (IEB-IEE)*.

For more information about how the routing and health information can be used to diagnose a problem in the fabric, see "Diagnosing problems in a switched fabric" on page 75.

HEALTH
Displays the health information, which includes the utilization, average delay, and error counts, for the fabric, switch, and port.

LINKINFO
The LINKINFO parameter displays link diagnostic information for a device and CHPID. Link diagnostic information consists of the optical transceiver values, error counters, and buffer credits for each port from the channel to the control unit, except inter-switch link (ISL) ports.

- For switched point-to-point configurations, information for the channel port, entry switch port, exit switch port, and control unit port is displayed.
- For point-to-point configurations, information for the channel port and control unit port is displayed.

The LINKINFO parameter may only be specified when a path is specified on the D M=DEV command.

Specify one of the following keywords on the LINKINFO parameter:

FIRST
Displays the link diagnostic information that was obtained during IPL or when the path was varied online for the first time after IPL.

LAST
Displays the link diagnostic information that was last retrieved by the system. The system retrieves new information for a path every 24 hours or when you specify LINKINFO=REFRESH.

REFRESH
Requests that the system obtain new link diagnostic information for the physical path and then displays that information. This replaces the prior information; a subsequent LINKINFO=LAST request will display this new information.

Notes:

1. A REFRESH request does not cause the entry switch port, exit switch port, and control unit port to retrieve new optical transceiver information; it simply causes the last retrieved values to be returned to the channel subsystem. The frequency at which a port retrieves its own optical transceiver information is manufacturer- and model-specific.
2. The system rejects a REFRESH request if the channel specified in the command is already processing the maximum number of concurrent requests. These requests could be from this system or from other systems running on the same CPC. The allowed maximum number of concurrent requests for a channel is model-dependent.

The system issues the IEE584I message in response to the FIRST, LAST, and REFRESH keywords.

COMPARE
Displays a comparison of the first and last set of link diagnostic information that was retrieved by the system. The system issues the IEE586I message in response to the COMPARE keyword.

Device numbers and ranges can be specified in any combination.

A device number consists of 3, 4, or 5 hexadecimal digits, optionally preceded by a slash (/). A channel path identifier can have a value from 0 to FF. In the 5-digit format, *sdddd*, *s* is the subchannel set identifier and *dddd* is the device number.

If a range of device numbers is found and one of the two numbers is a 5-digit number, the other number in the range must also be a 5-digit number.

HIGH
The system is to display the highest possible central storage addresses in decimal M bytes (megabytes) or when the value is greater than 16383 decimal, in hexadecimal M bytes. Each address indicates the amount of storage available at system initialization. For a description of the display format, see message IEE174I.

HSA
The system is to display the starting address and length of each portion of the hardware system area (HSA). For a description of the display format, see message IEE174I.

SCM [(DETAIL)]
Displays the online or offline status for all installed SCM increments, and usage information. If **DETAIL** is specified, details for each online increment are displayed; otherwise, summary information is displayed for ranges ofSCM.

For a complete description of the display format of DISPLAY M=SCM, refer to message IEE174I.

SIDE[(*id*)]
The system is to display the resources installed in side (physical partition) *id*, whether the resources are online or offline, and whether the side is online, offline, or unavailable. If the processor complex is partitioned and the specified side is part of another configuration, no information is provided. If the processor complex is running in single-image mode and you do not specify an *id*, the system displays both sides. If the command is issued from MVS running in a partition, no information is provided.

For a complete description of the display format of DISPLAY M=SIDE, see message IEE174I.

STORAGE *or* **STOR**
The system is to display the status of central storage. The display includes storage offline, storage waiting to go offline, and reconfigurable storage sections. For storage waiting to go offline, the system displays:

- The address space identifier (ASID)
- The jobname of the current user of the storage
- The amount of unassigned storage in offline storage elements
- The amount of storage that belongs to another configuration

STORAGE also indicates if a given range of central storage contains data that is shared through the use of the IARVSERV macro.

In this display, storage offline does not include the hardware save area (HSA). To find the location and length of the HSA, enter DISPLAY M=HSA.

If you do not specify (*dddddX-dddddX*), (*list*), or (E[=*id*]), the system displays the status of all central storage. For a description of the display format, see message IEE174I.

(*dddddX-dddddX*)
The starting and ending addresses of a range in central storage for which you want the status display. Specify up to five decimal digits followed by a multiplier (M-megabytes, G-gigabytes, T-terabytes, P-petabytes) for each address. The starting and ending addresses (*dddddX*) must each be on a valid storage boundary and cannot exceed 16383P. The starting and ending addresses must not be the same.

Instead of specifying the range using decimal numbers, you can specify it in hexadecimal, with or without a multiplier, in the format X'xxxxxx'-X'xxxxxx'. For example:

- X'123456789A00000'-X'123456789B00000'
- X'123'M-X'124'M

You can use underscores in any hexadecimal specification for better clarity. Underscores in the specification are ignored during processing.

(*list*)
One or more address ranges (in decimal), each separated by a comma.

(E[=*id*])
The system is to display the status of the requested storage element. The display includes the amount of storage (in megabytes) the system owns in each online storage element, the amount of storage available to be configured online, whether the storage element is online or offline. If you omit the *id*, the system displays this information for all installed storage elements.

Note: If the processor complex is partitioned and the specified storage element is part of another configuration, no information is provided.

SWITCH(*ssss* [,*pp*[-*pp*] [,*pp*[-*pp*]]...])
The system is to display the status of a specific switch, switch port, or list of switch ports.

For a description of the display format, see message IEE174I.

ssss
The device number of the switch device.

[,*pp*[-*pp*] [,*pp*[-*pp*]]...]
The port address or port address list.

(parm[,*parm*]...)
The system is to display the status of each resource you specify as *parm*. The list of *parm*s you specify within the parentheses may contain any combination of CHP, CPU, DEV, HIGH, HSA, STOR(E[=id]), and STOR. You must separate the resources in the list with commas and you must enclose the list in parentheses. Do not use blanks within the parentheses and do not specify CONFIG in the list.

L=*a*, *name*, *or* *name-a*
Specifies the display area (*a*), console name (*name*), or both (*name-a*) where the display is to appear.

If you omit this operand, the display is presented in the first available display area or the message area of the console through which you enter the command.

Examples

Example 1:

To display the online or offline status of all devices on channel path 01, enter:

```
D M=CHP(01)
```

Example 2:

To display the following information:

- The online or offline status of all processors
- The number of online channel paths to each device
- The highest central storage address available
- The status of central storage

enter the following command:

```
D M=(CPU,DEV,HIGH,STOR)
```

Example 3:

To display the number of megabytes of storage the system owns in storage element 0 and the status of the storage element, enter:

```
D M=STOR(E=0)
```

Example 4:

To display the number of megabytes of storage the system owns in each storage element and the status of each element, enter:

```
D M=STOR(E)
```

Example 5:

To display the status of all processors, the status for channel paths 1, 3, 4, 5, and the high storage addresses for central storage, enter:

```
D M=CPU
D M=CHP(01,03-05)
D M=HIGH
       or
D M=(CPU,CHP(01,03-05),HIGH)
```

Example 6:

The following example displays the status of cores. In this example, the configuration supports MT Mode=2 (MT=2) where standard CP cores 0 and 1 are exploiting MT Mode=1 (CP=1) and zIIP cores 2 and 3 are exploiting MT Mode=2 (zIIP=2).

```
D M=CORE
CORE STATUS: HD=Y  MT=2  MODE: CP=1  zIIP=2
ID    ST   ID RANGE   VP  ISCM  CPU THREAD STATUS
```

```
0000   +   0000-0001  H   FC00  +N
0001   +   0002-0003  H   FC00  +N
0002   +I  0004-0005  H   0200  ++
0003   +I  0006-0007  H   0200  ++
```

It is possible for a core status to be mixed (/). A core status of mixed means that a core's CPU thread status is unexpected given the MT Mode for cores of that type. In the following example, the status of core 3 is mixed, because CPU 6 is online, CPU 7 is offline, and zIIPs are exploiting MT Mode=2. With zIIPs exploiting MT Mode=2, the system expects core 3 to have both threads (CPUs 6 and 7) online. If a core appears with a mixed mode, it is generally due to an internal system error and should be configured to the desired online or offline state.

```
D M=CORE
CORE STATUS: HD=Y  MT=2  MODE: CP=1  zIIP=2
ID    ST   ID RANGE   VP  ISCM  CPU THREAD STATUS
0000   +   0000-0001  H   FC00  +N
0001   +   0002-0003  H   FC00  +N
0002   +I  0004-0005  H   0200  ++
0003   /I  0006-0007  H   0200  +-
```

Displaying message flood automation information

Use the DISPLAY MSGFLD command to display the following information about message flood automation:

- The enablement status of the message flood automation.
- The intensive mode states for all three message types: REGULAR, ACTION, and SPECIFIC.
- The values of parameters for all three message types or a specified message type.
- The default actions to be taken for all three message types or a specified message type.
- The message rate information.

The complete syntax for the DISPLAY MSGFLD command is:

```
D {MSGFLD|MF}[,STATUS]
             [,MODE]
             [,DEFAULTS]
             [,JOBS]
             [,MSGS]
             [,PARAMETERS]
             [,MSGTYPE=msgtype,keyword]
             [,MSGRATE[,n][,m]]
             [,L={a|name|name=a|}]
```

STATUS
Displays the current enablement status of message flood automation and the active MSGFLDxx parmlib member.

If you enter only the DISPLAY MSGFLD command, the default you get is STATUS.

MODE
Displays the current intensive mode states for all three message types.

Part 3. Updates for IBM Health Checker for z/OS User's Guide

This part contains updates to the information in *IBM Health Checker for z/OS User's Guide* (SC23-6843).

The following health checks have been added:

- IOS_BUFFER_CREDITS
- IOS_PORT_SPEED

Output:

The following shows sample output of the exception due to insufficient space to create the Version 2 Printer Inventory files:

```
CHECK(IBMINFOPRINT,ZOSMIGV1R12_INFOPRINT_INVSIZE)
START TIME: 05/05/2010 09:29:49.720815
CHECK DATE: 20100301  CHECK SEVERITY: MEDIUM
                Printer Inventory Migration Space Report
  Inv  File                                          (MB)
S Name System Name                                   Avail  Needed  Used
- ---- ------------------------------------------- ------ ------ ------
E AOP1 VAR.PRINTSR1.ZFS                               1470   2049   2341
  /var/Printsrv

* Medium Severity Exception *

AOPH1511E The Infoprint Server file system has insufficient space to
reformat the Printer Inventory when you migrate to z/OS V1R12.

  Explanation:  The Infoprint Server file system does not have enough
    available space for the Version 2 Printer Inventory. The first time
    you start Infoprint Server on z/OS V1R12, Infoprint Server attempts
    to reformat the Version 1 Printer Inventory and create a Version 2
    Printer Inventory. If insufficient space exists, Infoprint Server
    does not start.  The minimum available space that is required is 2
    times the space that the Version 1 Printer Inventory files currently
    use. (Version 1 Printer Inventory files have extension .db.)  The
    health check produced a report that identifies the Infoprint Server
    file system with its total available space and used space plus the
    minimum available space required to create the Version 2 Printer
    Inventory.

 System Action:  Processing continues. However, if you do not increase
   the available space, Infoprint Server cannot start on z/OS V1R12.

 Operator Response:  Report this problem to the system programmer.

 System Programmer Response:  Examine the report that the health check
   produced.

   o An "E" in the "S"(Status) column indicates that the file system
   does not have enough available space.

   o An "N" in the "S"(Status) column indicates that file master.v2db
   exists. The amount of available space was not checked because
   Version 2 Printer Inventory files already exist.

   After you increase the space in the file system, run this check
    again to verify that enough available space exists.

  Problem Determination:  Not applicable

  Source:   Infoprint Server

  Reference Documentation:  z/OS Migration Guide

  Automation:

  Check Reason:  Verify there is enough space to create the .v2db
    inventory files from the .db files when migrating to V1R12.

END TIME: 05/05/2010 09:29:49.735897  STATUS: EXCEPTION-MED
================================================================================
```

IOS checks (IBMIOS)

IOS_BUFFER_CREDITS

Description:

Reports if any FICON® ports in a switched fabric are configured with insufficient buffer credits to handle the I/O traffic from their neighbor port. In a switched fabric, there are two links that are monitored by this health check: the link between the channel and the entry switch port, and the link between the exit switch port and the control unit port.

The basic building block of a FICON I/O request is a fibre-channel frame. Each frame contains command information, read or write data, and status information and can hold as little as one byte to 2K bytes of information. A single I/O request requires one or more frames to be transferred through the switch fabric between the processor and device. The number of frames and their direction depend on the amount of data being transferred and whether this is a read or write request.

During link initialization, the two ports on each side of the link exchange the number of buffer credits. Buffer credits represent the number of frame buffers that the port has provided to handle traffic from its neighbor. The intent is to prevent one port from over-saturating the neighbor port causing frames to be dropped, which would result in I/O errors. When a frame is sent by a port to its neighbor, the number of available buffer credits is decreased by one. The number of available buffer credits is not increased until the port has received an acknowledgment from its neighbor. One acknowledgment is required for each frame sent. If the number of available buffer credits goes to zero, the port can not send any more frames to its neighbor until its buffer credits are replenished.

The number of buffer credits for channels and control unit ports is fixed to handle the maximum capable speed and maximum supported distance between the channel and entry switch, or the exit switch and the control unit, which is 10 kilometers. However, the number of buffer credits for a switch port is configurable. The number of buffer credits required depends on the speed of the link and the distance between the two ports. The higher the speed and the longer the distance, the more buffer credits are required to ensure that I/O traffic is not delayed due to lack of buffer credits. If an inadequate number of buffer credits is configured, then I/O latency increases and link throughput decreases because the port is not be able to send the frames for an I/O request.

The following formula shows how to calculate the number of buffer credits that are configured for a link:

$$\text{Buffer Credits} = \textit{Link speed (Gbps)} \times \textit{Distance (km)} \div \textit{Average frame size (K)} + 1$$

Example: If the link speed is 16 Gbps, the distance between the ports is 10 km, and the average frame size is 1K, the required number of buffer credits is 161.

Notes:

1. This health check uses an average frame size of one in its calculations.
2. This health check checks the number of buffer credits for the link between the channel and the entry switch port, and the link between the exit switch port and control unit port. It does not check buffer credits for inter-switch link (ISL) ports.
3. The ports on both sides of the link must support the Fibre Channel Read Diagnostic Parameters (RDP) extended link service and must both provide their buffer credit information in order for this check to perform its function. Otherwise, the system cannot determine whether an exception exists. This might require the installation of a certain level of switch or control unit firmware. Contact your switch or control unit manufacturer to determine the required hardware and firmware levels to support this function.

The system runs this check whenever any of the following occur:

- IBM Health Checker for z/OS starts.
- A channel path becomes available or is varied online and the system detects that an inadequate number of buffer credits has been configured for a port.

The information in the report identifies the problem port and its neighbor, the operating speed of the link, the estimated distance, the number of buffer credits configured to the problem port, and the estimated number of buffer credits required based on the link speed and distance.

Reason for check:
In a switched fabric, the configured number of buffer credits directly affects I/O latency and throughput. By monitoring this value, this health check can provide insight into performance-related problems.

z/OS releases the check applies to:
z/OS V2R1 and later, with APAR OA49089 and supporting processor, DASD, and switch hardware.

Parameters accepted:
None.

User override of IBM values:
The following statement shows the default keywords for the check, which you can override on either a POLICY statement in the HZSPRM*xx* parmlib member or on a MODIFY command. You can copy and modify this statement to override the check defaults:

```
UPDATE
CHECK(IBMIOS,IOS_BUFFER_CREDITS)
ACTIVE
VERBOSE(NO)
INTERVAL(ONETIME)
SEVERITY(MED)
DATE('date_of_the_change')
REASON('Your reason for making the update')
```

Debug support:
No.

Verbose support:
No.

Reference:

- For more information about increasing the number of buffer credits for a switch port, see the documentation provided by your switch vendor.
- The DISPLAY M=DEV command with the LINKINFO parameter also provides buffer credit information for a device path, as well as other information. For more information, see *z/OS MVS System Commands*.

Messages:
This check issues the following exception messages:

- IOSHC156E

See IOSHC messages in *z/OS MVS System Messages, Vol 9 (IGF-IWM)*.

SECLABEL recommended for MLS users:
SYSLOW

IOS_CAPTUCB_PROTECT

Description:
This check verifies that captured UCB protection is active on the system. Captured UCB protection is suggested.

Reason for check:
UCBs (Unit Control Blocks) are control blocks in storage that define the characteristics of devices. Legacy software may require a subset of these to

See IOSHC messages in *z/OS MVS System Messages, Vol 9 (IGF-IWM)*.

SECLABEL recommended for MLS users:
SYSLOW

IOS_PORT_SPEED

Description:
Reports if any FICON links are operating at a speed that is less than the maximum capable speed of the ports on each side of the link. The term *link* refers to the connection between two FICON ports. In a switched point-to-point topology, there is a link between the channel and the entry switch port, and a link between the exit switch port and the control unit port. In a point-to-point topology, there is a single link between the channel and control unit port.

During link initialization, the ports on each side of the link negotiate the operating speed of the link. Ideally, the operating speed of the link is the highest capable speed that is common between the two ports. For example, if an 8 Gbps port is connected to a 16 Gbps port, the link would ideally operate at 8 Gbps. However, if excessive errors occur during link negotiation due to the quality of the link (as might be caused by dirt or dust on the optics, or damaged cables), the link negotiates at a lower speed. This can result in increased I/O latency and reduced throughput.

Note: The ports on both sides of the link must support the Fibre Channel Read Diagnostic Parameters (RDP) extended link service and must both provide their maximum capable and operating speeds in order for this check to perform its function. Otherwise, the system cannot determine whether an exception exists. This might require the installation of a certain level of switch or control unit firmware. Contact your switch or control unit manufacturer to determine the required hardware and firmware levels to support this function.

The system runs this check when any of the following events occur:

- IBM Health Checker for z/OS starts.
- A channel path becomes available or is varied online and the system detects that the port speed is less than the maximum capable speed.

The information in the report includes the identifiers for the two ports on the link, their maximum capable speeds, and the negotiated or operating speed of the link.

Reason for check:
Port (link) speed is directly related to I/O latency and throughput. By monitoring this value, this health check can provide insight into fabric problems, such as hardware errors, I/O misconfiguration, or congestion.

z/OS releases the check applies to:
z/OS V2R1 and later, with APAR OA49089 and supporting processor, DASD, and switch hardware.

Parameters accepted:
None.

User override of IBM values:
The following statement shows the default keywords for the check, which you can override on either a POLICY statement in the HZSPRM*xx* parmlib member or on a MODIFY command. You can copy and modify this statement to override the check defaults:

```
UPDATE
CHECK(IBMIOS,IOS_PORT_SPEED)
ACTIVE
VERBOSE(NO)
INTERVAL(ONETIME)
SEVERITY(MED)
DATE('date_of_the_change')
REASON('Your reason for making the update')
```

Debug support:
No.

Verbose support:
No.

Reference:
For more information about diagnosing fiber optic link problems, consult the documentation supplied by your hardware vendor.

The DISPLAY M=DEV command with the LINKINFO parameter also provides the operating and capable speeds of the port for a device path, as well as other information. For more information, see *z/OS MVS System Commands* .

Messages:
This check issues the following exception messages:

- IOSHC151E

See IOSHC messages in *z/OS MVS System Messages, Vol 9 (IGF-IWM)*.

SECLABEL recommended for MLS users:
SYSLOW

IOS_STORAGE_IOSBLKS

Description:
This check verifies that control blocks used in IOS can reside in 31-bit addressable storage.

Reason for check:
Control blocks used to initiate I/O were obtained in storage addressable in the first 16 megabytes of storage so that 24-bit AMODE legacy software could perform scans on them. However, forcing all I/O control blocks below the 16 megabyte line creates a constraint on the amount of storage below the line. IBM recommends that the control blocks be allowed to be in 31-bit addressable storage.

You can verify the state of IOS blocks using the following console command:

```
DISPLAY IOS,STORAGE
```

In response to this command, the system issues message IOS089I to display the state of captured UCB protection:

```
IOS089I 12.21.54 STORAGE DATA 246
IOS BLOCKS RESIDE IN 31 BIT STORAGE
```

To change the state of the IOS blocks, see the SETIOS command in *z/OS MVS System Commands*.

z/OS releases the check applies to:
z/OS V1R12 and later.

Parameters accepted:
Yes, the following parameters are accepted:

Part 4. Updates for z/OS MVS System Messages, Vol 7 (IEB-IEE)

This part contains updates to the information in *z/OS MVS System Messages, Vol 7 (IEB-IEE)* (SA38-0674).

The following messages have been added:

- IEE584I
- IEE586I

Module: IEEDMDEV, IOSVSWFM

Routing code: -

Descriptor code: 4

IEE584I *hh.mm.ss* **DISPLAY M**
DEVICE *devno* **STATUS** *status*
[CHPID is offline, residual data will be displayed]
Link Information: *linkinfotype*
text

Explanation: In the message, *text* has the following format:

Description	Channel	Entry Port	Exit Port	Cntl Unit
Identifier	*pchid*	*linkaddr*	*linkaddr*	*intid*
Date Retrieved	*dateret*	*dateret*	*dateret*	*dateret*
Time Retrieved	*timeret*	*timeret*	*timeret*	*timeret*
Tx Power (dBm)	*txpower*	*txpower*	*txpower*	*txpower*
Rx Power (dBm)	*rxpower*	*rxpower*	*rxpower*	*rxpower*
Tx Bias (mA)	*txbias*	*txbias*	*txbias*	*txbias*
Temperature (C)	*temp*	*temp*	*temp*	*temp*
Voltage (V)	*voltage*	*voltage*	*voltage*	*voltage*
Capable Speed	*capspeed*	*capspeed*	*capspeed*	*capspeed*
Operating Speed	*opspeed*	*opspeed*	*opspeed*	*opspeed*
Buffer Credits	*buffcred*	*buffcred*	*buffcred*	*buffcred*
Link Failures	*linkfail*	*linkfail*	*linkfail*	*linkfail*
Loss of Sync	*losssync*	*losssync*	*losssync*	*losssync*
Loss of Signal	*losssgnl*	*losssgnl*	*losssgnl*	*losssgnl*
Primitive Seq Err	*primseq*	*primseq*	*primseq*	*primseq*
Invalid Trans Word	*invtranw*	*invtranw*	*invtranw*	*invtranw*
Invalid CRC	*invcrc*	*invcrc*	*invcrc*	*invcrc*
FEC Uncorrected	*fecuncorr*	*fecuncorr*	*fecuncorr*	*fecuncorr*

[Residual information is shown for the following:
component1
...
componentn]

Or, if the link diagnostic information cannot be displayed, the following message is displayed in place of the previous data:

Link information for device *devno* cannot be displayed:
rsntext

This message is in response to a D M=DEV(*devno*,(*chpid*)),LINKINFO=*xxxxx* command and displays the link diagnostic information for a channel path for a device. If this is a switched point-to-point configuration, information is displayed for the channel, the entry switch port connected to the channel, the exit switch port connected to the control unit, and the control unit port. If this is a point-to-point configuraton, the information is displayed for the channel and control unit port.

If a particular port does not support providing link diagnostic information, then `Not Supt` appears in each of the fields for the port except for the Identifier, Date Retrieved, and Time Retrieved fields. In this case, the date and time retrieved represents the last time that the system attempted to retrieve the information.

If the link diagnostic information is not available for a particular port, then `Not Avail` appears in each of the fields for the port except for the Identifier, Date Retrieved, and Time Retrieved fields. In this case, the date and time retrieved represents the last time that the system attempted to retrieve the information.

If a particular type of link diagnostic information is not available for a port, then `Not Avail` appears in the rows that correspond to that type of information. This may occur if the port does not support returning the particular type of information (for instance, the information is not supported at the current microcode level), or if the information is supported but conditions prevent the port from retrieving the information. For example, if port speed information is not provided for a particular port, `Not Avail` appears in the Capable Speed and Operating Speed rows for that port.

In the message text:

linkinfotype
Indicates the type of link diagnostic information being displayed:

First
The first set of link diagnostic information that was retrieved by the system is being displayed.

Last
The last set of link diagnostic information that was retrieved by the system is being displayed.

Last (Refresh)
A LINKINFO=REFRESH request was issued and the link diagnostic information that was retrieved as a result of that request is being displayed. This new information replaces the prior information, and a subsequent LINKINFO=LAST request will display this information.

pchid
The physical channel ID (PCHID) of the channel port.

linkaddr
The link address for the switch port. The link address is one or two bytes (two or four hexadecimal digits), depending on what is defined in the I/O configuration. If a two-byte link address is displayed, the first byte is the switch address (domain) and the second byte is the port address (area). If a one-byte link address is displayed, the byte is the port address (area).

intid
The interface ID of the control unit port.

dateret
The date in mm/dd/yyyy format that the system retrieved the link diagnostic information for the port. Note that this may differ from the date that the port obtained its own information.

timeret
The local time in hh:mm:ss format that the system retrieved the link diagnostic information for the port. Note that this may differ from the time that the port obtained its own information.

txpower
The measured transmitted optical power in decibel-milliwatts (dBm). This is the amount of laser light being emitted by the transmitter. This value is used to gauge the health of the transmitter.

rxpower
The measured received optical power in decibel-milliwatts (dBm). This is the amount of laser light being received from the fiber optic cable.

txbias
The measured transmitter laser bias current in milliamps (mA). This is the amount of electrical current to the laser diode transmitter. This value is used to gauge the health of the transmitter (that is, how the laser component is aging).

temp
The measured temperature of the optical transceiver in degrees Celsius (C).

voltage
The measured transceiver supply voltage in volts (V).

capspeed
The highest speed at which the port is capable of operating in gigabits per second (Gbps). If the port is unable to determine the capable speed, Unknown is displayed for that port. If the capable speed has been provided by the port, but the speed is not recognized by the system, Not Recog is displayed for that port.

opspeed
The current operating speed for this port in gigabits per second (Gbps). If the port is unable to determine the operating speed, Unknown is displayed for that port. If the operating speed has not been established for the port, None is displayed for that port. If the operating speed has been provided but is not recognized by the system, Not Recog is displayed for that port.

buffcred
The number of buffer credits that are configured for this port.

linkfail
The cumulative number of link failures. This is the count of miscellaneous fibre channel link errors.

losssync
The cumulative number of errors that have occurred due to loss of synchronization. This is the number of loss of synchronization errors where there is a confirmed and persistent synchronization loss on the fibre channel link.

losssgnl
The cumulative number of errors that have occurred due to loss of signal.

primseq
The cumulative number of primitive sequence errors that have occurred.

invtranw
The cumulative number of errors that have occurred as a result of an invalid transmission word being detected (bit errors).

invcrc
The cumulative number of errors that have occurred as a result of an invalid cyclical redundancy check (CRC) word being detected on a received frame.

fecuncorr
If forward error correction (FEC) is enabled for this port, the cumulative number of FEC uncorrected errors.

If the CHPID is offline and LINKINFO=LAST was specified on the D M=DEV command, the following line appears before the link diagnostic information to indicate that the information displayed might not be the most current set of information:

```
CHPID is offline, residual data will be displayed
```

If the system attempts to retrieve the latest link diagnostic information, but the channel subsystem was unsuccessful the last time it attempted to retrieve the information, and prior information exists, the following message is displayed:

```
Residual information is shown for the following:
  component1
  ...
  componentn
```

The *component* can be one of the following components:

Channel port SFP
The small form-factor pluggable or SFP (optical transceiver) link diagnostic information for the channel port. This includes the Tx power, Rx power, Tx bias, temperature and voltage.

Channel port non-SFP
The non-SFP link diagnostic information for the channel port. This includes all of the other information.

Entry switch port
The link diagnostic information for the entry switch port.

Exit switch port
The link diagnostic information for the exit switch port.

Control unit port
The link diagnostic information for the control unit port.

If the link diagnostic information cannot be displayed, the following message is displayed in place of the previous data:

```
Link information for device devno cannot be displayed:
   rsntext
```

The *rsntext* can be one of the following reasons:

Link diagnostics is not supported by the processor
The processor does not support the link diagnostics facility. This facility is only available for IBM z13™ and later processors.

Link diagnostic initialization is not complete
The system is in the process of initializing the link diagnostics function and cannot process the request at this time.

Channel is busy with another link request
A LINKINFO=REFRESH request was issued and the channel specified in the command is already processing the maximum number of concurrent requests. These requests could be from this system or from other systems on the same CPC. The maximum number of concurrent requests allowed for a channel is model-dependent.

Request timed out
A LINKINFO=REFRESH request was issued and the request took longer than the amount of time allowed by the system.

Channel path is not configured online
A LINKINFO=REFRESH request was issued for a channel path that is offline. A REFRESH request causes the system to send a request to the channel; therefore, it must be online in order to process the request.

Link diagnostic information is not available for the path
There is no link diagnostic information available for this channel path and destination link address. Note that this error occurs if you issue a link diagnostics request for a device with non-FICON channels.

Link diagnostics not available - permanent error
An unrecoverable error occurred and the system is no longer able to process link diagnostics requests.

Request failed, diag information = *diaginfo*
An unexpected error occurred while processing the link diagnostics request.

System action: The system continues processing.

Operator response:

- If the command was successful, no additional actions are necessary.
- If the command was rejected because the link diagnostic facility is not supported by the processor, reissue the command on a z13™ or later processor.
- If the command was rejected because link diagnostic initialization is not complete, the channel is busy with another request, or the request timed out, wait a short period of time and reissue the command. If the command is still rejected after a number of attempts, contact IBM support.
- If the command was rejected because the channel path is not configured online, issue a D M=CHP command to make sure that the CHPID is online to z/OS, and check the support element (SE) to make sure that the CHPID is operating and online to the logical partition. If the CHPID is online, contact IBM Support. Otherwise, configure the CHPID online or reissue the command with LINKINFO=LAST to get the last information obtained by the system.
- If the command was rejected because link diagnostic information is not available for the path, then either correct the command to specify a device with online, FICON CHPIDs, or contact IBM Support if the device has online FICON CHPIDs.
- Otherwise, contact IBM Support.

Module: IOSVLKFM

Routing code: -

Descriptor code: 4

IEE586I *hh.mm.ss* **DISPLAY M**
DEVICE *devno* **STATUS** *status*
Channel Information: CHPID=*cc***, PCHID=***pchid***, WWPN=***wwpn*
text

Explanation: In the message, *text* has the following format:

Description	First	Last
Date Retrieved	*dateret*	*dateret*
Time Retrieved	*timeret*	*timeret*
Tx Power (dBm)	*txpower*	*txpower*
Rx Power (dBm)	*rxpower*	*rxpower*
Tx Bias (mA)	*txbias*	*txbias*
Temperature (C)	*temp*	*temp*
Voltage (V)	*voltage*	*voltage*
Capable Speed	*capspeed*	*capspeed*
Operating Speed	*opspeed*	*opspeed*
Buffer Credits	*buffcred*	*buffcred*

```
Link Failures        linkfail   linkfail
Loss of Sync         losssync   losssync
Loss of Signal       losssgnl   losssgnl
Primitive Seq Err    primseq    primseq
Invalid Trans Word   invtranw   invtranw
Invalid CRC          invcrc     invcrc
FEC Uncorrected      fecuncorr  fecuncorr

Switch Entry Port Information: Link=linkaddr, WWPN=wwpn
(...Repeat same lines as shown under Channel Information...)

Switch Exit Port Information: Link=linkaddr, WWPN=wwpn
(...Repeat same lines as shown under Channel Information...)

Control Unit Information: Intid=intid, WWPN=wwpn
(...Repeat same lines as shown under Channel Information...)
```

Or, if the link diagnostic information cannot be displayed, the following message is displayed in place of the previous data:

```
Link Information for device devno cannot be displayed:
   rsntext
```

This message is in response to a D M=DEV(*devno*,(*chpid*)),LINKINFO=COMPARE command, which displays a comparison of the first and last set of link diagnostic information for each port. If this is a switched point-to-point configuration, information is displayed for the channel, the entry switch port connected to the channel, the exit switch port connected to the control unit, and the control unit port. If this is a point-to-point configuration, the information is displayed for the channel and control unit port.

If there is only a single version of the link diagnostic information for a port, then `No Change` appears in each of the rows under the Last column. This occurs, for example, if the path was recently initialized and not enough time has elapsed since the first version was obtained.

If the system cannot retrieve the link diagnostic information for a port, then `Not Supt` and/or `Not Avail` appears in each of the rows under both the First and Last columns, except for the Date Retrieved and Time Retrieved rows. If the port responds to the request sent by the system indicating that link diagnostics is not supported, `Not Supt` is displayed. If the port does not respond to the system or rejects the request for any other reason, `Not Avail` is displayed.

If the system successfully retrieves the first set of link diagnostic information for a port, but subsequent requests are unsuccessful, then `Not Supt` or `Not Avail` appears in each of the rows under the Last column, except for the Date Retrieved and Time Retrieved rows, which show the last time the system attempted to retrieve the link diagnostic information.

If a particular type of link diagnostic information is not available for a port, then `Not Avail` appears in the row that corresponds to that type of information. For example, if port speed information is not provided for a particular port, `Not Avail` appears in the Capable Speed and Operating Speed rows for that port.

In the message text:

cc The channel path identifier (CHPID) of the channel port.

pchid
The physical channel ID (PCHID) of the channel port.

wwpn
The world wide port name (WWPN) for that port.

linkaddr
The link address for the switch port. The link address is one or two bytes (two or four hexadecimal digits), depending on what is defined in the I/O configuration. If a two-byte link address is displayed, the first byte is the switch address (domain) and the second byte is the port address (area). If a one-byte link address is displayed, the byte is the port address (area).

intid
The interface ID of the control unit port.

The remaining fields are as described in message "IEE584I" on page 703.

If the link diagnostic information cannot be displayed, the following message is displayed in place of the previous data:

```
Link Information for device devno cannot be displayed:
   rsntext
```

For an explanation of the reason text (*rsntext*), see "IEE584I" on page 703.

System action: The system continues processing.

Operator response:

- If the command was successful, no additional actions are necessary.
- If the command was rejected because the link diagnostic facility is not supported by the processor, reissue the command on a z13 or later processor.
- If the command was rejected because link diagnostic initialization is not complete, the channel is busy with another request, or the request timed out, wait a short period of time and reissue the command. If the command is still rejected after a number of attempts, contact IBM support.
- If the command was rejected because link diagnostic information is not available for the path, then either correct the command to specify a device with online FICON CHPIDs, or contact IBM Support if the device has online FICON CHPIDs.
- Otherwise, contact IBM Support.

Module: IOSVLKFM

Routing code: -

Descriptor code: 4

IEE590I CHP(*xx*) NOT RECONFIGURED, SYSTEM STATUS CHANGED

Explanation: A reconfiguration request asked that the system reconfigure a channel path offline. Another channel path failed, making channel path *xx* the only path to one or more devices.

In the message text:

xx The channel path identifier.

System action: The system ends reconfiguration processing for channel path *xx*. The system processes any other channel paths that were to be reconfigured. The system continues processing.

Operator response: Enter DISPLAY M to determine that status of the channel paths. If appropriate, enter the CONFIG command again.

Source: Reconfiguration

Module: IEEVCHPR

Routing code: -

Descriptor code: 5

IEE591I OPEN PROCESSING FAILED FOR MEMBER *memberxx* IN *dsname*

Explanation: To process a command, the system tried to open a data set to access a parmlib member specified on the command. The system could not open the data set.

In the message text:

memberxx
The parmlib member specified on the command.

Part 5. Updates for z/OS MVS System Messages, Vol 9 (IGF-IWM)

This part contains updates to the information in *z/OS MVS System Messages, Vol 9 (IGF-IWM)* (SA38-0676).

The following messages have been added:

- IOSHC150I
- IOSHC151E
- IOSHC152I
- IOSHC155I
- IOSHC156E
- IOSHC157I

Module: IOSHCDYR

Routing code: None.

Descriptor code: None.

IOSHC145I The following do not support dynamic routing. This is allowed in the current environment, however it could result in I/O errors if dynamic routing were to be enabled in the SAN.

Explanation: CHECK(IBMIOS,IOS_DYNAMIC_ROUTING) determined that if dynamic routing were to be enabled in the storage area network (SAN), I/O errors could occur because the processor or controllers identified in the message do not support dynamic routing.

System action: The system continues processing.

Operator response: None.

System programmer response: If you are considering enabling dynamic routing in the SAN, the processor and identified controllers must first be upgraded to support dynamic routing.

Problem determination: None.

Source: Input/Output Supervisor (IOS)

Module: IOSHCDYR

Routing code: None.

Descriptor code: None.

IOSHC150I No port speed exceptions have been detected.

Explanation: CHECK(IBMIOS,IOS_PORT_SPEED) did not find port speed exceptions for any FICON links.

System action: The system continues processing.

Operator response: None.

System programmer response: None.

Problem determination: None.

Source: Input/Output Supervisor (IOS)

Module: IOSHCPSP

Routing code: None.

Descriptor code: None.

Reference Documentation: None.

IOSHC151E Port speed mismatches were detected.

Explanation: CHECK(IBMIOS,IOS_PORT_SPEED) detected one or more FICON links that are operating at a speed that is less than the maximum capable speed of the ports on either side of the link. The term *link* refers to the connection between two FICON ports. In a switched point-to-point topology, there is a link between the channel and the entry switch port, and a link between the exit switch port and the control unit port. In a point-to-point topology, there is single link between the channel and control unit port.

During link initialization, the ports on both sides of the link negotiate the operating speed of the link. Ideally, the operating speed of the link will be the highest capable speed that is common between the two ports. However, if excessive errors occur during link negotiation due to the quality of the link (as might be caused by dirt or dust on the optics, damaged cables, bad connections), the link negotiates at a lower speed. This can result in increased latency and reduced throughput for I/O operations that use that link.

For example:

- The channel and entry switch port are both capable of operating at 16 Gbps, but are currently operating at 8 Gbps.

- The exit switch port is capable of operating at 16 Gbps and the control unit port is capable of operating at 8 Gbps. Under ideal conditions, both ports will operate at 8 Gbps, which is the highest capable speed in common between the two ports. However, the ports are currently operating at 4 Gbps.

Note: Higher link speeds are more sensitive to optical signal degradation caused by link quality issues. Fiber optic links that worked at lower link speeds might not be able to run at higher link speeds without encountering errors and, therefore, might negotiate down to a lower link speed.

System action: The system continues processing.

Operator response: Contact the system programmer.

System programmer response: Refer to the corresponding reports for this health check to determine which FICON ports are operating at a suboptimal link speed. Use diagnostic tools such as the D M=DEV command with the LINKINFO parameter to help determine the source of the problem. Refer to the edition of *Planning for Fibre Optic Links* for your processor for information about the specifications and optical properties for fibre optic links, jumper cables and trunk cables. Refer to the edition of *Maintenance Information for Fiber Optic Links* for your processor for problem determination and cleaning procedures.

Problem determination: None.

Source: Input/Output Supervisor (IOS)

Module: IOSHCPSP

Routing code: None.

Descriptor code: None.

Reference Documentation:

- *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, and Open Systems Adapters)* (GA23- 1407)
- *Maintenance Information for Fiber Optic Links (FICON/FCP, Coupling Links, and Open System Adapters* (SY27-7694)

IOSHC152I Port speed mismatches were detected for the following link(s):
text

Explanation: In the message, *text* has the following format:

```
Port    Port  Assoc  Capable   Port    Port  Capable   Operating
Type    Id    CHPID  Speed     Type    Id    Speed     Speed
ptype1  id1   achpid capspeed1 ptype2  id2   capspeed2 opspeed
```

CHECK(IBMIOS,IOS_PORT_SPEED) determined that the operating speed for the ports on a FICON link is less than the maximum capable speed of both of the ports. For example, both ports are capable of operating at 16 Gbps but are operating at 8 Gbps; or one port is capable of operating at 16 Gbps and the other port is capable of operating at 8 Gbps, but the ports are operating at 4 Gbps.

During link initialization, the ports on both sides of the link negotiate the operating speed of the link. Ideally, the operating speed of the link will be the highest capable speed that is common between the two ports. However, if excessive errors occur during link negotiation due to the quality of the link (as might be caused by dirt or dust on the optics, damaged cables, bad connections), the link negotiates at a lower speed. This can result in increased latency and reduced throughput for I/O operations that use that link.

Note: Higher link speeds are more sensitive to optical signal degradation caused by link quality issues. Fiber optic links that worked at lower link speeds might not be able to run at higher link speeds without encountering errors and, therefore, might negotiate down to a lower link speed.

In the message text:

ptype1
The type of port on the first side of the link. If set to `CHPID`, then this represents the channel side of the link in either a point-to-point or switched point-to-point configuration. If set to `SWITCH`, then this represents the exit switch port side of the control unit link in a switched point-to-point configuration.

id1
If the port type is `CHPID`, then this is the channel path identifier (CHPID).

If the port type is SWITCH, then this is the link address for the switch port. The link address is one or two bytes (two or four hexadecimal digits), depending on what was defined in the I/O configuration. If a two-byte link address is displayed, the first byte is the switch address (domain) and the second byte is the port address (area). If a one-byte link address is displayed, the byte is the port address (area).

achpid
If the port type is SWITCH, the CHPID associated with this link. Otherwise, dashes appear in this field. If multiple CHPIDs are configured to the same exit switch port for the logical partition, a line will appear in the health check report for each online CHPID configured to this exit port.

capspeed1
The maximum capable speed in gigabits per second (Gbps) for the port on the first side of the link.

ptype2
The type of port on the second side of the link. If set to CU, then this represents the control unit side of the link in either a point-to-point or switched point-to-point configuration. If set to SWITCH, then this represents the entry switch port side of the channel link in a switched point-to-point configuration.

id2
If the port type is SWITCH, then this is the link address for the switch port. The link address is one or two bytes (two or four hexadecimal digits), depending on what was defined in the I/O configuration. If a two-byte link address is displayed, the first byte is the switch address (domain) and the second byte is the port address (area). If a one-byte link address is displayed, the byte is the port address (area).

If the port type is CU, then this is the interface id for the control unit port.

capspeed2
The maximum capable speed in Gbps for the port on the second side of the link.

opspeed
The current operating speed of both ports in the link, in Gbps.

System action: The system continues processing.

Operator response: Contact the system programmer.

System programmer response: See the system programmer response for message "IOSHC151E" on page 822 for more information.

Problem determination: None.

Source: Input/Output Supervisor (IOS)

Module: IOSHCPSP

Routing code: None.

Descriptor code: None.

Reference Documentation: None.

IOSHC155I No buffer credit exceptions have been detected.

Explanation: CHECK(IBMIOS,IOS_BUFFER_CREDITS) did not find any buffer credit exceptions for any FICON links.

System action: The system continues processing.

Operator response: None.

System programmer response: None.

Problem determination: None.

Source: Input/Output Supervisor (IOS)

Module: IOSHCBCR

Routing code: None.

Descriptor code: None.

Reference Documentation: None.

IOSHC156E Insufficient buffer credits were detected.

Explanation:

CHECK(IBMIOS,IOS_BUFFER_CREDITS) detected one or more FICON ports in a switched fabric with an insufficient number of buffer credits configured to handle the I/O traffic from its neighbor port. This is based on the operating speed and the distance between the two ports. If an insufficient number of buffer credits is configured, then I/O traffic will be delayed when the neighbor port runs out of buffer credits, resulting in higher I/O latency and reduced link bandwidth.

The number of required buffer credits is computed as:

$$\text{Buffer credits} = \textit{Link speed (Gbps)} \times \textit{Distance (km)} \div \textit{Average frame size (KB)} + 1$$

where:

Link speed
: The operating speed of the link, in gigabits per second (Gbps).

Distance
: The distance between the two ports, in kilometers (km).

Average frame size
: The average amount of data in a fibre channel frame, in kilobytes (KB). An average frame size of 1 is used in the calculation, which is adequate for most environments.

Example: If the link between the channel and entry switch port is operating at 16 Gbps and the distance between the two ports is 10 kilometers, the minimum number of buffer credits required for each is 161. If the configured number of credits for either the channel or the entry switch port is less than 161, an exception is reported.

System action: The system continues processing.

Operator response: Contact the system programmer.

System programmer response: Refer to the documentation for your FICON director to determine how to increase the number of buffer credits for the switch port.

Problem determination: None.

Source: Input/Output Supervisor (IOS)

Module: IOSHCBCR

Routing code: None.

Descriptor code: None.

Reference Documentation: None.

IOSHC157I Insufficient buffer credits were detected for the following link(s):
text

Explanation: In the message, *text* has the following format:

```
Problem Port:                                          Neighbor Port:
Port   Port Assoc Operating Estimated Actual   Required Port   Port
Type   Id   CHPID Speed     Distance  Credits  Credits  Type   Id
ptype1 id1  achp  opspeed   estdist   actcred  reqcred  ptype2 id2
```

CHECK(IBMIOS,IOS_BUFFER_CREDITS) detected one or more FICON ports in a switched fabric with an insufficient number of buffer credits configured to handle the I/O traffic from its neighbor port. This is based on the operating speed and the distance between the two ports. If an insufficient number of buffer credits is configured, then I/O traffic will be delayed when the neighbor port runs out of buffer credits, resulting in higher I/O latency and reduced link bandwidth.

The number of required buffer credits is computed as:

| Buffer credits = *Link speed (Gbps)* × *Distance (km)* ÷ *Average frame size (KB)* + 1

| where:

| *Link speed*
| The operating speed of the link, in gigabits per second (Gbps).

| *Distance*
| The distance between the two ports, in kilometers (km).

| *Average frame size*
| The average amount of data in a fibre channel frame, in kilobytes (KB). An average frame size of 1 is used in the calculation, which is adequate for most environments.

| **Example:** If the link between the channel and entry switch port is operating at 16 Gbps and the distance between the two ports is 10 kilometers, the minimum number of buffer credits required for each is 161. If the configured number of credits for either the channel or the entry switch port is less than 161, an exception is reported.

| In the message text:

| *ptype1*
| The port type for the problem port. That is, the port with an insufficient number of buffer credits configured. If set to CHPID, then this is the channel link and the channel port has insufficient buffer credits.

| If set to SWITCH and the neighbor port type is CHPID, then this is the channel link and the entry switch port has insufficient buffer credits configured. If the neighbor port type is CU, then this is the control unit link and the exit switch port has insufficient buffer credits configured.

| If set to CU, then this is the CU link and the control unit port has insufficient buffer credits configured.

| *id1*
| If the port type is CHPID, then this is the channel path identifier (CHPID).

| If the port type is SWITCH, then this is the link address for the switch port. The link address is one or two bytes (two or four hexadecimal digits), depending on what was defined in the I/O configuration. If a two byte link address is displayed, the first byte is the switch address (domain) and the second byte is the port address (area). If a one byte link address is displayed, the byte is the port address (area).

| If the port type is CU, then this is the interface id for the control unit port.

| *achpid*
| If the port type is SWITCH, then this is the CHPID associated with this link. Otherwise, dashes appear in this field. If multiple CHPIDs are configured to the same exit switch port for the logical partition, a line will appear in the health check report for each online CHPID configured to this exit port.

| *opspeed*
| The current operating speed of the link in gigabits per second (Gbps).

| *estdist*
| The estimated distance between the two ports in the link in kilometers.

| *actcred*
| The actual number of buffer credits configured for this port.

| *reqcred*
| The number of buffer credits required based on the current operating speed of the link and the distance.

| *ptype2*
| The port type for the neighbor port. That is, the port on the opposite side of the link of the port with an insufficient buffer credits configured. If set to CHPID, then this is the channel link and the channel port is the neighbor port.

| If set to SWITCH and the neighbor port type is CHPID, then this is the channel link and the entry switch port is the neighbor port. If the neighbor port type is CU, then this is the control unit link and the exit switch port is the neighbor port.

| If set to CU, then this is the CU link and the control unit port is the neighbor port.

| *id2*
| If the port type is CHPID, then this is the physical channel identifier (PCHID) of the CHPID.
|
| If the port type is SWITCH, then this is the link address for the switch port. The link address is one or two bytes (two or four hexadecimal digits), depending on what was defined in the I/O configuration. If a two byte link address is displayed, the first byte is the switch address (domain) and the second byte is the port address (area). If a one byte link address is displayed, the byte is the port address (area).
|
| If the port type is CU, this is the interface id for the control unit port.

| **System action:** The system continues processing.

| **Operator response:** Contact the system programmer.

| **System programmer response:** Refer to the documentation for your FICON director to determine how to increase the number of buffer credits for the switch port.

| **Problem determination:** None.

| **Source:** Input/Output Supervisor (IOS)

| **Module:** IOSHCBCR

| **Routing code:** None.

| **Descriptor code:** None.

| **Reference Documentation:** None.

Part 6. Updates for z/OS MVS System Management Facilities (SMF)

This part contains updates to the information in *z/OS MVS System Management Facilities (SMF)* (SA38-0667).

SMF record type 124 has been added.

Offsets		Name	Length	Format	Description
36	24	SMF121TS_CAT	8	EBCDIC	Thread category. Possible values are: APP APP-U1 APP-U2 APP-U3 APP-U4 APP-U5 SYS GC JIT OTHER RM Empty string (""), if not available
44	2C	SMF121TS_CPU	8	binary	Total CPU time, in nanoseconds. If not available, value is -1.
52	34	SMF121TS_NATIVEID	8	binary	Native OS thread ID. If not available, value is -1.

Record type 124 (7C) — I/O Supervisor (IOS) information

Record type 124 has the following subtypes:

Subtype 1 — Link diagnostic information

This record is written for each FICON channel, switch entry port, switch exit port, and control unit port that is accessible to z/OS. It contains information that can be used to diagnose I/O errors and performance issues that might be caused by fiber optic infrastructure issues or incorrect I/O configurations. Subtype 1 records are created at every link diagnostic monitoring interval, which is every 24 hours and consist of a single section:

Port section

Contains link diagnostic information for a particular port. This includes operational information related to the optics, such as transmit and receive power, current and capable operating speed, and error counters. There is one port section for every port connected to an online FICON channel that is accessible to z/OS. For example, if a FICON channel is connected through a switch to three control unit ports, then eight port sections will appear in the SMF record: one for the channel port, one for the entry switch port, one for each of the three exit switch ports, and one for each of the three control unit ports.

Macro to symbolically address the record: The SMF record mapping macro for all SMF 124 records is IOSDS124. The mapping macro resides in SYS1.MACLIB.

Record environment

The following conditions exist for the generation of this record:

Macro SMFWTM (record exit: IEFU83)

Mode Task

Storage residency

31-bit

Record mapping

Header/self-defining section

This section contains the common SMF record header fields and, if applicable, the triplet fields (offset/length/number) that locate the other sections on the record.

Offsets		Name	Length	Format	Description
0	0	SMF124RCL	2	binary	Record length. This field and the next field (total of four bytes) form the record descriptor word (RDW). See "Standard SMF record header" on page 176 for a detailed description.
2	2	SMF124SGD	2	binary	Segment descriptor (see record length field). This is zero, if the record is not spanned.
4	4	SMF124FLG	1	binary	System indicator flags: **Bit** **Meaning when set** **0** Subsystem identification follows system identification. **1** Subtypes are used. **2** Reserved. **3-6** Version indicators*. **7** Reserved. *See "Standard SMF record header" on page 176 for a detailed description.
5	5	SMF124RTY	1	binary	Record type 124 (X'7C').
6	6	SMF124TME	4	binary	Time since midnight, in hundredths of a second, when the record was moved into the SMF buffer.
10	A	SMF124DTE	4	packed	Date when the record was moved into the SMF buffer, in the form `0cyydddF`. See "Standard SMF record header" on page 176 for a detailed description.
14	E	SMF124SID	4	EBCDIC	System identification (from the SID parameter).
18	12	SMF124SSI	4	binary	Subsystem identification.
22	16	SMF124STY	2	binary	Record subtype: **Value** **Meaning** **1** Link diagnostic information
24	18	SMF124Hdr_Len	2	binary	Length of header.
26	1A	SMF124Hdr_TrplCnt	2	binary	Number of triplets in header.
28	1C	SMF124_Hdr_Flags	2	binary	Header flags.
30	1E	*	2	binary	Reserved.

The following fields are only included with subtype 1:

Offsets		Name	Length	Format	Description
32	20	SMF124S1_Port_Offset	4	binary	Offset to port section from start of record, including record descriptor word (RDW).
36	24	SMF124S1_Port_Len	2	binary	Length of port section.
38	26	SMF124S1_Port_Num	2	binary	Number of port sections.

Subtype 1

Port section

Offsets		Name	Length	Format	Description
0	0	SMF124S1_RetDate	4	packed	Date the link diagnostic information was retrieved, in the form *0cyydddF*.
4	4	SMF124S1_RetTime	4	binary	Time since midnight, in hundredths of a second, that the link diagnostic information was retrieved.
8	8	SMF124S1_WWPN	8	binary	World wide port name (WWPN) of the port.
16	10	SMF124S1_ReportSrc	1	binary	Reporting source: **Value (Name)** **Meaning** **1 (SMF124S1_ReportSrc_Monitor)** Periodic monitoring
17	11	SMF124S1_PortID	3	binary	Port identifier. The format depends on the port type (SMF124S1_PortType) and the identifier size (SMF124S1_IdSize) fields. See the following entries for the different mappings based on whether the port type is a channel port, switch port, or control unit port.
17	11	SMF124S1_CHPID	1	binary	For channel ports, the channel path identifier (CHPID) assigned to the port.
18	12	SMF124S1_PCHID	2	binary	For channel ports, the physical channel identifier (PCHID) assigned to the port.
17	11	SMF124S1_ID_LA2	2	binary	For entry and exit switch ports, the domain and area portions of the two-byte link address, if the identifier size (SMF124S1_IdSize) is 2.
17	11	SMF124S1_ID_LA1	1	binary	For entry and exit switch ports, the one-byte link address, if the identifier size (SMF124S1_IdSize) is 1.
17	11	SMF124S1_INTID	2	binary	For control unit ports, the control unit interface ID assigned to the port.
20	14	SMF124S1_PortType	1	binary	Port type: **Value (Name)** **Meaning** **1 (SMF124S1_PortType_Channel)** Channel port **2 (SMF124S1_PortType_EntrySwitch)** Entry switch port **3 (SMF124S1_PortType_ExitSwitch)** Exit switch port **4 (SMF124S1_PortType_CU)** Control unit port
21	15	SMF124S1_AssocCHPID	1	binary	The associated CHPID for switch and control unit ports.

Offsets		Name	Length	Format	Description
22	16	SMF124S1_Flag1	1	binary	Flag byte 1: **Bit (Name)** **Meaning when set** **0 (SMF124S1_ValSpeed)** Port speed information is valid. **1 (SMF124S1_ValSFPDP)** SFP diagnostic parameters are valid. **2 (SMF124S1_ValBuff)** Buffer credit information is valid. **3 (SMF124S1_ValLESB)** Link error status block (LESB) information is valid. **4 (SMF124S1_ValFEC)** Forward error correction (FEC) information is valid. **5 (*)** Reserved. **6-7 (SMF124S1_IdSize)** Port identifier size (1, 2 or 3).
23	17	SMF124S1_Flag2	1	binary	Flag byte 2: **Bit (Name)** **Meaning when set** **0 (SMF124S1_ValThresh_Temp)** Temperature threshold values are valid. **1 (SMF124S1_ValThresh_Voltage)** Voltage threshold values are valid. **2 (SMF124S1_ValThresh_TxBias)** Transmitter laser bias current (Tx bias) threshold values are valid. **3 (SMF124S1_ValThresh_TxPower)** Optical transmit power (Tx) threshold values are valid. **4 (SMF124S1_ValThresh_RxPower)** Optical receive power (Rx) threshold values are valid. **5-7 (*)** Reserved.

Offsets		Name	Length	Format	Description
24	18	SMF124S1_Flag3	1	binary	Flag byte 3: **Bit (Name)** **Meaning when set** **0 (SMF124S1_OpSpeedUnknown)** The operating speed is not known to the port. **1 (SMF124S1_OpSpeedUnRecog)** The operating speed is not recognized by z/OS. **2 (SMF124S1_OpSpeedNotEst)** The operating speed has not been established by the port. **3 (SMF124S1_CapSpeedUnknown)** The capable speed is not known to the port. **4 (SMF124S1_CapSpeedUnRecog)** The capable speed is not recognized by z/OS. **5 (SMF124S1_FECActive)** Forward error correction (FEC) is active for this link. (If bit is not set, FEC is not active or the state is unknown.) **6-7 (*)** Reserved.
25	19	SMF124S1_Flag4	1	binary	Flag 4: **Bit** **Meaning when set** **0-7** Reserved.
26	1A	SMF124S1_Flag5	1	binary	Flag 5: **Bit** **Meaning when set** **0-7** Reserved.
27	1B	SMF124S1_Flag6	1	binary	Flag 6: **Bit** **Meaning when set** **0-7** Reserved.
28	1C	SMF124S1_Flag7	1	binary	Flag 7: **Bit** **Meaning when set** **0-7** Reserved.
29	1D	SMF124S1_Flag8	1	binary	Flag 8: **Bit** **Meaning when set** **0-7** Reserved.
30	1E	SMF124S1_PortSpeed	4	binary	Port speed information. This information is valid if SMF124S1_ValSpeed is ON.
30	1E	SMF124S1_OperSpeed	2	binary	Current operating speed, in gigabits per second (Gbps). If zero, see operating speed flags in SMF124S1_Flag3 for more information.
32	20	SMF124S1_CapSpeed	2	binary	Maximum capable speed, in gigabytes per second (Gbps). If zero, see capable speed flags in SMF124S1_Flag3 for more information.

Offsets		Name	Length	Format	Description
34	22	SMF124S1_SFPDP	10	binary	Optical transceiver/small form-factor pluggable (SFP) diagnostic parameters. This information is valid if SMF124S1_ValSFPDP is ON.
34	22	SMF124S1_SFP_Temp	2	binary	Transceiver temperature. This field contains a signed, two's complement value in increments of 1/256 of a degree Celsius (C). The valid range is -128°C to 128°C (127.996°C).
36	24	SMF124S1_SFP_Voltage	2	binary	Voltage. The value is in units of 100 microvolts (µV). The valid range is 0 - 6.55 volts (V).
38	26	SMF124S1_SFP_TxBias	2	binary	Transmitter laser bias current (Tx bias). The value is in units of 2 microamps (µA). The valid range is 0 - 131 milliamps (mA).
40	28	SMF124S1_SFP_TxPower	2	binary	Transmit power (Tx). The value is in units of 0.1 microwatts (µW). The valid range is 0 - 6.5 milliwatts (mW).
42	2A	SMF124S1_SFP_RxPower	2	binary	Receive power (Rx). The value is in units of 0.1 microwatts (µW). The valid range is 0 - 6.5 milliwatts (mW).
44	2C	SMF124S1_BuffCred	16	binary	Buffer credit and distance information. This information is valid if SMF124S1_ValBuff is ON.
44	2C	SMF124S1_ThisPort_B2BCredit	4	binary	Number of buffer-to-buffer credits for this port.
48	30	SMF124S1_AttPort_B2BCredit	4	binary	Number of buffer-to-buffer credits for the attached port.
52	34	SMF124S1_RTT	4	binary	Round trip time from this port to the attached port, in nanoseconds. A value of zero means the round trip time is unknown.
56	38	SMF124S1_Est_Distance	4	binary	Estimated distance, in meters, based on the round trip time. A value of zero means the estimated distance is unknown.
60	3C	SMF124S1_ErrorInfo	40	binary	Error information. See the individual fields to determine how to check for validity.
60	3C	SMF124S1_LESB_LinkFailureCount	4	binary	Link failure count for this monitoring interval. This information is valid if SMF124S1_ValLESB is ON.
64	40	SMF124S1_LESB_LossOfSyncCount	4	binary	Loss-of-synchronization count for this monitoring interval. This information is valid if SMF124S1_ValLESB is ON.
68	44	SMF124S1_LESB_LossOfSignalCount	4	binary	Loss-of-signal count for this monitoring interval. This information is valid if SMF124S1_ValLESB is ON.
72	48	SMF124S1_LESB_PrimitiveSeqProtocol	4	binary	Count of primitive sequence protocol errors for this monitoring interval. This information is valid if SMF124S1_ValLESB is ON.
76	4C	SMF124S1_LESB_InvalidTransWord	4	binary	Count of invalid transmission words for this monitoring interval. This information is valid if SMF124S1_ValLESB is ON.
80	50	SMF124S1_LESB_InvalidCRCount	4	binary	Invalid CRC count for this monitoring interval. This information is valid if SMF124S1_ValLESB is ON.
84	54	SMF124S1_FEC_UnCorrected_Blks	4	binary	Number of FEC uncorrected blocks for this monitoring interval. This information is valid if SMF124S1_ValFEC is ON.
88	58	*	12	binary	Reserved.

Offsets		Name	Length	Format	Description
100	64	SMF124S1_Thresholds_Temp	8	binary	Transceiver temperature thresholds. Each field contains a signed, two's complement value in increments of 1/256 of a degree Celsius (C). The valid range is -128°C to 128°C (127.996°C). This information is valid SMF124S1_ValThresh_Temp is on.
100	64	SMF124S1_Threshold_Temp_HighAlarm	2	binary	High alarm threshold.
102	66	SMF124S1_Threshold_Temp_LowAlarm	2	binary	Low alarm threshold.
104	68	SMF124S1_Threshold_Temp_HighWarn	2	binary	High warning threshold.
106	6A	SMF124S1_Threshold_Temp_LowWarn	2	binary	Low warning threshold.
108	6C	SMF124S1_Thresholds_Voltage	8	binary	Voltage thresholds. Each field contains a value in units of 100 microvolts (µV). The valid range is 0 - 6.55 volts (V). This information is valid when SMF124S1_ValThresh_Voltage is ON.
108	6C	SMF124S1_Threshold_Voltage_HighAlarm	2	binary	High alarm threshold.
110	6E	SMF124S1_Threshold_Voltage_LowAlarm	2	binary	Low alarm threshold.
112	70	SMF124S1_Threshold_Voltage_HighWarn	2	binary	High warning threshold.
114	72	SMF124S1_Threshold_Voltage_LowWarn	2	binary	Low warning threshold.
116	74	SMF124S1_Thresholds_TxBias	8	binary	Transmitter laser bias current (Tx bias) thresholds. Each field contains a value in units of 2 microamps (µA). The valid range is 0 - 131 milliamps (mA). This information is valid when SMF124S1_ValThresh_Bias is ON.
116	74	SMF124S1_Threshold_TxBias_HighAlarm	2	binary	High alarm threshold.
118	76	SMF124S1_Threshold_TxBias_LowAlarm	2	binary	Low alarm threshold.
120	78	SMF124S1_Threshold_TxBias_HighWarn	2	binary	High warning threshold.
122	7A	SMF124S1_Threshold_TxBias_LowWarn	2	binary	Low warning threshold.
124	7C	SMF124S1_Thresholds_TxPower	8	binary	Tx power thresholds. Each field contains a value in units of 0.1 microwatts (µW). The valid range is 0 - 6.5 milliwatts (mW). This information is valid if SMF124S1_ValThresh_TxPower is ON.
124	7C	SMF124S1_Threshold_TxPower_HighAlarm	2	binary	High alarm threshold.
126	7E	SMF124S1_Threshold_TxPower_LowAlarm	2	binary	Low alarm threshold.
128	80	SMF124S1_Threshold_TxPower_HighWarn	2	binary	High warning threshold.
130	82	SMF124S1_Threshold_TxPower_LowWarn	2	binary	Low warning threshold.
132	84	SMF124S1_Thresholds_RxPower	8	binary	Rx power thresholds. Each field contains a value in units of 0.1 microwatts (µW). The valid range is 0 - 6.5 milliwatts (mW). This information is valid if SMF124S1_ValThresh_RxPower is ON.
132	84	SMF124S1_Threshold_RxPower_HighAlarm	2	binary	High alarm threshold.
134	86	SMF124S1_Threshold_RxPower_LowAlarm	2	binary	Low alarm threshold.
136	88	SMF124S1_Threshold_RxPower_HighWarn	2	binary	High warning threshold.
138	8A	SMF124S1_Threshold_RxPower_LowWarn	2	binary	Low warning threshold.
140	8C	*	116	binary	Reserved.

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