

z/OS  
Version 2 Release 4

*JES2 Small Environment and NOTIFY  
enhancements*



**Note**

Before using this information and the product it supports, read the information in [“Notices” on page 33.](#)

This edition applies to Version 2 Release 4 of z/OS (5650-ZOS) and to all subsequent releases and modifications until otherwise indicated in new editions.

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# About the JES2 Small environment and NOTIFY content solution enhancements

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## **Purpose of this information**

This information is a collection of all of the information that you need to understand and exploit privilege support on a system with limited available resources. Support for privileged space was added to JES2 in z/OS V2R3.

This information also documents updates to the NOTIFY JCL statement.

Some of the information in this content solution also exists elsewhere in the z/OS library.

## **Who should read this information**

This information is intended for system programmers who are responsible for the resolution of critical JES2 resource shortage conditions.

## **Related information**

To find the complete z/OS® library, go to [IBM Knowledge Center \(www.ibm.com/support/knowledgecenter/SSLTBW/welcome\)](http://www.ibm.com/support/knowledgecenter/SSLTBW/welcome).



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# Chapter 1. What is JES2 small environment?

JES2 small environment is an enhancement to JES2 privilege support for small installations with limited resource defined.



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## Chapter 2. Using JES2 Small environment

This topic contains documentation about JES2 privilege support with updates about using the JES2 small environment.

### Privilege support and the emergency subsystem

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Privilege support shows how to assist the system programmer in the resolution of critical JES2 resource shortage conditions. Before z/OS V2R3, the exhaustion of certain critical resources, such as spool space, could prevent such activities as TSO LOGONS, execution of diagnostic jobs and JES2 commands.

A certain amount of critical resource is reserved for privileged job (STC, TSU, JOB) consumption, if you use privilege support. This reserved resource can then be used by privileged jobs to diagnose and correct offending jobs. Privileged jobs enter the system by using an emergency subsystem.

A small percentage of SPOOL, jobs, output elements, and BERTs are set aside for privileged jobs. This assures enough resource to log on, perform analysis, submit jobs, and resolve the root cause of resource exhaustion. Privilege resources can only be used by privileged jobs, STCs, and TSO logons. It cannot be stressed enough that the sole purpose behind the emergency subsystem and privileged resource is to provide analysis and resolution of critical resource shortages. It is not meant for running high priority workloads.

The following resources are guarded with this privilege support:

- BERTs
- JQEs
- JOEs
- SPOOL/Tracks

Various aspects of privilege support are:

- By default, privilege support is activated if:
  - MAS is at checkpoint level z22.
  - All members are at V2R3.
  - On a per resource basis – enough free resource exists so that privilege activation does not cause shortage issues with non-privileged resources.
  - Resources are activated under Default environment rules. See [“Privilege resource activation rules” on page 5](#) for more information.
- With privilege support, there is no marking or pooling of resource. Instead, a checkpoint object is created to reserve resource for privilege use. This object has an entry for each managed resource and the reservation is simply a number that is enforced when free resource is handed out.
- Part of each managed resource is reserved for the privileged jobs by modifying the concept and interpretation of "free resource". The amount available for non-privileged jobs is simply total free minus the amount set aside for privileged. Once non-privileged jobs consume all non-privileged resource, they wait and a message is issued denoting a shortage situation exists. The highlighted message that is issued on one member within the MAS is:

```
$HASP1405 - Resource shortage encountered for <resource type>
```
- Each resource has a defined algorithm to determine whether privileged activation occurs and how much is to be reserved. This algorithm is run when privilege support first starts. JES2 periodically reruns the activation algorithm for any resource that did not qualify for activation (for example, amount of resource is too small for efficient management).

- Promotion logic allows non-privileged jobs to consume privileged resource when in a shortage situation and it is advantageous to do so. This is only done for non-privileged jobs that are exiting the system and return much needed resource. In other words, the job is marked for cancel and purge. This decision rests entirely with the privilege support. This type of promotion is used for both BERT and SPOOL usage. Use \$CJ,P to get rid of offending batch jobs and \$CS,P to cancel/purge STCs. Prior to z/OS 2.3, \$CS,P could not be used on STCs that are in execution. Now it can.
- At input processing, privilege support assures non-privileged jobs do not start when a shortage exists for JQEs, BERTs, job numbers, or SPOOL. This action assures privileged jobs always start since JQRB processors are not tied up waiting for unavailable resources.
- Special privilege PCEs are started if and when a SPOOL or JOE or both shortage occurs. For a SPOOL shortage, a conversion PCE is started. For a JOE shortage, an Output PCE is started. This assures that at least one of these PCEs is available for privilege use. When the shortage abates, the PCE is detached in a reasonable amount of time.
- If privilege JOBA submits JOBB and JOBB submits JOBC, then all are marked privileged. Privilege attribute is inherited.
- Non-privileged jobs are not selected for output processing or spin processing if a JOE shortage exists.
- Privilege count management logic is error tolerant (accuracy not necessary) and always a bias towards privileged. When non-privileged resource is returned, privilege counts are replenished first, if required.
- From a JES2 buffer perspective, privileged jobs receive special consideration. Extra buffer usage is allowed when a job is privileged or if a job is being purged during a SPOOL shortage.
- \$T LIMITS,PRIV=ON/OFF can be used to explicitly turn privilege support on or off for all resources. For more information about the \$T LIMITS command, see [\\$T LIMITS - Set the privilege](#).

## Default versus small environment

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Privileged support runs under one of two environments:

### Default environment

By default, this mode is activated when all preconditions are satisfied. Use this mode for large installations that might require several privileged jobs to run when a resource shortage occurs. Activation rules require more free resource than is required for small environment. Privileged resource reservation is also larger.

### Small environment

Use this environment for small installations with limited resource that is defined. Also, when a shortage occurs, only a few privileged jobs are allowed to diagnose and correct the situation. At the most, 10 privileged jobs can be started at once within the MAS when using the small environment.

This mode requires you to take action. The Default environment must be turned off with the \$TLIMITS command. For example:

```
-          $tlimits,priv=off
          $HASP1402 Privilege Resource Support ended
          $HASP1490 LIMITS(1)
LIMITS(1)
PRIVILEGE SUPPORT IS OFF
.
.
.
```

*Figure 1. Sample Default environment turned off using \$TLIMITS*

Then, turn on small environment with the \$TLIMITS command. For Example:

```

-          $tlimits,priv=on,smallenv=on
          $HASP1401 Privilege Resource Support activated for -- BERTs.
          $HASP1401 Privilege Resource Support activated for -- JOEs.
          $HASP1401 Privilege Resource Support activated for -- SPOOL/Tracks.
          $HASP1401 Privilege Resource Support activated for -- JQEs.
          $HASP1490 LIMITS(1)

LIMITS(1)
PRIVILEGE SUPPORT IS ON,SMALL ENVIRONMENT IS ON
.
.
.

```

Figure 2. Sample Small environment turned on using \$TLIMITS

The \$DLIMITS command can be used to determine which environment is active. Both environments share all of the privileged capabilities as described.

## Privilege resource activation rules

Privilege support determines whether support for a resource is activated or not. The decision is always based on the number of free elements at the time when the resource is to be activated. This decision differs for default versus small environment. The amount of resource that is reserved also differs for both environments. All resources have a maximum (MAX) number that can be reserved for privileged users. See “Privilege resource activation rules” on page 5, Table 1 on page 5, for information about activation rules for each resource.

*Table 1. Default environment resource activation and reservation rules*

Resource	Free required to activate	Number reserved for privilege	MAX
BERTs	20,000	1% of free	756
JOEs	20,000	1% of free	600
JQEs	10,000	1% of free	300
SPOOL(TGs)	20,000 TGs	400 TGs	400

**Note:** TG is track group.

*Table 2. Small environment resource activation and reservation rules*

Resource	Free required to activate	Number reserved for privilege	MAX
BERTs	1,200	150	150
JOEs	600	60	60
JQEs	100	10	10
SPOOL(TGs)	380**	45 TGs per MAS member	32*45

\*\* Also required for activating SPOOL small environment: If the product of (45 TGs times number of MAS members) exceeds 12.5 % of total free TGs -- then activation cannot occur and \$HASP1403 message is issued.

When a resource is activated, the following message is issued:

```
$HASP1401 - Privilege Resource Support activated for <resource type>
```

If a resource cannot be activated, then the following message is issued:

```
$HASP1403 - Privilege Resource Support could not be activated for <resource type>
```

\$D LIMITS command can be used to display resource limits, usage, and shortage status. This includes an indication if privileged support is activated for the resource, default or small environment active, whether there is a resource shortage, the amount of privileged resource that is reserved left for privileged use. The example below shows output for JQEs by using the \$D LIMITS(JQE) command.

The following display illustrates DEFAULT environment JQE privileged status:

```
-          $dlimits(JQE)
          $HASP1490 LIMITS(JQE)
LIMITS(JQE)
PRIVILEGE SUPPORT IS ON
JQE PRIVILEGE SUPPORT IS ON
JQE UTILIZATION ON 10 FEB 2018 AT 13:18:35
----- NON-PRIVILEGED -----|----- PRIVILEGED --
      MAXIMUM  WARN%  IN-USE  %|  MAX  AVAILABLE
      10,891    80      15    0|  109    109
JQE EXHAUST: 26 FEB 2018 AT 15:29
*****
```

Figure 3. Sample DEFAULT environment JQE privileged status

**Note:** The display indicates privileged support is ON, and 109 JQEs are reserved for privileged jobs. Currently, there is no JQE shortage.

## Default and small environment SPOOL reservation differences

This section contains information about the privilege SPOOL reservation scheme for the default versus the small environment mode.

Available and allocated SPOOL space is tracked in the JES2 checkpoint by using the master track group map. Each member has a cache of TGs (track groups) which might be handed out to requesting jobs. This cache is called the BLOB and has capacity of 1024 TGs. As SPOOL is consumed, the BLOB is replenished from the master track group map. When jobs are purged, TGs are handed back to the master track group map.

In default environment, a shortage is signaled when the number of TGs left in the master track group map falls below 400 TGs. This assures hundreds of TGs exist within the BLOB of each member. This assures adequate SPOOL for several privileged jobs.

For small environment, there is a minimal number of TGs. The algorithm that is used reserves approximately 45 TGs in the BLOB of each MAS member (cache). The master track group map is empty at the time of the shortage. The 45 TGs per member allow approximately 10 privileged jobs on any one member at a time.

## Reset rules for privileged resources

JES2 privileged support runs in either the default or small environment. Default environment is designed for large operations with substantial defined resource. Small environment is designed for small installations with limited defined resource.

### Reset rules for Default environment

The following scenarios all assume that there is no shortage.

- Defined resource is increased. (For example, the \$TJOBDEF,JOBNUM= command is issued to increase defined JQEs.) Therefore, the added resource is considered free and one percent of the additional resource is added to existing privileged reserve up to the MAX value for that resource. Also, see [“Privilege resource activation rules” on page 5.](#)

The following message is issued:

```
$HASP1404 - Privileged Resource Support has been updated for <resource type>.
```

- Defined resource is decreased. (For example, the \$PSPL command is issued to drain a spool volume.) In this scenario, the privileged reserve could stay the same or be adjusted up or down depending on the amount of free resource after the decrease is made. The modified reserved will be set to one percent of total free. An HASP1404 message is issued to indicate a potential adjustment of the decreased resource.

In some cases, privilege support is deactivated if the reduction is drastic. The reason might be as follows:

- Number of defined TGs for SPOOL is set to 10,000 or less.
- Number of defined BERTs is set to 3200 or less.
- If after the modification one percent of free becomes 0.

If a resource is deactivated, the following message is issued:

```
$HASP1409 - Defined resource reduction has ended Privilege Support for <resource type>.
```

- Defined resource does not change but free resource does. A resource can have less than the maximum reserved. This depends on the amount of free resource at the time of activation. If more resource is freed by purging work from the system, then JES2 periodically checks to see whether there is enough free resource to allow the increase of the privileged reserve. If one percent of current free resource is greater than current privileged reserve, then the reserve is updated with that number. Reserved resource only increase and never decrease in this reset scenario. No message is produced if the reserve is increased.

### Reset rules for Small environment

The following scenarios all assume that there is no shortage.

- Defined resource is increased. (For example, the \$TJOBDEF,JOBNUM= command is issued to increase defined JQEs.)

For JQEs, JOEs, BERTs, or SPOOL an increase in defined has no effect on the amount that is reserved for privileged jobs.

- Defined resource is decreased. (For example, the \$PSPL command is issued to drain a spool volume.)

The BERT support is deactivated if the number of defined BERTs is set to 1500 or less. For the other resources, they are deactivated if defined is reduced to current privileged reserved. If a resource is deactivated, the following message is issued.

```
$HASP1409 - Defined resource reduction has ended Privilege Support
for <resource type>
```

- If MAS members are added or removed, the only resource that is affected is SPOOL.

45 TGs per member are reserved if the total reserved does not exceed 12.5% of the total free for the MAS. When a member is added, an attempt is made to reserve 45 TGs for that member. If this is not possible, then the support is periodically retried to reserve 45 TGs.

If a MAS member is removed, then the TGs reserved for that member go back to non-privileged free pool.

- Defined resource does not change but free resource does. Only the amount that is reserved for SPOOL might possibly change. If the 45 TGs reserved per member are not met, then the additional free might now allow this pending reservation.

## Resource shortage

A resource shortage is encountered when total free resource minus the privileged reserve free is zero or less. Then, the following message is issued.

```
$HASP1405 - Resource shortage encountered for <resource type>
```

Any non-privileged job that requires resource waits unless privilege support decides to temporarily promote the job (for example, the \$CJ,P command causes a temporary promotion to allow the job to purge). When a shortage occurs, any privileged jobs in the system continue to run and consume privileged resources when needed. TSO users can sign on through the emergency subsystem to become a privileged user. When the resource shortage is resolved, the following message is issued.

```
$HASP1406 - Resource shortage resolved for <resource type>
```

When a resource shortage is encountered, the \$DLIMITS command might be used to determine how much privileged resource is left. For example, consider the \$DLIMITS performed on a two member MAS.

The following display illustrates remaining privileged resource amount:

```
$dlimits(spool)
$HASP1490 LIMITS(SPOOL)
LIMITS(SPOOL)
PRIVILEGE SUPPORT IS ON, SMALL ENVIRONMENT IS ON
SPOOL PRIVILEGE SUPPORT IS ON
SPOOL UTILIZATION ON 27 FEB 2018 AT 14:22:10
----- NON-PRIVILEGED -----|---- PRIVILEGED --
      MAXIMUM  WARN%  IN-USE  %|  MAX  AVAILABLE
      1,708      80      1,709 100|   90      86
SPOOL EXHAUST: 28 FEB 2018 AT 21:18
RESOURCE SHORTAGE REPORTED FOR SPOOL
NON-PRIVILEGE RESOURCE EXHAUSTED FOR SPOOL
```

Figure 4. Remaining privileged resource amount

The display also illustrates the following:

- Small environment is on for SPOOL.
- SPOOL resource shortage is reported.
- Total of 90 privileged TGs (45 per member) were reserved for SPOOL.
- Privileged jobs have consumed 4 of the 90 TGs so far.

## Emergency subsystem

The goal is to make a normal systems management environment available when there is a JES2 resource shortage. Therefore, TSO users, started tasks, and batch jobs that are identified as privileged might use privileged resources.

The emergency subsystem is just another portal into the subsystem and is identified by the ESUBSYS keyword on the MASDEF statement. This keyword can identify a static subsystem (SUBSYS statement in IEFSSNxx) or if not defined JES2 dynamically adds one. The emergency subsystem uses the exact same code as the main JES2 subsystem, it is just a separate subsystem name that is used to allow the entry of privileged jobs. No special commands, setup, or additional management is required. A SAF security check call protects who can use the emergency subsystem.

The default name is HASP for the emergency subsystem, and if there is already a subsystem that is named HASP that is in use, the default is HASA. If that is already in use, the default is HASB and so on. The MASDEF initialization statement can be used to specify a different value. Secondary JES2 subsystems also have an emergency subsystem.

TSO support allows logon to the secondary subsystem. Also, there is support for TSO Submit command by using the SUBSYS parameter. This allows submission to a secondary subsystem. The user must be authorized to submit jobs to the emergency subsystem. The authorization that is required is READ to RACF profile JES.EMERGENCY.<subsys> in the FACILITY class. <subsys> is the name of the emergency subsystem.

For more information about the SUBSYS keyword, see the SUBMIT and LOGON commands in [z/OS TSO/E Command Reference](#).





2 = JQE  
3 = JOE  
4 = BERT

- Wild card character “\*” indicates display all of the resource types that are monitored.
- Issue \$D LIMITS, without subscript or resource type, and all resource types are displayed.

### **resource\_type**

Specifies 1-5 character resource type names to display. The valid values are:

SPOOL: Spool space (track groups).  
JQE: Job Queue Element.  
JOE: Job Output Element.  
BERT: Block Extension Reuse Table.  
\*: Display all resource types monitored.

### **LONG**

Specifies whether an abbreviated list of characteristics is provided. An abbreviated display of characteristics is provided unless LONG is requested. LONG also displays the TOP 10 CONSUMERS OF *resource\_type* BY COUNT and the TOP 10 CONSUMERS OF *resource\_type* BY RATE. The abbreviated list includes the following characteristics:

- MAS member PRIVILEGE SUPPORT IS on/off
- NON-PRIVILEGED.
- PRIVILEGED.
- *Resource\_type* PRIVILEGE SUPPORT IS on/off.
- *Resource\_type* EXHAUST.
- RESOURCE SHORTAGE REPORTED FOR *resource\_type*.

### **Returned information:**

#### **PRIVILEGE SUPPORT IS on/off, SMALL ENVIRONMENT IS ON**

Indicates the status of privilege support for the MAS. ON indicates that privilege support is active on the MAS. OFF indicates that the privilege support is not available on this MAS. The individual resource types report if they have privilege support active or not.

ON might be followed by the phrase SMALL ENVIRONMENT IS ON. This indicates that the privilege support was requested to be turned on and to use the Small environment activation rules. See [Privilege support and the emergency subsystem](#) for more information.

#### **Resource\_type PRIVILEGE SUPPORT IS on/off**

Indicates the status of privilege support for this resource type. ON indicates that the privilege support is active for this resource type, and privileged users can acquire privileged resource for their jobs. OFF indicates that the privilege support is not available for this resource type so privileged jobs are only able to utilize non-privileged resources.

#### **Resource\_type UTILIZATION ON dd mmm yyyy AT hh:mm:ss**

Indicates when data is collected. Where,

*dd* is the day of the month.  
*mmm* is the 3 character month.  
*yyyy* is the year.  
*hh* is the hour in 24 hour clock.  
*mm* is the minute.  
*ss* is the second.

#### **NON-PRIVILEGED**

Displays the resource metrics for non-privileged space for this resource type. The metrics that are reported are:

**MAXIMUM**

The maximum number of this resource available in non-privileged space.

**WARN%**

The percentage of in-use resource in non-privileged space that the operator is alerted through by message \$HASP050 JES2 RESOURCE SHORTAGE.

**IN-USE**

The number of resources currently allocating in non-privileged space.

**%**

The percentage of in-use resource that is compared to the maximum resource that is available in non-privileged space.

**PRIVILEGED**

Displays the resource metrics for privileged space for this resource type. The metrics that are reported are:

**MAX**

The maximum number of this resource that is available in privileged space.

**AVAILABLE**

Indicates the number of resources that are available for privileged work. This number might initially be smaller than MAX when the non-privileged portion of a resource enters a shortage. This can be because not all members in a MAS are aware of the shortage at the same time, or if the SPOOL resource there might be track groups (TGs) used out of the BLOB before the shortage is detected. As resource is freed, it is added to the AVAILABLE count until it reaches MAX.

**EXHAUST: *dd mmm yyyy at hh:mm***

Indicates a projected date and time in the future when the specified resource type might become exhausted. Where,

*dd* is the day of the month.

*mmm* is the month of the year.

*yyyy* is the year.

*hh* is the hour.

*mm* is the minute of the day/month/year/hour/minutes of the projected date and time when the resource might become exhausted.

**RESOURCE SHORTAGE REPORTED FOR *resource\_type***

Indicates a resource shortage message, such as \$HASP050 JES2 RESOURCE SHORTAGE, has been issued for this resource type.

**NON-PRIVILEGED RESOURCE EXHAUSTED FOR *resource\_type***

Indicates that a resource shortage is detected for the non-privileged portion of this resource type. Only privileged work can acquire new allocations of this resource type until the shortage is relieved.

**TOP 10 CONSUMERS OF *resource\_type* BY COUNT**

Lists the top 10 batch jobs, STCs, or TSUs that consume this resource type. The list is sorted by the total number of that resource type allocated. Fields that are displayed:

- **JOBNAME:** The name of the job that is listed.
- **JOB ID:** The job identifier for the job that is listed.
- **TOTAL COUNT:** The total count of this resource type that is allocated by the listed job.
- **%:** The percentage of the in-use resources of this resource type that are allocated by the listed job.
- **COUNT PER M:** During the last time that the listed job was allocating this resource type, it was allocating this many per minute. The count per minute value does not consider the number of resources that are deallocated during the same period. If this job is executing on a JES2 member different than the one where the \$D LIMITS, LONG command was issued, this field displays "UNKNOWN". The field ACTIVE ON MBR indicates which JES2 member is executing that job. A \$D LIMITS, LONG command on that JES2 member displays the resource allocation rate of the job.
- **ACTIVE ON MBR:** For an executing job, it indicates on which MAS member the job is actively executing.

## TOP 10 CONSUMERS OF *resource\_type* BY RATE

Lists the top 10 batch jobs, STCs, or TSUs consuming this resource type. The list is sorted by the rate of allocation of that resource type. Fields that are displayed are:

- JOBNAME: The name of the job that is listed.
- JOB ID: The job identifier for the job that is listed.
- COUNT PER M: During the last time that the listed job was allocating this resource type, it was allocating this many per minute. The count per minute value does not consider the number of resources that are deallocated during the same period. If this job is executing on a JES2 member different than the one where the \$D LIMITS, LONG command was issued, this field displays "UNKNOWN". The field ACTIVE ON MBR indicates which JES2 member is executing that job. A \$D LIMITS, LONG command on that JES2 member displays the resource allocation rate of the job.
- TOTAL COUNT: The total count of this resource type that is allocated by the listed job.
- %: The percentage of the in-use resources of this resource type that are allocated by the listed job.
- ACTIVE ON MBR: For an executing job, it indicates on which MAS member the job is actively executing.

### Authority Required

This command requires display authority. The description of the \$T RDRnn command describes how to ensure that the authority of the appropriate MVS system command group is assigned.

This command also requires read security access authority. For a description of assigning command input authority, see *z/OS JES2 Initialization and Tuning Guide*.

### Processing considerations

There is some information that is not displayed for the \$D LIMITS, LONG output. For JQE UTILIZATION, the total number of jobs that are submitted by a specific job is not tracked over time. Only the rate of job submission over a time is recorded. Therefore, no TOP 10 CONSUMERS OF JQE BY COUNT table is presented. Likewise, no TOTAL COUNT or % information is provided in the TOP 10 CONSUMERS OF JQE BY RATE table. For BERT UTILIZATION, the rate of BERT usage is not tracked over time because BERTs can come and go each time a control block is returned to the checkpoint. Therefore, no TOP 10 CONSUMERS OF BERT BY RATE table is presented. Likewise, no COUNT PER M information is provided in the TOP 10 CONSUMERS OF BERT BY COUNT table.

The COUNT OF M column in the top 10 lists represents the rate of allocation of a resource. It does not consider the deallocation rate for the resource. Additionally, it reflects the rate of allocation of a resource only during periods of activity. If a job allocated resource at a rate of 7 resources per minute 20 minutes ago but did not request any more resource in the last 20 minutes, it still reports a COUNT PER M of 7. The information is reported this way so that the user understands that when the job is allocating resource that it might allocate at this reported rate. Knowing the workload represented by the job, the user can anticipate whether the job might contribute to a resource shortage soon.

The COUNT OF M information is only maintained for active jobs because they have the potential to allocate resources. Jobs that are past execution might still have a TOTAL COUNT of resource that is allocated but it reports a COUNT OF M of zero. Also, because the COUNT OF M information is associated with active jobs, it can only be displayed on the member where the job is executing. Other members can report that job in their top 10 by count table and provide the total count of resource that is allocated by the job, but they report a COUNT OF M value of "UNKNOWN" for the job. The field ACTIVE ON MBR indicates which JES2 member in the MAS is executing that job. A \$D LIMITS, LONG command must be issued on the JES2 member where the job is executing in order to see the COUNT OF M value for the job.

Initially the top 10 lists might be filled with STCs that become active during JES2 initialization. These jobs might have zero values for COUNT PER M or even TOTAL COUNT. They might remain in the top 10 tables for a time before jobs with ongoing resource activity take their place. A new job that becomes active that is not using resources (also has a COUNT OF M or TOTAL COUNT of zero) does not take the place of these early STCs because counts of zero do not contribute to resource shortages so no processing time is spent placing them in the tables.

The data that is used to provide the \$D LIMITS display is generated every 15 seconds from a checkpoint version. So information that is provided in the display lags behind activity on the system by 15-30 seconds.

## Scope

Single member. This command displays information about the member where the command is issued. The user must run the command on each member to receive a complete understanding of the active jobs in the entire MAS that are most affecting the resource utilization.

## Messages

The \$HASP1490 message displays the current values of all the parameters that are associated with the resource limits requested.

## Example

```

1 $d limits
      $HASP1490 LIMITS(1)
LIMITS(1)
PRIVILEGE SUPPORT IS ON
SPOOL PRIVILEGE SUPPORT IS OFF
SPOOL UTILIZATION ON 2 FEB 2018 AT 07:35:06
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
          525    80         33   6|    0    0
*****
      $HASP1490 LIMITS(2)
LIMITS(2)
PRIVILEGE SUPPORT IS ON
JQE PRIVILEGE SUPPORT IS OFF
JQE UTILIZATION ON 2 FEB 2018 AT 07:35:06
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
          500    80         13   3|    0    0
*****
      $HASP1490 LIMITS(3)
LIMITS(3)
PRIVILEGE SUPPORT IS ON
JOE PRIVILEGE SUPPORT IS OFF
JOE UTILIZATION ON 2 FEB 2018 AT 07:35:06
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
          200    80          8   4|    0    0
*****
      $HASP1490 LIMITS(4)
LIMITS(4)
PRIVILEGE SUPPORT IS ON
BERT PRIVILEGE SUPPORT IS OFF
BERT UTILIZATION ON 2 FEB 2018 AT 07:35:06
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
          500    80        154  31|    0    0
*****

```

JES2 displays the resource utilization information for all resource types that are tracked: SPOOL, JQE, JOE, and BERT. Information about non-privileged and privileged resources is presented.

```

2 $d limits(spool)
      $HASP1490 LIMITS(SPOOL)
LIMITS(SPOOL)
PRIVILEGE SUPPORT IS ON
SPOOL PRIVILEGE SUPPORT IS ON
SPOOL UTILIZATION ON 2 FEB 2018 AT
08:25:10
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      32,320    80         168   1|  400    400
SPOOL EXHAUST: 7 FEB 2018 AT 12:06
*****

```

JES2 displays the resource utilization information for SPOOL resources.

```

3
    $dlimits,long
    $HASP1490 LIMITS(1)
LIMITS(1)
PRIVILEGE SUPPORT IS ON
SPOOL PRIVILEGE SUPPORT IS ON
SPOOL UTILIZATION ON 2 FEB 2018 AT 09:45:15
----- NON-PRIVILEGED -----|----- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      32,320    80         171    1|  400    400
SPOOL EXHAUST: 7 FEB 2018 AT 08:12
-----
TOP 10 CONSUMERS OF SPOOL BY COUNT
      JOB NAME      JOB ID      TOTAL      COUNT      ACTIVE
      -----      -----      -----      -----      -----
      SUBJOBS      JOB00034      32      19      UNKNOWN      N1M3
      SYSLOG      STC00002      17      10      0.000      N1M1
      ZTTSETUP      STC00004      3       2      0.000
      SUBJBA1      JOB00037      3       2      0.000
      SUBJBA2      JOB00038      3       2      0.000
      SUBJBA3      JOB00039      3       2      0.000
      SUBJBA4      JOB00040      3       2      0.000
      SUBJBA5      JOB00041      3       2      0.000
      SUBJBA6      JOB00042      3       2      0.000
      SUBJBA7      JOB00043      3       2      0.000
-----
TOP 10 CONSUMERS OF SPOOL BY RATE
      JOB NAME      JOB ID      COUNT      TOTAL      ACTIVE
      -----      -----      -----      -----      -----
      $MASCOMM      STC00001      0.000      0       0
      SYSLOG      STC00002      0.000      17      10      N1M1
      IRRDPTAB      STC00003      0.000      2       1
      ZTTSETUP      STC00004      0.000      3       2
      ZFS          STC00005      0.000      2       1      N1M1
      INIT          STC00006      0.000      2       1      N1M1
      BPXAS         STC00009      0.000      2       1      N1M1
      INIT          STC00022      UNKNOWN      2       1      N1M2
      BPXAS         STC00010      0.000      2       1      N1M1
      BPXAS         STC00011      0.000      2       1      N1M1
*****
    $HASP1490 LIMITS(2)
LIMITS(2)
PRIVILEGE SUPPORT IS ON
JQE PRIVILEGE SUPPORT IS ON
JQE UTILIZATION ON 2 FEB 2018 AT 09:45:15
----- NON-PRIVILEGED -----|----- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      14,851    80         53     0|  149    149
JQE EXHAUST: 8 FEB 2018 AT 07:38
-----
TOP 10 CONSUMERS OF JQE BY RATE
      JOB NAME      JOB ID      COUNT      ACTIVE
      -----      -----      -----      -----
      SYSLOG      STC00002      0.000      N1M1
      ZFS          STC00005      0.000      N1M1
      INIT          STC00006      0.000      N1M1
      BPXAS         STC00009      0.000      N1M1
      INIT          STC00022      UNKNOWN      N1M2
      BPXAS         STC00010      0.000      N1M1
      BPXAS         STC00011      0.000      N1M1
      BPXAS         STC00012      0.000      N1M1
      BPXAS         STC00013      0.000      N1M1
      RACF          STC00014      0.000      N1M1
*****
    $HASP1490 LIMITS(3)
LIMITS(3)
PRIVILEGE SUPPORT IS ON
JOE PRIVILEGE SUPPORT IS OFF
JOE UTILIZATION ON 2 FEB 2018 AT 09:45:15
----- NON-PRIVILEGED -----|----- PRIVILEGED ---
      MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      200      80         24    12|  0     0
JOE EXHAUST: 5 FEB 2018 AT 17:40
-----
TOP 10 CONSUMERS OF JOE BY COUNT
      TOTAL      COUNT      ACTIVE

```

JOB NAME	JOB ID	COUNT	%	PER M	ON MBR
IRRDPTAB	STC00003	1	4	0.000	
ZTTSETUP	STC00004	1	4	0.000	
SUBJBA1	JOB00037	1	4	0.000	
SUBJBA2	JOB00038	1	4	0.000	
SUBJBA3	JOB00039	1	4	0.000	
SUBJBA4	JOB00040	1	4	0.000	
SUBJBA5	JOB00041	1	4	0.000	
SUBJBA6	JOB00042	1	4	0.000	
SUBJBA7	JOB00043	1	4	0.000	
SUBJBA8	JOB00044	1	4	0.000	

TOP 10 CONSUMERS OF JOE BY RATE

JOB NAME	JOB ID	COUNT PER M	TOTAL COUNT	%	ACTIVE ON MBR
\$MASCMM	STC00001	0.000	0	0	
SYSLOG	STC00002	0.000	0	0	N1M1
IRRDPTAB	STC00003	0.000	1	4	
ZTTSETUP	STC00004	0.000	1	4	
ZFS	STC00005	0.000	0	0	N1M1
INIT	STC00006	0.000	0	0	N1M1
BPXAS	STC00009	0.000	0	0	N1M1
INIT	STC00022	UNKNOWN	0	0	N1M2
BPXAS	STC00010	0.000	0	0	N1M1
BPXAS	STC00011	0.000	0	0	N1M1

\*\*\*\*\*

\$HASP1490 LIMITS(4)

LIMITS(4)

PRIVILEGE SUPPORT IS ON

BERT PRIVILEGE SUPPORT IS ON

BERT UTILIZATION ON 2 FEB 2018 AT 09:45:15

NON-PRIVILEGED				PRIVILEGED	
MAXIMUM	WARN%	IN-USE	%	MAX	AVAILABLE
20,092	80	186	1	408	408

BERT EXHAUST: 10 FEB 2018 AT 20:33

TOP 10 CONSUMERS OF BERT BY COUNT

JOB NAME	JOB ID	TOTAL COUNT	%	ACTIVE ON MBR
INIT	STC00015	2	1	N1M2
INIT	STC00016	2	1	N1M2
INIT	STC00017	2	1	N1M2
INIT	STC00018	2	1	N1M2
INIT	STC00019	2	1	N1M2
IBMUSER	TSU00033	2	1	N1M1
SUBJOBS	JOB00034	2	1	N1M3
TESTJOB	JOB00058	2	1	N1M2
SYSLOG	STC00002	1	1	N1M1
ZFS	STC00005	1	1	N1M1

\*\*\*\*\*

JES2 displays the resource utilization information for all resource types that are tracked: SPOOL, JOE, JOE, and BERT, from the viewpoint of member N1M1. Information about non-privileged and privileged resources is presented. It also displays the top 10 job lists that are maintained for each of the resource types.

4

\$dlimits(joe),long  
\$HASP1490 LIMITS(JOE)

LIMITS(JOE)

PRIVILEGE SUPPORT IS ON, SMALL ENVIRONMENT IS ON

JOE PRIVILEGE SUPPORT IS ON

JOE UTILIZATION ON 2 FEB 2018 AT 10:55:05

NON-PRIVILEGED				PRIVILEGED	
MAXIMUM	WARN%	IN-USE	%	MAX	AVAILABLE
140	80	8	6	60	60

TOP 10 CONSUMERS OF JOE BY COUNT

JOB NAME	JOB ID	TOTAL COUNT	%	COUNT PER M	ACTIVE ON MBR
ZTTSETUP	STC00004	1	12	0.000	
IRRDPTAB	STC00005	1	12	0.000	
BPXAS	STC00009	1	12	0.000	
BPXAS	STC00010	1	12	0.000	
BPXAS	STC00011	1	12	0.000	

BPXAS	STC00012	1	12	0.000	
BPXAS	STC00013	1	12	0.000	
\$MASCOMM	STC00001	0	0	0.000	
SYSLOG	STC00002	0	0	0.000	N1M1
ZFS	STC00003	0	0	0.000	N1M1
-----					
TOP 10 CONSUMERS OF JOE BY RATE					
JOB NAME	JOB ID	COUNT PER M	TOTAL COUNT	%	ACTIVE ON MBR
-----					
\$MASCOMM	STC00001	0.000	0	0	
SYSLOG	STC00002	0.000	0	0	N1M1
ZFS	STC00003	0.000	0	0	N1M1
ZTTSETUP	STC00004	0.000	1	12	
IRRDPTAB	STC00005	0.000	1	12	
INIT	STC00006	0.000	0	0	N1M1
BPXAS	STC00009	0.000	1	12	
\$JESNEWS	STC00008	0.000	0	0	
BPXAS	STC00010	0.000	1	12	
BPXAS	STC00011	0.000	1	12	
*****					

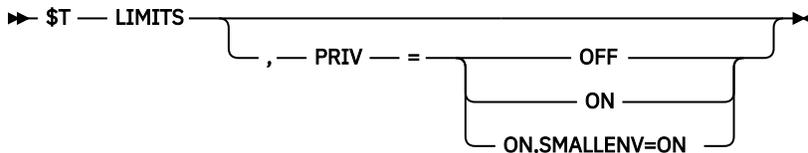
JES2 displays the resource utilization information for the JOE resource type. Information about non-privileged and privileged resources is presented. It also displays the top 10 job lists that are maintained for the JOE resource type.

## \$T LIMITS - Set the privilege support characteristics

### Function

Use the \$T LIMITS command to manage the use of privileged space.

### Syntax



### Parameters

#### PRIV={Off|On}

Indicates which state privilege support is set to. The values are:

#### OFF

Privilege support is turned off for all resource types. All resources are considered non-privileged.

#### ON

Privilege support is turned on for all resource types. Privilege space is set aside for each resource type.

#### ON,SMALLENV=ON

Privilege support is turned on for all resource types. Privilege space is set aside for each resource type, according to Small environment activation and reservation rules. See [Privilege support and the emergency subsystem](#).

### Authority Required

This command requires system authority. The description of the \$T RDRnn command explains how to ensure that the authority of the appropriate MVS system command group is assigned.

This command also requires **read** security access authority. For a description of assigning command input authority, see [z/OS JES2 Initialization and Tuning Guide](#).

## Programming considerations

Privilege support can only be turned on by using \$T LIMITS,PRIV=ON if the support is turned off by using \$T LIMITS,PRIV=OFF.

Privilege support cannot be turned on by using \$T LIMITS,PRIV=ON or off by using \$T LIMITS,PRIV=OFF if privilege support is suspended because of an error.

Privilege support cannot be turned on by using \$T LIMITS,PRIV=ON if all of the members of the MAS are not at release z/OS V2R3 or higher, or if the MAS is not at checkpoint level z22 or higher.

To activate privilege support using the Small environment activation and reservation rules, first turn off privilege support using \$T LIMITS,PRIV=OFF. Then, turn on privilege support requesting Small environment by using \$T LIMITS,PRIV=ON,SMALLENV=ON.

## Scope

**MAS-Wide.** This command has an effect across the entire MAS.

## Messages

The \$HASP1490 message displays the current values of all the parameters that are associated with the resource limits requested.

## Example

```
1) $t limits,priv=off
    $HASP1402 Privilege Resource Support ended
    $HASP1490 LIMITS(1)
LIMITS(1)
PRIVILEGE SUPPORT IS OFF
SPOOL PRIVILEGE SUPPORT IS OFF
SPOOL UTILIZATION ON 2 FEB 2018 AT 10:55:05
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
    MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      525     80         33   6|   0    0
*****
    $HASP1490 LIMITS(2)
LIMITS(2)
PRIVILEGE SUPPORT IS OFF
JQE PRIVILEGE SUPPORT IS OFF
JQE UTILIZATION ON 2 FEB 2018 AT 10:55:05
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
    MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      500     80         13   3|   0    0
*****
    $HASP1490 LIMITS(3)
LIMITS(3)
PRIVILEGE SUPPORT IS OFF
JOE PRIVILEGE SUPPORT IS OFF
JOE UTILIZATION ON 2 FEB 2018 AT 10:55:05
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
    MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      200     80          8   4|   0    0
*****
    $HASP1490 LIMITS(4)
LIMITS(4)
PRIVILEGE SUPPORT IS OFF
BERT PRIVILEGE SUPPORT IS OFF
BERT UTILIZATION ON 2 FEB 2018 AT 10:55:05
----- NON-PRIVILEGED -----|--- PRIVILEGED ---
    MAXIMUM  WARN%      IN-USE  %|  MAX  AVAILABLE
      500     80        139  28|   0    0
*****
```

JES2 indicates that privilege support is turned off.

```
2) $t limits,priv=on,smallenv=on
    $HASP1403 Privilege Resource Support could not be activated for BERTs.
    $HASP1401 Privilege Resource Support activated for -- JOEs.
    $HASP1401 Privilege Resource Support activated for -- SPOOL/Tracks.
```

\$HASP1401 Privilege Resource Support activated for -- JQEs.  
\$HASP1490 LIMITS(1)

LIMITS(1)  
PRIVILEGE SUPPORT IS ON, SMALL ENVIRONMENT IS ON  
SPOOL PRIVILEGE SUPPORT IS ON  
SPOOL UTILIZATION ON 2 FEB 2018 AT  
10:55:05

NON-PRIVILEGED				PRIVILEGED	
MAXIMUM	WARN%	IN-USE	%	MAX	AVAILABLE
480	80	33	7	45	45

\*\*\*\*\*  
\$HASP1490 LIMITS(2)

LIMITS(2)  
PRIVILEGE SUPPORT IS ON, SMALL ENVIRONMENT IS ON  
JQE PRIVILEGE SUPPORT IS ON  
JQE UTILIZATION ON 2 FEB 2018 AT 10:55:05

NON-PRIVILEGED				PRIVILEGED	
MAXIMUM	WARN%	IN-USE	%	MAX	AVAILABLE
490	80	13	3	10	10

\*\*\*\*\*  
\$HASP1490 LIMITS(3)

LIMITS(3)  
PRIVILEGE SUPPORT IS ON, SMALL ENVIRONMENT IS ON  
JOE PRIVILEGE SUPPORT IS ON  
JOE UTILIZATION ON 2 FEB 2018 AT 10:55:05

NON-PRIVILEGED				PRIVILEGED	
MAXIMUM	WARN%	IN-USE	%	MAX	AVAILABLE
140	80	8	6	60	60

\*\*\*\*\*  
\$HASP1490 LIMITS(4)

LIMITS(4)  
PRIVILEGE SUPPORT IS ON, SMALL ENVIRONMENT IS ON  
BERT PRIVILEGE SUPPORT IS OFF  
BERT UTILIZATION ON 2 FEB 2018 AT 10:55:05

NON-PRIVILEGED				PRIVILEGED	
MAXIMUM	WARN%	IN-USE	%	MAX	AVAILABLE
500	80	154	31	0	0

\*\*\*\*\*

JES2 indicates that privilege support is turned on and small environment is on.

# Chapter 4. JES2 Messages that were updated for JES2 small environment

## **\$HASP1110**

### **Explanation**

➤ **JOBGROUP** — *name* — **ILLEGAL JOBGROUP CARD** *reason* ➤

The message is displayed when JES2 detected an error on the **JOBGROUP** statement while parsing JCL statements. The problem encountered is identified by *reason*.

In the message text:

#### **JOBGROUP name**

The name of the affected job group.

*reason* is one of the following:

#### **Illegal jobgroup card - Multiple jobgroup/job cards detected**

Under normal conditions, multiple job/jobgroup statements are allowed. For example, they are allowed from an internal reader (a SUBMIT from ISPF EDIT). However, JES2 does not permit multiple job/jobgroup statements in the following situations:

- An NJE job stream from VM RSCS or from another JES2 node that uses /\*XMIT.
- Started jobs that use IEFJOBS support, where only one JOB card is permitted in the started member.

#### **operand field does not terminate in comma or blank**

Operand field must terminate with a comma or blank.

#### **name field contains invalid characters**

Name field contains invalid characters.

#### **could not obtain a ZJC from the CPOOL**

Could not obtain a ZJC from the cell pool. This is virtual storage capacity issue.

#### **cccccccccccc card not valid within JOBGROUP**

Card denoted by ccccccccccc is not valid within **JOBGROUP**.

#### **value of USER= exceeds 8 characters**

The specified keyword has a value longer than the maximum allowed for the keyword.

#### **value of USER=parameter is not valid**

The value provided for the specified keyword is not valid.

#### **value of GROUP= exceeds 8 characters**

The specified keyword has a value longer than the maximum allowed for the keyword.

#### **value of GROUP= parameter is not valid**

The value provided for the specified keyword is not valid.

#### **value of PASSWORD= has too many operands**

Value of **PASSWORD** has too many operands.

#### **value of TYPE= must be SCAN**

The value provided for the specified keyword must be **SCAN**.

#### **value of HOLD= must be NO or YES**

The value provided for the specified keyword must be **NO** or **YES**.

#### **value of ONERROR must be STOP, SUSPEND, or FLUSH**

The value provided for the specified keyword must be **STOP**, **SUSPEND**, or **FLUSH**.

#### **value of SYSAFF= parameter is not valid**

The value provided for the specified keyword is not valid.

#### **SYSTEM and SYSAFF cannot both be specified**

**SYSTEM=** and **SYSAFF=** are mutually exclusive keywords.

#### **SYSTEM specified more than once**

**SYSTEM** has been specified more than once.

#### **value of SYSTEM= parameter is not valid**

The value provided for the specified keyword is not valid.

#### **SYSTEM= names JGLOBAL and JLOCAL are ignored**

**JGLOBAL** and **JLOCAL** are used in a JES3 environment. They are tolerated in a JES2 environment but provide no function. This situation results in one of the following:

- The message ID and the reason text are the only text written.
- The message appears only in the JESYSMSG data set.
- The condition is treated as a warning, not an error.

#### **SYSTEM of -ANY not valid**

It is not valid to remove all members from **SYSAFF** by using **"-ANY"**.

#### **SYSTEM invalid begins with "-" on second or later value**

**"-"** is allowed only before the first system name.

**value of SECLABEL= exceeds 8 characters**

The specified keyword has a value longer than the maximum allowed for the keyword.

**value of SCHENV= is too long**

The specified keyword has a value longer than the maximum allowed for the keyword.

**SCHENV already set**

SCHENV has been specified more than once.

**SCHENV parameter is missing**

The SCHENV parameter was specified without a value. A value must be provided if the keyword is provided.

**duplicate keyword - ccccccc**

Duplicate keyword – ccccccc not allowed on JOBGROUP card.

**unknown keyword**

Unknown keyword – unknown keyword found on JOBGROUP card.

**ERROR= operator not valid**

An invalid operator specified for ERROR=. Valid operators are -, !, NOT, >, GT, <, LT, ->, !>, NG, -<, !<, NL, =, EQ, -=, !=, NE, >=, GE, <=, LE, &, AND, | and OR.

**ERROR= dependency ccccccc and dddddddd not found**

CCCCCCCC and dddddddd are job names which denote a dependency in error.

**ERROR= dependency ccccccc and dddddddd invalid**

CCCCCCCC and dddddddd are job names which denote a dependency in error.

**ERROR= invalid character**

Invalid character found.

**ERROR= has exceeded its limit**

RPN (Reverse Polish Notation) list is full. The ERROR= parameter has exceeded its limit. Reduce the parameter size and resubmit the JOBGROUP.

**ERROR= is too complex**

Internal operator stack is full. The ERROR= parameter is too complex. Reduce the complexity and resubmit the JOBGROUP.

**ERROR= only ( or blank allowed before NOT**

Only ( or blank allowed before NOT.

**ERROR= operator not within valid context**

Operator not used within a valid context. Check operator use in relation to RUN, RC, ABENDCC, or ABEND.

**ERROR= character before/after operator is not valid**

Invalid character preceding or following a textual operator. Valid textual operators are NOT, GT, LT, NG, NL, EQ, NE, GE, and LE. All these operators must be preceded with a blank or "( ". The

character following the operator must be a blank or "( ".

**ERROR= ABEND/RUN only supports logical operators**

ABEND and RUN only support logical operators AND(&) or OR(|).

**ERROR= must start with (**

ERROR= must start with '( '.

**ERROR= ABENDCC, ABEND, RC, or RUN within invalid context**

ABENDCC, ABEND, RC, or RUN is not contained within a valid context.

**ERROR= ABENDCC code contains too many digits**

ABENDCC code contains too many digits.

**ERROR= expression ended unexpectedly**

Statement is incomplete.

**ERROR= misplaced AND or OR**

Misplaced logical operator.

**ERROR= ABENDCC operand within invalid context**

Context surrounding ABENDCC is invalid.

**ERROR= operator is missing**

Missing operator.

**ERROR= ABENDCC code must start with U or S**

ABENDCC code must start with U (user) or S (system) abend code.

**ERROR= last 3 chars of ABENDCC sys code must be HEX**

Last three characters of ABENDCC system code must be hexadecimal.

**ERROR= last 4 chars of ABENDCC user code must be DEC**

Last four characters of ABENDCC user code must be decimal.

**ERROR= mismatched parenthesis**

Unequal number of left and right parenthesis.

**ERROR= mismatched left parenthesis**

Misplaced left parenthesis.

**ERROR= RC, ABEND, ABENDCC, or RUN required**

At least one -- RC, ABEND, ABENDCC, or RUN is required.

**ERROR= RC integer cannot be greater than 4095**

RC value must fall within the 0-4095 range.

**ERROR= user abend code cannot be larger than 4095**

ABENDCC user code cannot be larger than 4095.

**ERROR= only 4 digits allowed for RC value**

Only 4 digits allowed for RC integer.

**ERROR= ABENDCC missing equal operator**

ABENDCC requires (EQ or =) operator. ABENDCC only supports the equal operator.

**ERROR= expression is empty**

Empty expression is not allowed.

**ERROR= ABEND does not support integer**

ABEND does not support integer.

**ERROR= ABENDCC or RC is incomplete**

ABENDCC or RC is incomplete.

**ERROR= AND or OR must be not preceded by "("**

Logical operators AND, &, or OR, |, must not be preceded by "(".

**ERROR= AND or OR must not be followed by ")"**

Logical operators AND, &, or OR, |, must not be followed by ")".

**ERROR= RUN does not support integer**

RUN does not support integer.

**ERROR= SECERR not supported**

SECERR not supported.

**ERROR= JCLERR not supported**

JCLERR not supported.

**unable to map EMAIL to USER**

System cannot map email address provided on EMAIL= keyword to a user identifier.

**System action**

The message is written to the JESYSMSG data set. The job group is queued for output processing.

**Operator response**

None.

**Programmer response**

See [z/OS MVS JCL Reference](#) for information about coding JOBGROUP statements. Correct the JOBGROUP statement and resubmit the job group.

**Module**

HASCS RIP

**Routing Code:** N/A

**Descriptor Code:** N/A

---

**\$HASP1112****Explanation**

The message is displayed when JES2 detected an error on the BEFORE or AFTER statement while parsing JCL statements. The problem encountered is identified by keyword and *reason*.

In the message text:

**JOBGROUP name**

The name of the affected job group.

Keyword and *reason* are one of the following:

**operand field does not terminate in comma or blank**

Operand field must terminate with a comma or blank.

**NAME= is required for BEFORE and AFTER**

Name keyword is required for both BEFORE and AFTER statements.

**NAME= requires at least one parameter**

At least one job must be specified.

**NAME= parameter must not be blank**

NAME= parameter must not be blank.

**NAME= supports up to 10 names**

More than 10 names have been specified.

**NAME= duplicate dependency between cccccccc dddddddd**

Specified name created a duplicate dependency. The cccccccc and dddddddd identify the jobs which comprise the duplicate dependency.

**NAME= circular dependency between cccccccc dddddddd**

Specified name created a circular dependency. The cccccccc and dddddddd identify the jobs which comprise a circular dependency.

**previous card must be GJOB or JOBSET**

BEFORE and AFTER statements must follow a GJOB or a JOBSET statement. Multiple BEFORE and AFTER statements may be grouped together.

**previous GJOB or JOBSET statement was invalid**

Previous GJOB or JOBSET statement was invalid.

**not within a valid JOBGROUP context**

BEFORE or AFTER statement not used within valid job group context.

**must immediately follow JOBSET**

BEFORE or AFTER statement must immediately follow JOBSET statement. No intervening SJOB statements are allowed.

**could not obtain ZOD work area**

During processing JES2 could not obtain work area. This is due to insufficient 64 bit storage.

**could not obtain a ZDB from the CPOOL**

During processing JES2 could not obtain a ZDB from CPOOL. This is due to insufficient 64 bit storage.

**WHEN= operator not valid**

An invalid operator specified for WHEN=. Valid operators are ¬, !, NOT, >, GT, <, LT, ¬>, !>, NG, ¬<, !<, NL, =, EQ, ¬=, !=, NE, >=, GE, <=, LE, &, AND, | and OR.

**WHEN= dependency ccccccc and dddddddd not found**

CCCCCCCC and dddddddd are job names which denote a dependency.

**WHEN= dependency ccccccc and dddddddd invalid**

CCCCCCCC and dddddddd are job names which denote a dependency.

**WHEN= invalid character**

Invalid character found.

**WHEN= has exceeded its limit**

RPN (Reverse Polish Notation) list is full. The WHEN= parameter has exceeded its limit. Reduce the parameter size and resubmit the job group.

**WHEN= is too complex**

Internal operator stack is full. The WHEN= parameter is too complex. Reduce the complexity and resubmit the job group.

**WHEN= only ( or blank allowed before NOT**

Only ( or blank allowed before NOT.

**WHEN= operator not within valid context**

Operator not used within a valid context. Check operator use in relation to RUN, RC, ABENDCC, or ABEND.

**WHEN= character before/after operator is not valid**

Invalid character preceding or following a textual operator. Valid textual operators are NOT, GT, LT, NG, NL, EQ, NE, GE, and LE. All these operators must be preceded with a blank or (. The character after the operator must be a blank or (.

**WHEN= ABEND/RUN only supports logical operators**

ABEND and RUN only support logical operators AND(&) or OR(|).

**WHEN= must start with (**

WHEN= must start with '('.

**WHEN= ABENDCC, ABEND, RC or RUN not specified or context was invalid.**

ABENDCC, ABEND, RC, or RUN not specified or context was invalid.

**WHEN= ABENDCC code contains too many digits**

ABENDCC code contains too many digits.

**WHEN= expression ended unexpectedly**

Statement is incomplete.

**WHEN= misplaced AND or OR**

Misplaced logical operator.

**WHEN= ABENDCC operand within invalid context**

Context surrounding ABENDCC is invalid.

**WHEN= operator is missing**

Missing operator.

**WHEN= ABENDCC code must start with U or S**

ABENDCC code must start with U (user) or S (system) abend code.

**WHEN= last 3 chars of ABENDCC sys code must be HEX**

Last three characters of ABENDCC system code must be hexadecimal.

**WHEN= last 4 chars of ABENDCC user code must be DEC**

Last four characters of ABENDCC user code must be decimal.

**WHEN= mismatched parenthesis**

Unequal number of left and right parenthesis.

**WHEN= mismatched left parenthesis**

Misplaced left parenthesis.

**WHEN= RC, ABEND, ABENDCC, or RUN required**

At least one -- RC, ABEND, ABENDCC, or RUN is required.

**WHEN= RC integer cannot be greater than 4095**

RC value must fall within the 0-4095 range.

**WHEN= user abend code cannot be larger than 4095**

ABENDCC user code cannot be larger than 4095.

**WHEN= only 4 digits allowed for RC value**

Only 4 digits allowed for RC integer.

**WHEN= ABENDCC missing equal operator**

ABENDCC requires (EQ or =) operator. ABENDCC only supports the equal operator.

**WHEN= expression is empty**

Empty expression is not allowed.

**WHEN= ABEND does not support integer**

ABEND does not support integer.

**WHEN= ABENDCC or RC is incomplete**

ABENDCC or RC is incomplete.

**WHEN= AND or OR must be not preceded by "("**

Logical operators AND, &, or OR, |, must not be preceded by "(".

**WHEN= AND or OR must not be followed by ")"**

Logical operators AND, &, or OR, |, must not be followed by ")".

**WHEN= RUN does not support integer**

RUN does not support integer.

**ERROR= SECERR not supported**

WHEN = SECERR not supported.

**ERROR= JCLERR not supported**

WHEN = JCLERR not supported.

**ACTION= must be SATISFY, FLUSH, or FAIL**

Only valid parameters for ACTION= are SATISFY, FLUSH, or FAIL.

**ACTION= dependency between ccccccc dddddddd not found**

Dependency specified by jobs ccccccc and dddddddd is not found.

**ACTION= dependency between ccccccc ddddddd is not valid**

Dependency specified by jobs ccccccc and ddddddd is not valid.

**OTHERWISE= dependency between ccccccc ddddddd is not valid**

Dependency specified by jobs ccccccc and ddddddd is not valid.

**OTHERWISE= must be FLUSH, FAIL or SATISFY**  
OTHERWISE= must be FLUSH, FAIL or SATISFY.

**OTHERWISE= dependency ccccccc ddddddd not found**

Dependency specified by jobs ccccccc and ddddddd is not found.

**duplicate keyword - ccccccc**

Duplicate keyword – ccccccc not allowed on BEFORE or AFTER card.

**unknown keyword**

Unknown keyword found on BEFORE or AFTER card.

**statement label is too long**

The supplied label on the BEFORE or AFTER statement is too long.

**System action**

The message is written to the JESYSMSG data set. The job group is queued for output processing.

**Operator response**

None.

**Programmer response**

See *z/OS MVS JCL Reference* for information about coding BEFORE and AFTER statements. Correct the BEFORE or AFTER statement and resubmit the job group.

**Module**

HASCS RIP

**Routing Code:** N/A

**Descriptor Code:** N/A

---

**\$HASP1120**

**Explanation**

►► Illegal NOTIFY card WHEN= — *reason* ◄◄

The message is displayed when JES2 detects an error in the WHEN keyword of NOTIFY JCL statement. The problem encountered is identified by a *reason*.

In the message text:

**WHEN= operator not valid**

An invalid operator specified for WHEN=. Valid operators are ¬, !, NOT, >, GT, <, LT, ¬>, !>, NG, ¬<, !<, NL, =, EQ, ¬=, !=, NE, >=, GE, <=, LE, &, AND, | and OR.

**WHEN= invalid character**

Invalid character found.

**WHEN= has exceeded its limit**

RPN (Reverse Polish Notation) list is full. The WHEN= parameter has exceeded its limit. Reduce the parameter size and resubmit the job.

**WHEN= is too complex**

Internal operator stack is full. The WHEN= parameter is too complex. Reduce the complexity and resubmit the job.

**WHEN= only ( or blank allowed before NOT**

Only “(“ character or blank allowed before NOT.

**WHEN= operator not within valid context**

Operator not used within a valid context. Check the operator use in relation to RUN, RC, ABENDCC, or ABEND.

**WHEN= character before/after operator is not valid**

Invalid character preceding or following a comparison operator. Valid comparison operators are NOT, GT, LT, NG, NL, EQ, NE, GE, and LE. All of these operators must be preceded with a blank or (. The character after the operator must be a blank or (.

**WHEN= ABEND/RUN only supports logical operators**

ABEND and RUN only support logical operators AND(&) or OR(!).

**WHEN= must start with (**

Must start with “(“ character.

**WHEN= ABENDCC, ABEND, RC, RUN, SECERR or JCLERR missing or context wrong**

At least one -- RC, ABEND, ABENDCC, RUN, SECERR or JCLERR is required. If specified, then has been used within a wrong context.

**WHEN= Invalid integer following JCLERR**

Invalid integer following JCLERR.

**WHEN= Invalid integer following SECERR**

Invalid integer following SECERR.

**WHEN= ABEND, RUN, JCLERR, SECERR only support logical operators**

ABEND, RUN, JCLERR, SECERR only support logical operators.

**WHEN= ABENDCC code contains too many digits**

ABENDCC code contains too many digits.

**WHEN= expression ended unexpectedly**

Expression is incomplete.

**WHEN= misplaced AND or OR**

Misplaced logical operator.

**WHEN= ABENDCC operand within invalid context**

Context surrounding ABENDCC is invalid.

**WHEN= operator is missing**

Missing operator.

**WHEN= ABENDCC code must start with U or S**

ABENDCC code must start with U (user) or S (system) abend code.

**WHEN= last 3 chars of ABENDCC sys code must be HEX**

Last three characters of ABENDCC system code must be hexadecimal.

**WHEN= last 4 chars of ABENDCC user code must be DEC**

Last four characters of ABENDCC user code must be decimal.

**WHEN= mismatched parenthesis**

Unequal number of left and right parenthesis.

**WHEN= misplaced left parenthesis**

Misplaced left parenthesis.

**WHEN= RC integer cannot be greater than 4095**

RC value must fall within the 0-4095 range.

**WHEN= user abend code cannot be larger than 4095**

ABENDCC user code cannot be larger than 4095.

**WHEN= only 4 digits allowed for RC value**

Only 4 digits allowed for RC integer.

**WHEN= ABENDCC missing equal operator**

ABENDCC requires (EQ or "=") operator. ABENDCC only supports the equal operator.

**WHEN= expression is empty**

Empty expression is not allowed.

**WHEN= ABEND does not support integer**

ABEND does not support integer.

**WHEN= ABENDCC or RC is incomplete**

ABENDCC or RC is incomplete.

**WHEN= AND or OR must be not preceded by "("**

Logical operators AND, &, or OR, |, must not be preceded by "(".

**WHEN= AND or OR must not be followed by ")"**

Logical operators AND, &, or OR, |, must not be followed by ")".

**WHEN= RUN does not support integer**

RUN does not support integer.

**System action**

The message is written to the JESYSMSG data set. The job fails with a JCL error.

**Operator response**

None.

**Programmer response**

See *z/OS MVS JCL Reference* for information about coding the WHEN keyword. Correct the JCL statement, and resubmit the job.

**Module**

HASCSRIP

**Routing Code:** N/A

**Descriptor Code:** N/A

# Chapter 5. z/OS MVS JCL reference updates for JES2 small environment and NOTIFY enhancements

The *z/OS MVS JCL Reference* is updated to include the addition of keywords JCLERR and SECERR to the NOTIFY JCL Statement.

## WHEN parameter

**Parameter type:** Keyword, optional.

**Purpose:** The WHEN parameter defines a set of conditions that must be evaluated to determine whether the notification should be sent. The conditions apply to the completion state of the current job.

## Syntax

The syntax of *condition* is the same as used for the conditional syntax on the IF statement. Supported keywords that can be tested are:

Keyword	Use
RC	Indicates return code of a job.
ABEND	Indicates that an ABEND condition occurred.
–ABEND	Indicates that no ABEND condition occurred.
ABENDCC	Indicates a specific system or user ABEND code.
RUN	Indicates that the job was executed.
–RUN	Indicates that the job did not run (for example, was cancelled or had a JCL error).
SECERR	Indicates that a Security error condition occurred.
–SECERR	Indicates that no SECERR condition occurred.
JCLERR	Indicates that a JCL error condition occurred.
–JCLERR	Indicates than no JCLERR condition occurred.

The operators that you can use are:

Operator -----	Operation -----	Order -----
NOT operator:		
Not or ~ or !	NOT	first
Comparison operators:		
GT or >	Greater than	second
LT or <	Less than	second
NG or ~> or !>	Not greater than	second
NL or ~< or !<	Not less than	second
EQ or =	Equal to	second
NE or ~= or !=	Not equal to	second
GE or >=	Greater than or equal to	second
LE or <=	Less than or equal to	second
Logical operators:		

AND or &  
OR or |

AND  
OR

third  
third

---

## Appendix A. Accessibility

Accessible publications for this product are offered through [IBM Knowledge Center \(www.ibm.com/support/knowledgecenter/SSLTBW/welcome\)](http://www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

If you experience difficulty with the accessibility of any z/OS information, send a detailed message to the [Contact z/OS web page \(www.ibm.com/systems/z/os/zos/webqs.html\)](http://www.ibm.com/systems/z/os/zos/webqs.html) or use the following mailing address.

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### Accessibility features

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features in z/OS can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

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### Consult assistive technologies

Assistive technology products such as screen readers function with the user interfaces found in z/OS. Consult the product information for the specific assistive technology product that is used to access z/OS interfaces.

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### Keyboard navigation of the user interface

You can access z/OS user interfaces with TSO/E or ISPF. The following information describes how to use TSO/E and ISPF, including the use of keyboard shortcuts and function keys (PF keys). Each guide includes the default settings for the PF keys.

- [\*z/OS TSO/E Primer\*](#)
- [\*z/OS TSO/E User's Guide\*](#)
- [\*z/OS ISPF User's Guide Vol I\*](#)

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### Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users who access IBM Knowledge Center with a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line because they are considered a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that the screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The \* symbol is placed next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element \*FILE with dotted decimal number 3 is given the format 3 \\* FILE. Format 3\* FILE indicates that syntax element FILE repeats. Format 3\* \\* FILE indicates that syntax element \* FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol to provide information about the syntax elements. For example, the lines 5.1\*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, it indicates a reference that is defined elsewhere. The string that follows the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you must refer to separate syntax fragment OP1.

The following symbols are used next to the dotted decimal numbers.

#### **? indicates an optional syntax element**

The question mark (?) symbol indicates an optional syntax element. A dotted decimal number followed by the question mark symbol (?) indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that the syntax elements NOTIFY and UPDATE are optional. That is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

#### **! indicates a default syntax element**

The exclamation mark (!) symbol indicates a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicate that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the dotted decimal number can specify the ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In the example, if you include the FILE keyword, but do not specify an option, the default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, the default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP applies only to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

#### **\* indicates an optional syntax element that is repeatable**

The asterisk or glyph (\*) symbol indicates a syntax element that can be repeated zero or more times. A dotted decimal number followed by the \* symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1\* data area, you know that you can include one data area, more than one data area, or no data area. If you

hear the lines 3\* , 3 HOST, 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

**Notes:**

1. If a dotted decimal number has an asterisk (\*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you can write HOST STATE, but you cannot write HOST HOST.
3. The \* symbol is equivalent to a loopback line in a railroad syntax diagram.

**+ indicates a syntax element that must be included**

The plus (+) symbol indicates a syntax element that must be included at least once. A dotted decimal number followed by the + symbol indicates that the syntax element must be included one or more times. That is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the \* symbol, the + symbol can repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the \* symbol, is equivalent to a loopback line in a railroad syntax diagram.



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## **Policy for unsupported hardware**

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## Minimum supported hardware

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