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Introduction to Batch Processing

Enterprise Data Processing

Mainframe Data Processing

Data on the mainframe does not come in one shape. For example, every record within a data set containing daily transactions will need to be processed, while other data sets provide the ability to update individual records only.

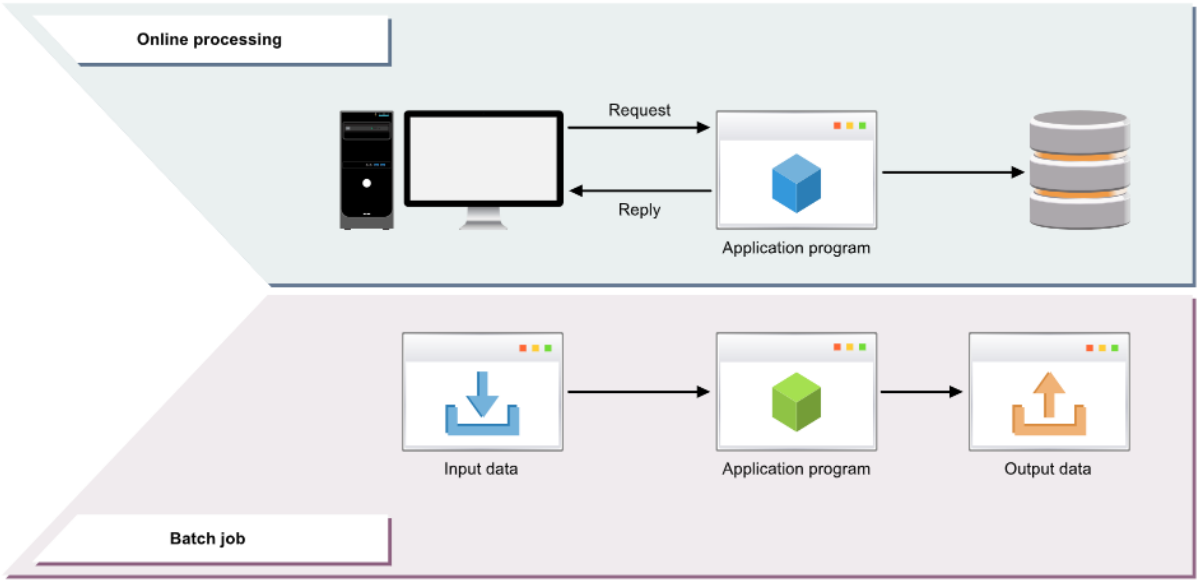
Data Types:

- Partitioned Data Set
    - Contains individual members.
    - An example of this is individual compiled programs residing in a production partitioned data set.
- Sequential Data Set
    - Contains data that is stored sequentially, one record following the next.
    - An example of this would be performance data that will later be printed or a list of transactions that will be applied to a master file.
- VSAM Data Set
    - There are several types of VSAM data set that can be created in a z/OS environment.
    - These are more complex than other types of data sets as they can consist of indexes or keys, to access and retrieve data records.
    - An example of data that would be stored in a VSAM structure would be system catalogs or customer data containing fields such as name, or ID that need to be referenced using that information as a key.
- z/OS UNIX File
    - JCL can be used to run shell scripts or z/OS UNIX application programs against z/OS UNIX data.
    - A wide range of data can be stored in several types of z/OS UNIX files.
- Database File
    - They provide many features and capabilities that can be applied to data stored within them.
    - They are generally used where there is a large amount of data and specific information needs to be accessed quickly.
    - An example of data that would be stored in a database table would be results of research experiments or records of organizational purchases.

Online and Batch Processing

Due to the mainframe containing several types of data with numerous people needing access to it the z/OS needs a way to manage this.

There are two methods for how this can be achieved - online and batch



With online processing you simply enter a request from a screen and press Enter, the relevant data is accessed, and a response is returned to your screen. Online processing is usually reserved for simple, quick tasks.

Batch processing is often used when large amounts of data need to be accessed and worked on, usually at a predetermined time, unlike online processing which is immediate. Batch processing uses JCL to identify the programs to be run, what is to be used as input data, and what needs to be produced as a result.

Benefits of Batch Processing

If online processing can perform tasks instantly, why is there a need for batch processing? This is due to how the cost to make resources available to that extent is not yet economically viable. Hence, batch processing is the perfect solution for situations where there is repetitious, high volume work.

- Updates to data can be performed at a time that is suitable to the organisation.
- It is suitable for large amounts of repeated work i.e. master file updates.
- Dollar costs per workload are significantly less because of the characteristics above.
- Less user interaction is required to schedule and run batch jobs.

Working with Batch Processing

Depending on one's role, our relationship to batch processing is likely to differ. However, regardless of its application if the JCL is not coded correctly, it can have some drastic consequences.

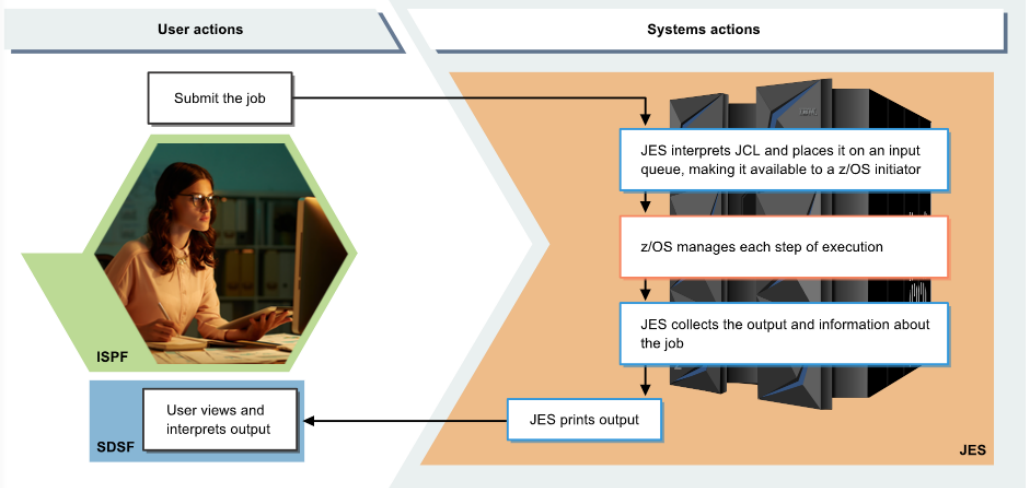
Examples:

- An incorrect version of a master file is being used as input, resulting in overpayment notices being sent to some customers.
- Some parameters that you passed to a sort program have accidentally deleted data that is normally used as input to a later program you have to run.
- The management report that is supposed to be created from your batch job is not being produced.

Running a Batch Job

Understanding how the process works allows one to better diagnose JCL error messages at a later stage.

- Submit the Job
    - JES interprets JCL and places it on an input queue, making it available to a z/OS initiator.
- z/OS manages each step of execution
    - Required resources are allocated - programs, memory, files
    - Resources are freed when the program is finished
- Output time
    - JES collects the output and information about the job
    - JES prints output
- User views and interprets output



Other terminology:

- ISPF - to access the JCL code that is used for a batch job
- JES - you will need some background on how JES, JES2, or JES3 is going to handle your submitted batch job
- SDSF or similar output viewing software - to display the results following the completion of your batch job

Batch Job Automation

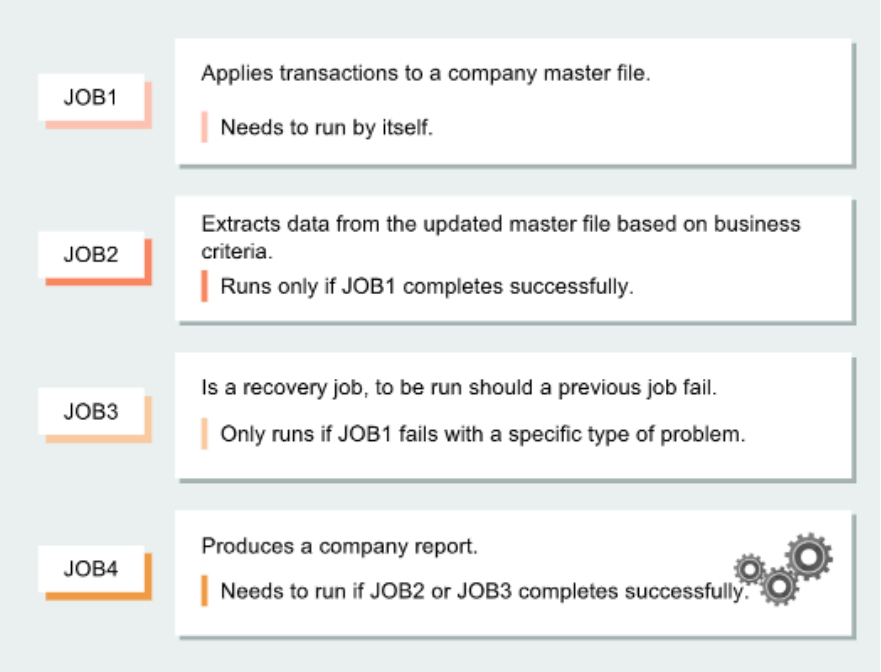
Many larger organizations have implemented automated batch scheduling software that is capable of handling complex batch job scheduling requirements. For example, batch processing may need to run at a specific time, once other data has become available, when a resource becomes free, or simply triggered once another batch job has completed.

Some examples of scheduling products used:

- BMC Control-M Product
- IBM Workload Scheduler
- CA Workload Automation - CA 7 Edition

Batch Job Scheduling

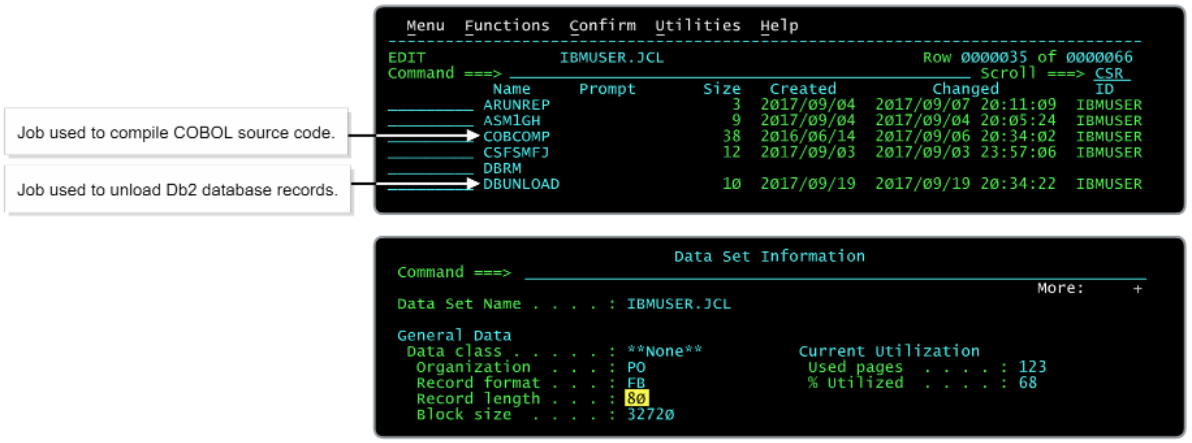
Since z/OS 2.2, we can create simple scheduling for batch jobs within the batch job itself. The JCL code is referenced by JES which can run jobs at specific times or after other jobs have completed.




```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
------------------------------------------------------------------------------
EDIT       IBMUSER.JCL(XRGRP) - 01.03                  Columns 00001 00072
Command ===> ____________________________________________ Scroll ===> CSR
****** ***************************** Top of Data ******************************
000100 //XRGRP   JOBGROUP (MK112),HARRIS,ERROR=(ABEND),ONERROR=STOP
000200 //TRANAPY GJOB
000300 //XTRCT   GJOB
000400 //         AFTER NAME=TRANAPY,WHEN=(RC=0)
000500 //XRSTORE GJOB
000600 //         AFTER NAME=TRANAPY,WHEN=(RC=8)
000700 //XREPORT GJOB
000800 //         AFTER NAME=XTRCT
000900 //         AFTER NAME=XRSTORE
001000 //XRGRP   ENDGROUP
001100 //TRANAPY JOB MSGCLASS=X
001200 //         SCHEDULE JOBGROUP=XRGRP,
001300 //         HOLDUNTL='+03:00'
001400 //APPLY   EXEC PGM=TRNASS
001500 //XTRCT   JOB MSGCLASS=X
001600 //         SCHEDULE JOBGROUP=XRGRP
001700 //EXTRACT EXEC PGM=TRNXRT
001800 //XRSTORE JOB MSGCLASS=X
```

Batch Processing Prerequisites

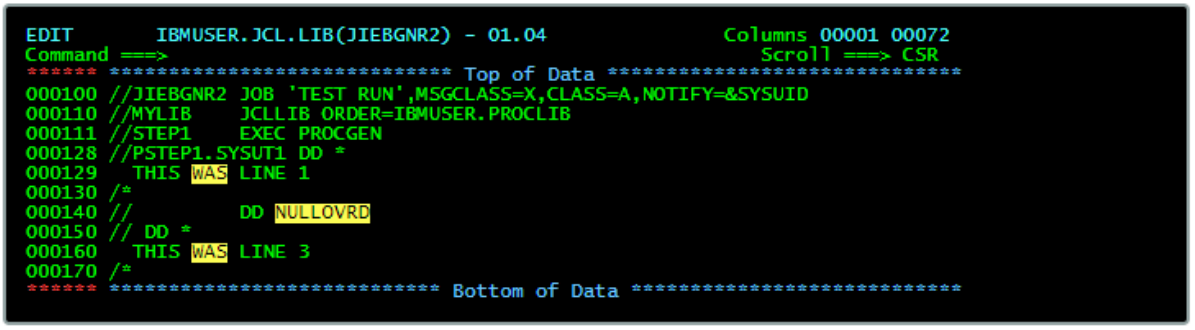
The data set used for storing batch jobs is the partitioned data set (PDS) This is because it contains individual members, thus, making it an ideal location to store all batch jobs belonging to you or your group.



JCL z/OS 2.4 Update

There are only minor changes made to JCL with the introduction of z/OS 2.4, with one being included here.

A new NULLOVRD parameter can be used when performing overrides of DD * or DD DATA statements.



Coding Requirements

JCL Coding Rules

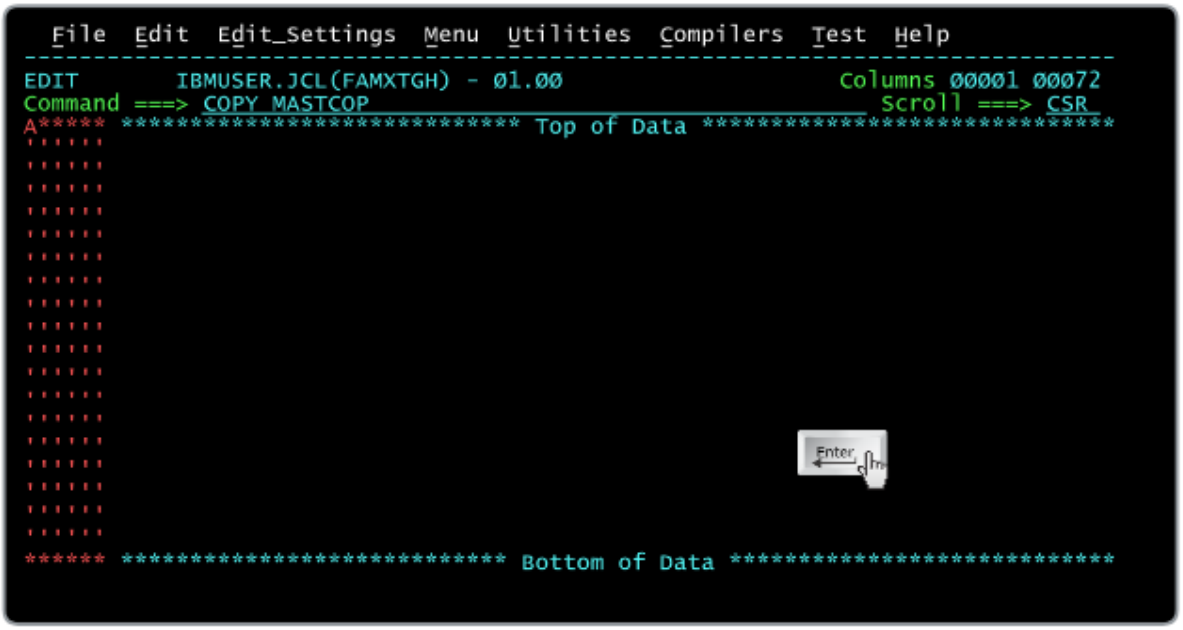
Planning Processing Requirements

Before writing any JCL, one must first plan out the batch processing that is to be performed.

- Take a backup of a data set before you work on it
- Run a COBOL program you have been working on, against the data set you copied
- Create a report that identifies discrepancies between the result of your program, and another set of data

Reality of JCL Coding

It's extremely unlikely that one will ever write out JCL for a job from scratch as it is much easier to copy it from a similar job and modify it.

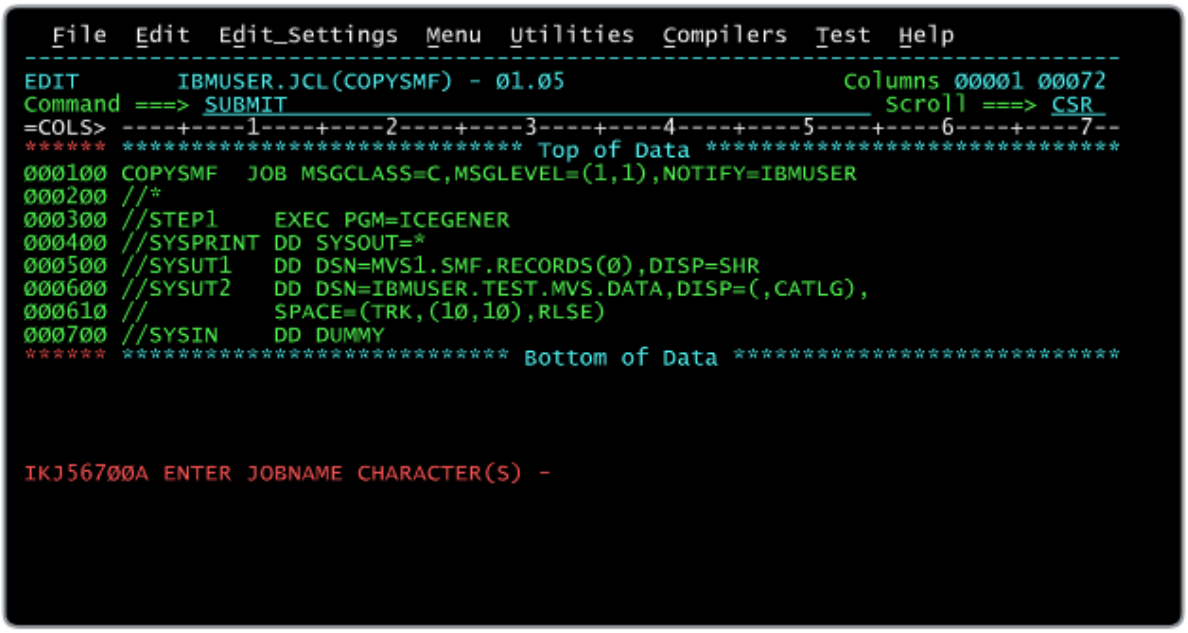


How to copy JCL:

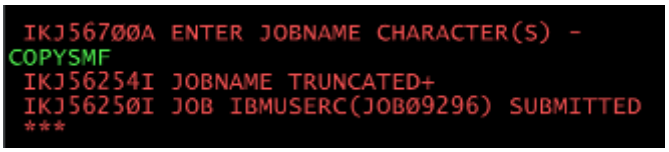
- Create an empty PDS member
- Type Copy [Other file's name] into the command line
- Place an A in the empty PDS member's line right at the top then hit enter
- Make your changes then submit it once you're ready

Identifying JCL code

JCL statements begin with a double slash within columns 1 and 2. This is how the system is able to interpret the data that is submitted to the system as JCL. Do note that there are, however, some exceptions to this double slash rule.



In the example above, the system cannot determine the name of the job because it does not recognise the first line due to the lack of double slash (//) at the beginning of the line.

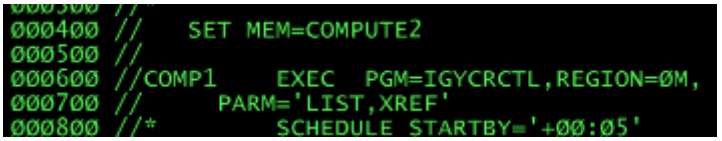


What the initial prompt did not not mention was that it will use one's user ID (IBMUSER) as part of the job name and that one needs to add characters to append to it. Since the name of the job can only be eight characters, it has truncated the response using the C only.

The empty // curse

A common mistake for new JCL users is to submit a job that contains a line where the only data is //. This type of statement is called a null statement and indicates that this is the end of your JCL.

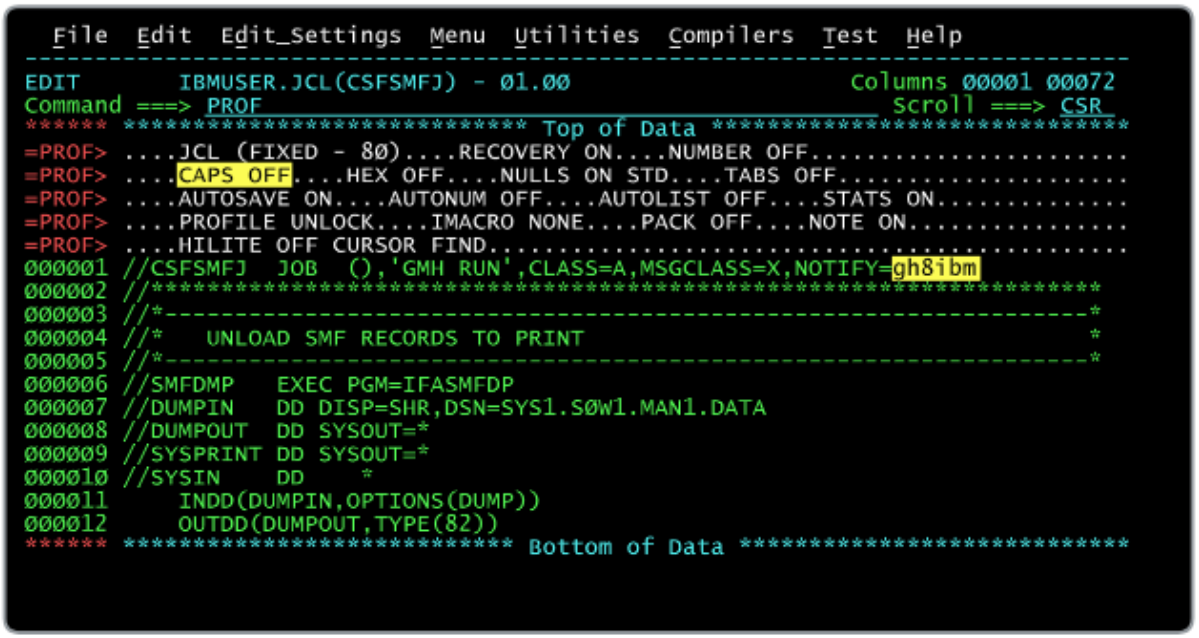
In the example here, the user wanted to remove the content from a JCL statement, but left // by itself on line 000500. Even though JCL statements appear after this line, the system will not recognize them.



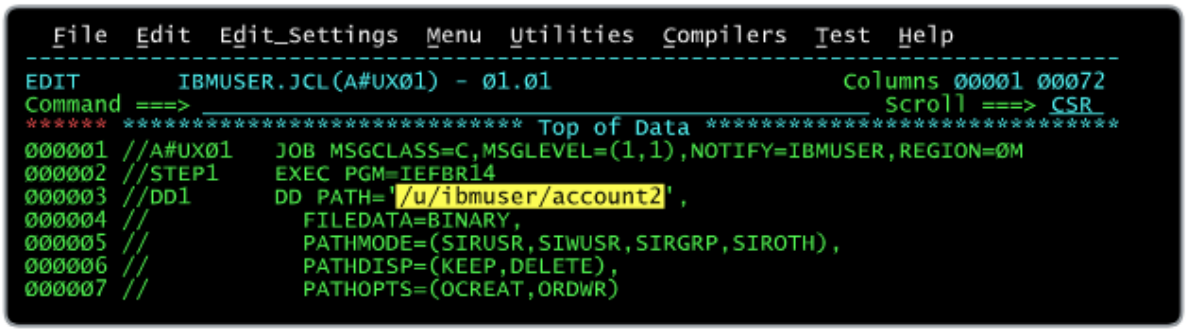
Uppercase Characters

JCL is coded in uppercase characters and you can use the PROF command in the CLI to check whether you have caps set to on or off.

- This can be fixed by using CAPS ON in the command line to automatically have your input converted to uppercase whenever you hit enter.



However, not everything has to be in uppercase; there are a few exceptions where you'll need to use lowercase characters enclosed within single quotes. The example shown below showcases this concept through a z/OS UNIX file being referenced.



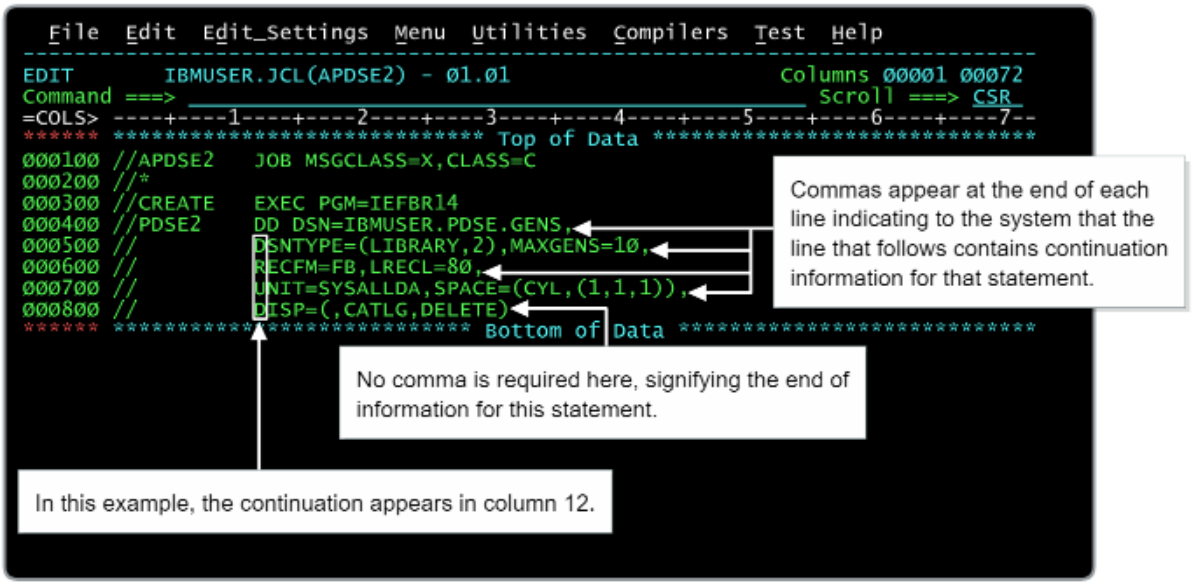
Record Length

Within the PDS member that stores one's JCL code, it has a record length of 80 - based on punch cards from the early days of computing. Columns 73 - 80 are ignored when a job is submitted as they were traditionally used for sequence numbers. Thus, avoid code that overruns into these columns to prevent errors popping up when the job is submitted.

Continuing a statement

Since you cannot extend your JCL statement past column 72, how do you handle a JCL statement that contains lots of information? To continue a statement, you code a comma at the end of the parameter being specified on that line, and on the following line the double slash (//) characters must be in columns 1 and 2, and your continued information can appear anywhere between columns 4 and 16 (inclusive).

Often you will see for readability purposes that continued line data is aligned with previous lines.

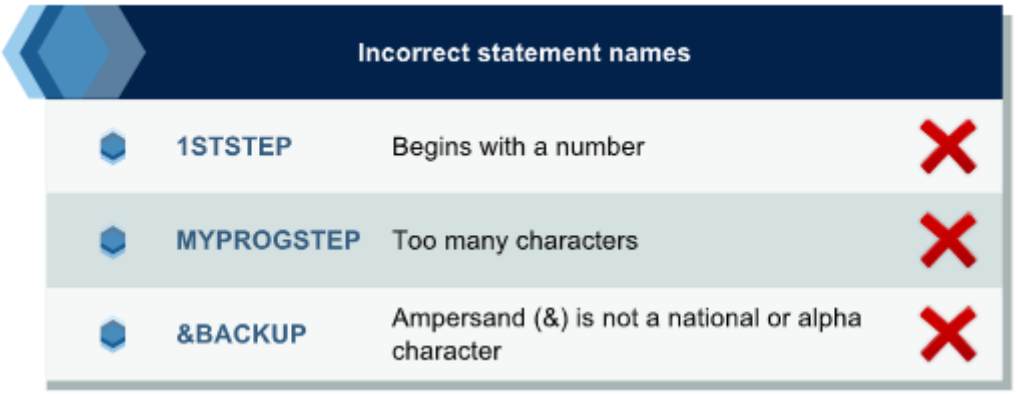


Additionally, one should avoid putting any code in column 72 itself as traditionally this column was used to indicate a continuation but today is generally no longer used for this purpose and needs to be blank.

Statement Breakdown

Statement Names

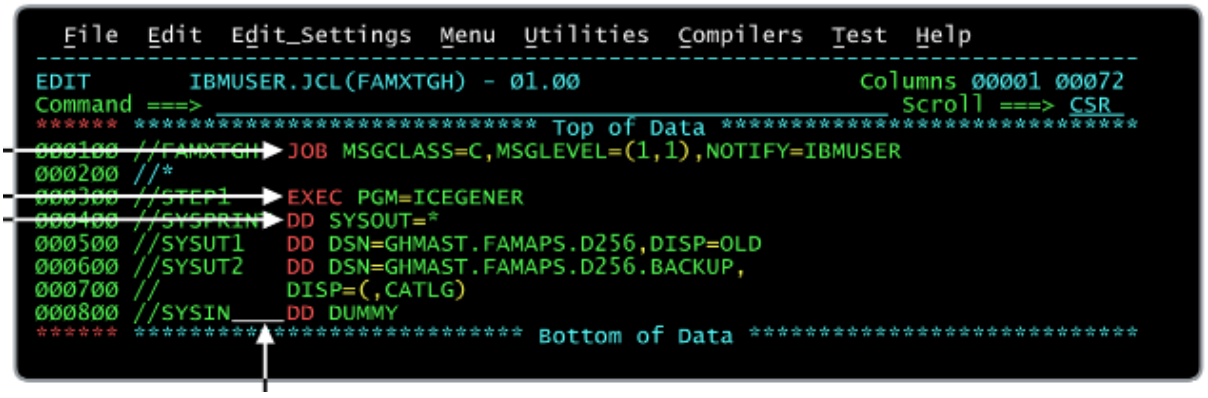
When creating JCL, you will need to tell the system the type of statement you are providing, and in most cases, provide a name for that statement. The name you provide for each statement is one to eight characters and appears immediately after the double slash (//) characters. This name must start with an alpha or national character ($, #, @), while the remaining characters can also contain numbers.



Statement Types

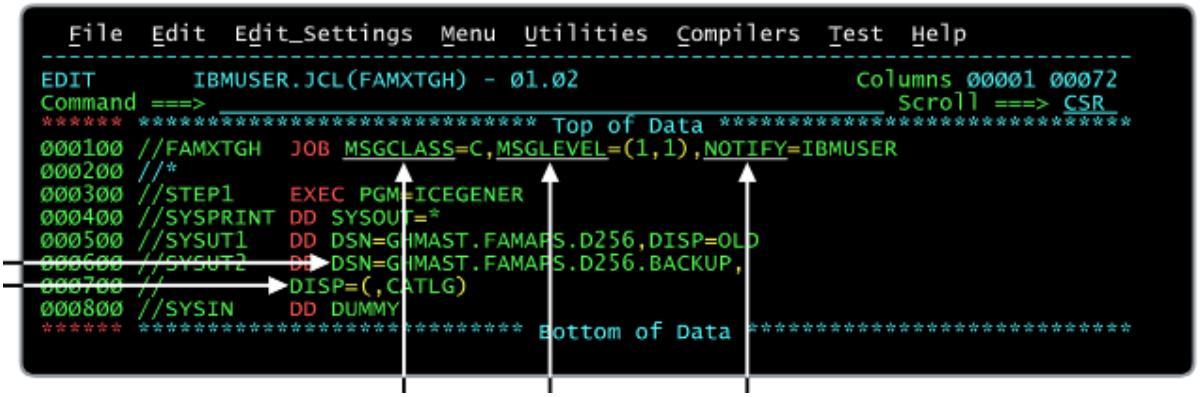
Associated with the name is the statement type. Common statements used include JOB, EXEC, and DD (as seen in the image below). At least one space must be coded following the name before this statement type is entered.

If you are working on an existing JCL you will often see several spaces between the name and the statement type. This is for readability purposes as it aligns important information.



Parameters

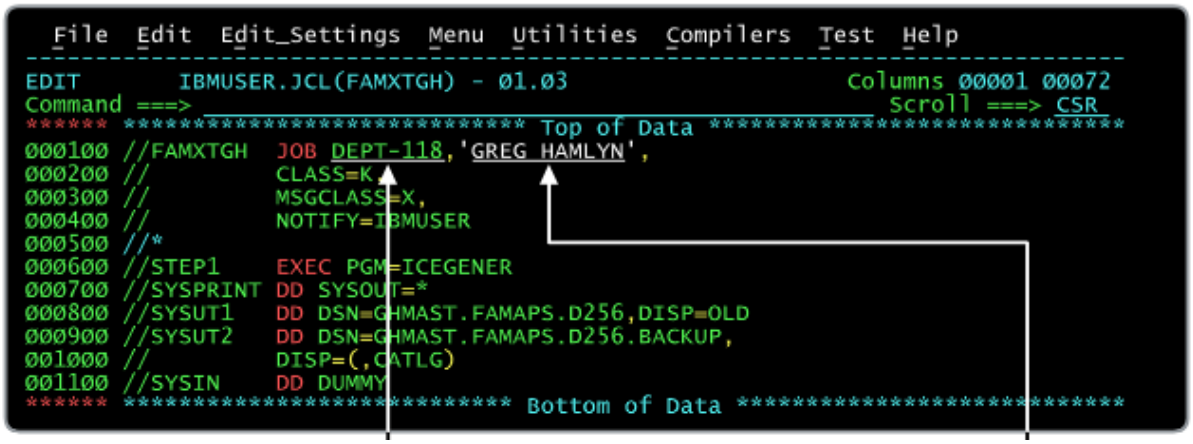
Every statement will have some parameters that describe requirements, or attributes, to be associated with that statement. There may be many associated with that statement, though in reality you are only likely to use a subset of them regularly. If parameters are specified, at least one space must follow the statement type - JOB, EXEC, or DD - before they are entered.



Where there are multiple parameters for a statement, they must be separated by commas, and if the parameter itself contains a space, it needs to be enclosed in single quotes.

Positional Parameters

The parameters for each statement are separated into positional and keyword. If used, a positional parameter must appear in a specific area of the code, and if it is not required, a comma is often used to indicate it being bypassed, although this is not always the case.



Example:

- Left arrow: If this accounting information was not required but the programmer's name was, then a comma would need to be coded to signify that the accounting information was being bypassed.
- Right arrow: Even though this is a positional parameter, if it is not required and the accounting information is, then you do not need to code a comma to indicate its absence. Note that in this example, because the value contains a space, it needs to be encased in single quotes.

Keyword Parameters

Keyword parameters are more common and can appear in any order within the statement, following the statement type. Their name is followed by an equals (=) sign and then the value assigned to that keyword parameter.

```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
-------------------------------------------------------------------------------
EDIT       IBMUSER.JCL(FAMXTGH) - 01.04                 Columns 00001 00072
Command ===> _____________________________________________ Scroll ===> CSR
****** ***************************** Top of Data ******************************
000100 //FAMXTGH  JOB 'GREG HAMLYN',
000200 //         CLASS=K,
000300 //         MSGCLASS=X,
000400 //         NOTIFY=IBMUSER
000500 //*
000600 //STEP1    EXEC PGM=ICEGENER
000700 //SYSPRINT DD SYSOUT=*
000800 //SYSUT1   DD DISP=OLD,DSN=GHMAST.FAMAPS.D256
000900 //SYSUT2   DD DSN=GHMAST.FAMAPS.D256.BACKUP,DISP=(,CATLG)
001000 //SYSIN    DD DUMMY
****** **************************** Bottom of Data ****************************
```

Example:

- Line 000800 shows a DISP parameter first, and then a DSN parameter. On the line after this, these two parameters appear in the opposite order. As DISP and DSN are keyword parameters this coding is acceptable.

Comments

There are two ways of coding comments in JCL. The more common method is to code a //* statement such as on lines 000500 to 000800. Any text that then appears after this is considered a comment. Another method is to leave at least one space at the end of a line and type your comment, such as on the end of line 001100.

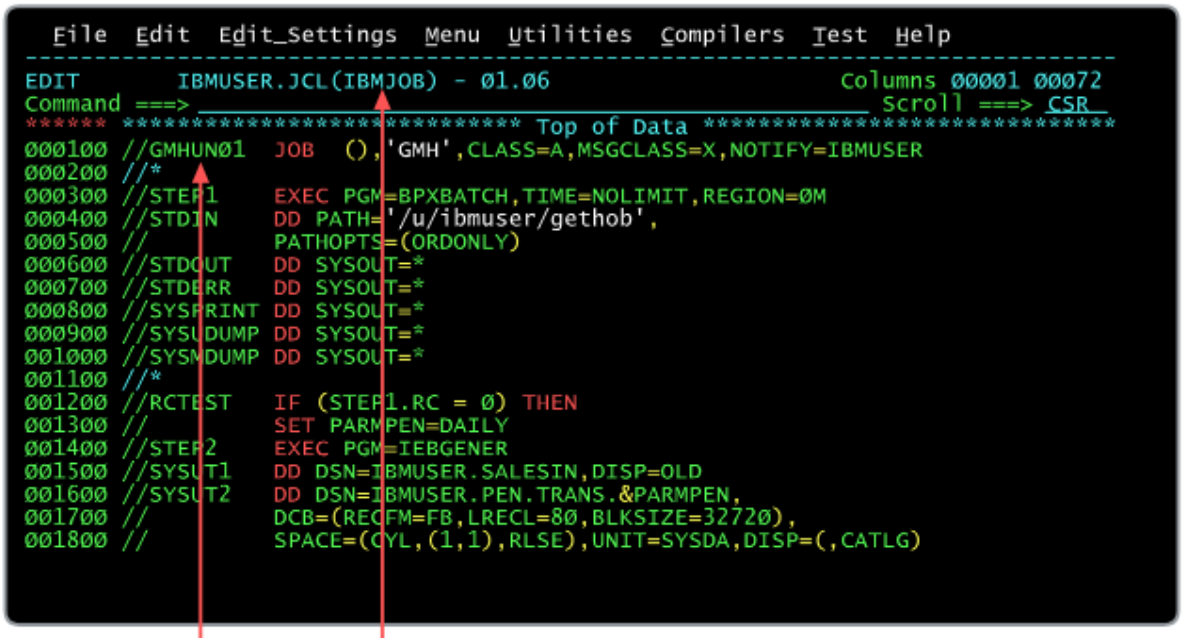
```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
-------------------------------------------------------------------------------
EDIT       IBMUSER.JCL(FAMXTGH) - 01.04                 Columns 00001 00072
Command ===> _____________________________________________ Scroll ===> CSR
****** ***************************** Top of Data ******************************
000100 //FAMXTGH  JOB 'GREG HAMLYN',
000200 //         CLASS=K,
000300 //         MSGCLASS=X,
000400 //         NOTIFY=IBMUSER
000500 //*
000600 //*  THE FIRST STEP IS USED FOR RECOVERY PURPOSES
000700 //*  CHANGE THE SYSUT1 AND SYSUT2 DATA SETS AS REQUIRED
000800 //*
000900 //STEP1    EXEC PGM=ICEGENER
001000 //SYSPRINT DD SYSOUT=*
001100 //SYSUT1   DD DISP=OLD,DSN=GHMAST.FAMAPS.D256   * INPUT DATA SET *
001200 //SYSUT2   DD DSN=GHMAST.FAMAPS.D256.BACKUP,DISP=(,CATLG)
001300 //SYSIN    DD DUMMY
****** **************************** Bottom of Data ****************************
```

JOB Statement Basics

Statement Requirements

JOB Statement Importance

The JOB statement is typically the first statement encountered in your job, it is used to specify attributes to be associated with your job when it is submitted to the system. The JOB statement is important and if not coded correctly, can have major ramifications on the success of your job.



The name you specify on this statement is the one that the system uses to reference your job when it is submitted. The PDS member name you are using to store your JCL can be the same or different to the job name and has no relationship with it.

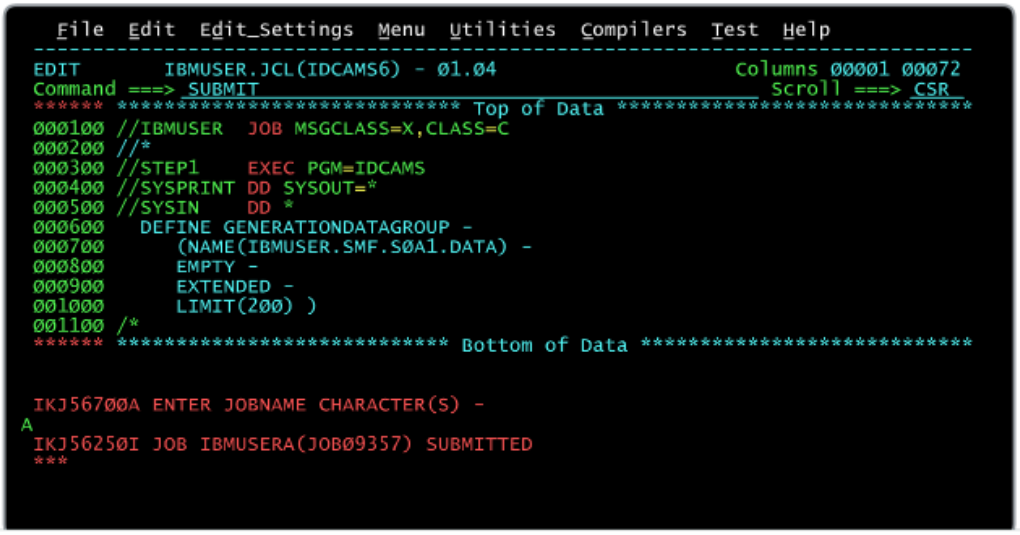
JOB Name Standards

Mentioned previously in a section above, a statement name needs to meet specific rules - it should be between one and eight characters in length and begin with an alpha or national character. It can contain a number as long as it is not the first character.

Each organization will probably have its own standards regarding job names. This allows the organization to more clearly identify to whoever is looking at the job, what group, or individual it belongs to.

Running a JOB Multiple Times

To submit a job several times, for testing purposes for example, you can code your user ID as the job's name. When you submit your job, it will prompt you for a character to be added to the end of this name before it is submitted.

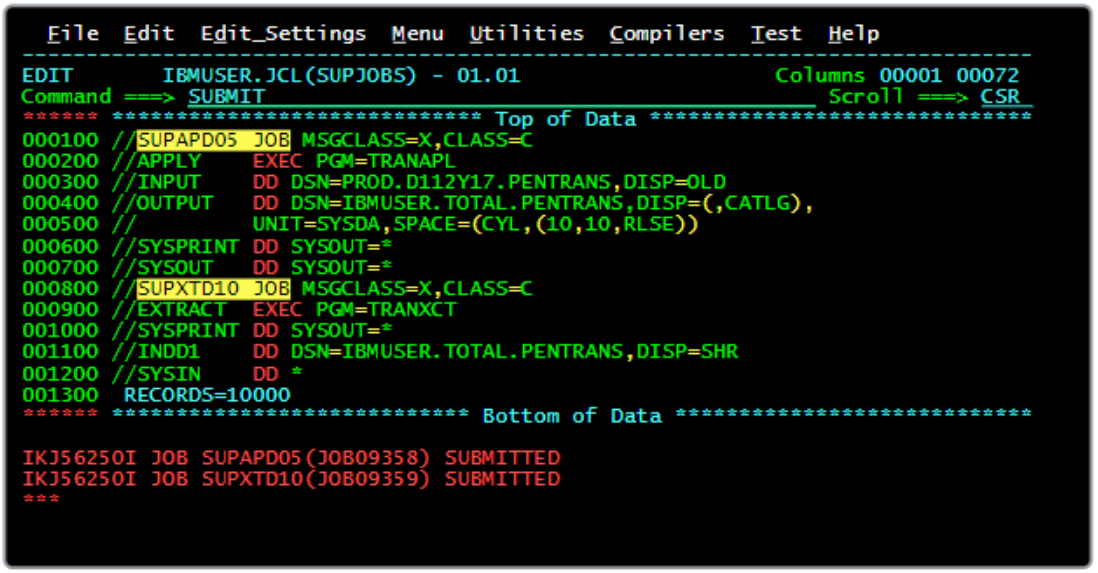


The A character has been appended to IBMUSER, which was specified in the JOB statement, to create the job name that the system will use. You can now use the same job, changing the name of the generation data set to S0B1, and when you submit the job you can use B for the appended job name character. When you check the output from these jobs, it is easy to determine which output belongs to which job.

Note that to use this option, one's user ID needs to be a maximum of seven characters, because a maximum of eight characters are allowed for a job name.

Multiple JOB Statements

Normally, there is just a single JOB statement followed by one or more steps used to execute programs. However, in some situations there might be several JOB statements coded within a PDS member. When submitted to the system, it will detect the JOB statement and submit the statements following it as a separate job.



Incorrect JOB Name

Depending on the problem, the system may prompt you for some input that it will use with system defaults, to build a JOB statement for you, or it may fail indicating that it has an invalid name. In this example it failed because the job name did not start with an alpha or national character.

```
  File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
--------------------------------------------------------------------------------
EDIT       IBMUSER.JCL(IBMJOB3) - 01.05                Columns 00001 00072
Command ===> _____________________________________________ Scroll ===> CSR
****** ***************************** Top of Data ********************************
000100 //1DAYMOD  JOB  ,'GMH',CLASS=C,MSGCLASS=X,NOTIFY=IBMUSER
000200 //*
000300 //          SET WDAY=THURS
000400 //STEP1    EXEC PGM=IEBGENER
000500 //SYSUT1   DD DSN=IBMUSER.JSONDATA,DISP=SHR
```

```
SDSF OUTPUT DISPLAY 1DAYMOD  JOB09360  DSID     2 LINE 0       COLUMNS 02- 81
COMMAND INPUT ===>                                            SCROLL ===> CSR
3.14.27 JOB09360 ---- MONDAY,     30 OCT 2017 ----
3.14.27 JOB09360  IRR010I  USERID IBMUSER  IS ASSIGNED TO THIS JOB.
3.14.27 JOB09360  IEFC452I INVALID - JOB NOT RUN - JCL ERROR  975
----- JES2 JOB STATISTICS ------
. . .
        1 //1DAYMOD  JOB  ,'GMH',CLASS=C,MSGCLASS=X,NOTIFY=IBMUSER
          //*
        2 //         SET WDAY=THURS
. . .
STMT NO. MESSAGE
        1 IEFC662I INVALID LABEL
******************************** BOTTOM OF DATA ********************************
```

Statement Positional Parameters

With a correct job name and type of statement defined, you now need to look at the types of parameters that can be coded on a JOB statement.

There are two positional parameters that can be specified on a JOB statement - **accounting information**, and the **programmer's name**. As discussed previously, positional parameters, if used, need to appear in a specific order.
The value for these two parameters may be enforced through organizational standards, therefore supplying them in the JOB statement could be optional or mandatory.

```
  File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
--------------------------------------------------------------------------------
EDIT       IBMUSER.JCL(FAMXTP15) - 01.07               Columns 00001 00072
Command ===>                                             Scroll ===> CSR
****** ***************************** Top of Data ********************************
000100 //FAMXTP15 JOB (170A80),'GINA HARRIS',
000200 //          CLASS=K,
000300 //          MSGCLASS=X,
000400 //          NOTIFY=IBMUSER
000500 //*
000600 //*  THE FIRST STEP IS USED FOR RECOVERY PURPOSES
000700 //*  CHANGE THE SYSUT1 AND SYSUT2 DATA SETS AS REQUIRED
000800 //*
000900 //STEP1    EXEC PGM=ICEGENER
001000 //SYSPRINT DD SYSOUT=*
001100 //SYSUT1   DD DSN=GHMAST.FAMAPS.D256,DISP=OLD
001200 //SYSUT2   DD DSN=GHMAST.FAMAPS.D256.BACKUP,DISP=(,CATLG)
001300 //SYSIN    DD DUMMY
****** ***************************** Bottom of Data ******************************
```

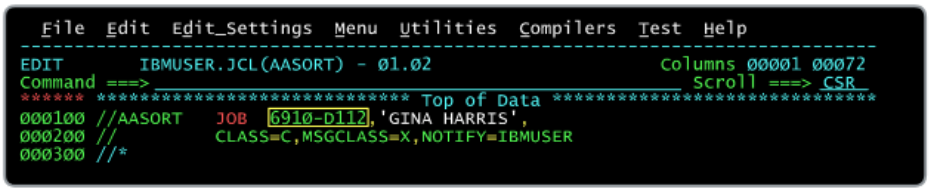
Accounting Information:

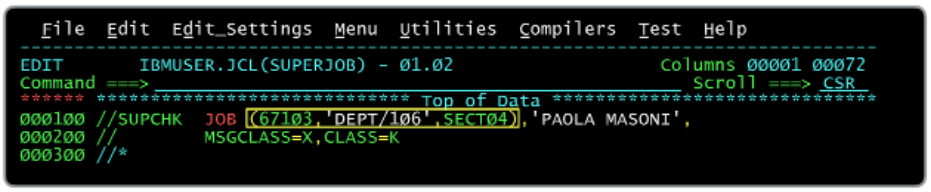
The accounting information parameter is used generally for billing, statistical, or performance-related purposes. The use of this parameter is likely to be dictated by an organization's standards. If used, this parameter must appear before any other JOB statement parameters.

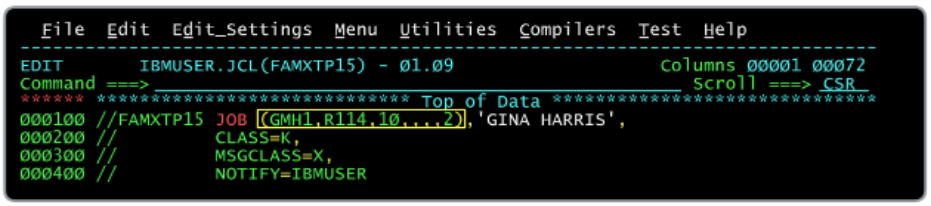
The following are some rules when coding this parameter:

- If more than one subparameter is required, you must code the sub parameters within parentheses. You may also see a single parameter here enclosed in parentheses which is also acceptable.
- If sub parameters contain special characters, with the exception of hyphens, they must appear within apostrophes.
- It cannot exceed 143 characters in length.

The accounting information parameter can consist of two sub parameters - the account number, and more granular details associated with the account. You may also see JES2 accounting information supplied here, although this is not commonly used by organizations.







Examples:

- Image 1 - This is an example of an accounting code defined by the organisation. Even though it contains a hyphen, it does not need to be enclosed in parentheses or apostrophes, although syntactically this is allowed.
- Image 2 - This is an example wherein the organization has defined their accounting information for a job must contain a code, department number, and section name. As the department number contains a slash (/), it needs to be enclosed in apostrophes. As there are three sub parameters altogether, they are enclosed in parentheses.
- Image 3 - When using this parameter to supply JES2 accounting information, a range of sub parameters can be specified. These are positional sub parameters, in this example there are several commas entered to indicate values being bypassed.

Programmer's Name:

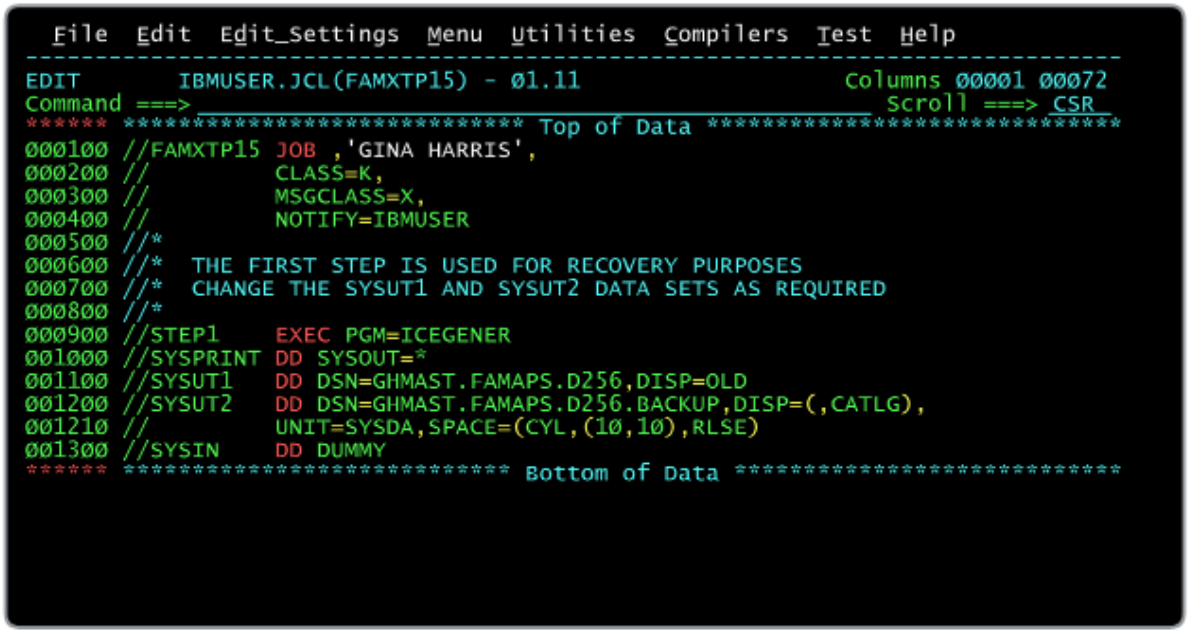
The programmer's name is another optional parameter that may be required by your organization. This field helps to provide identification about the owner of the job. This is often the name of an individual but could also be the name of your group. You can see here that the job's log at the bottom displays this information.

When coding the programmer's name parameter a maximum of 20 characters can be coded and single quotes are required if the name contains any special characters, other than hyphens (-) or periods (.).

Some or No Positional Parameters

If a positional parameter is not required, a comma is coded to signify its absence. This is required when another positional parameter immediately follows it. If no positional parameters are required at all for the statement, they can be omitted without any commas.

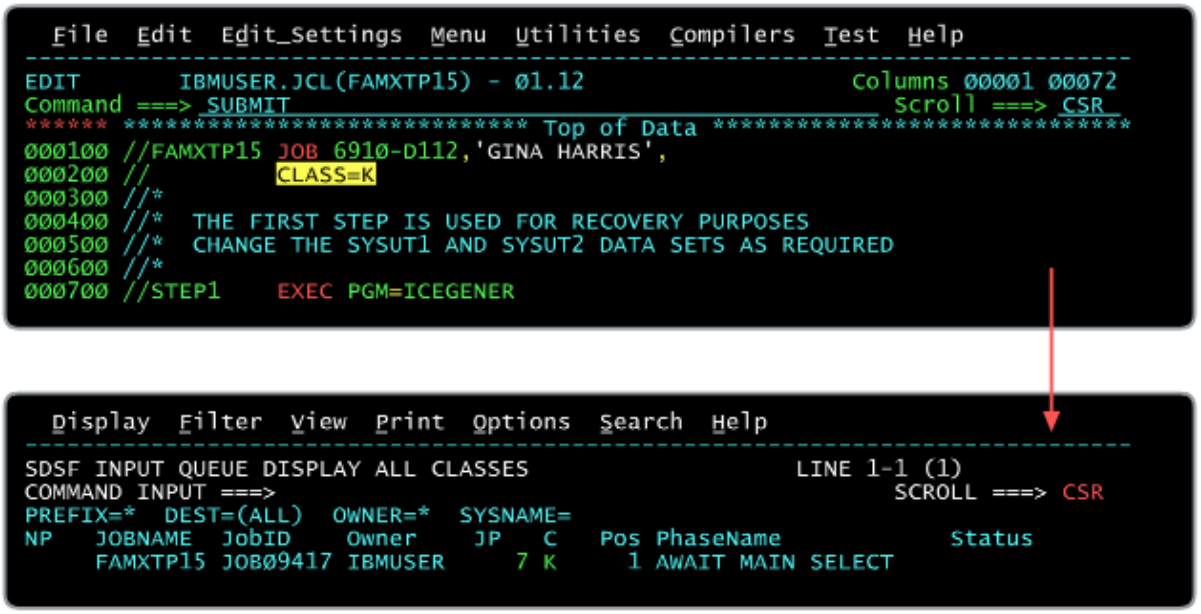
The example below is for when you omit the accounting information.



Statement Keyword Parameters

CLASS Parameter

During JES initialization, organizational job classes are defined with each containing their own characteristics. These classes can be a single number (0-9), letter (A-Z), or even a one to eight-character name. The example at the bottom of this page shows attributes assigned to K class jobs during JES initialization.

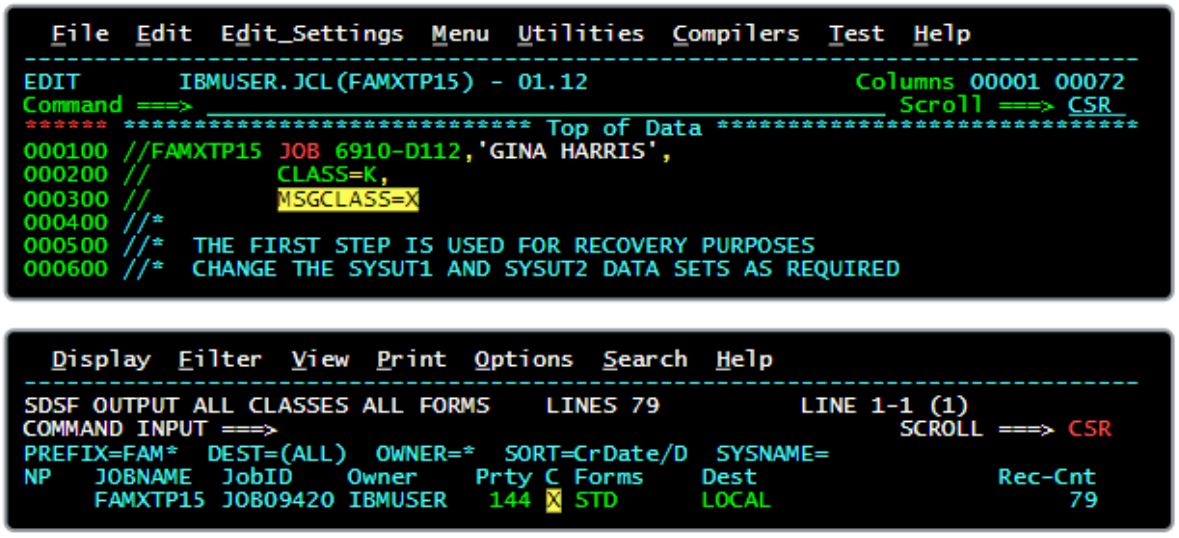


One of the items you would normally code on a JOB statement is a CLASS parameter and you can see in the screen at the top that the syntax is straightforward.

- If an invalid class is specified in the JOB statement the job will be flushed or cancelled and an error message will be displayed.

MSGCLASS Parameter

The MSGCLASS parameter is used to assign the job's log to an output class. This is what you look at in SDSF to determine whether your job ran successfully. Like the CLASS parameter, the attributes associated with output classes are defined during JES initialization.

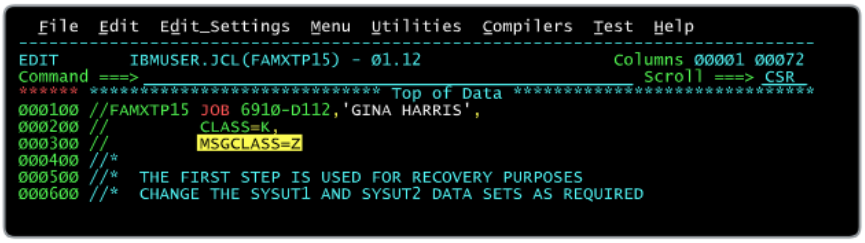


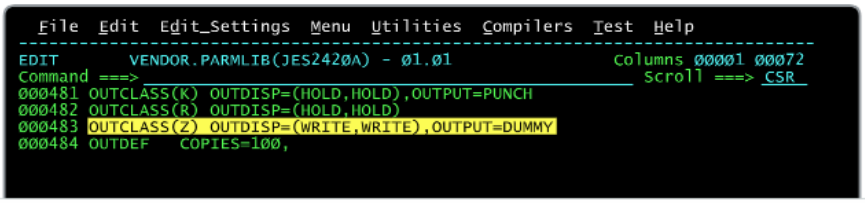
Note that you will again be likely to have organizational standards that specify the output class you should use.

- MSGCLASS=Z is often configured to automatically purge job log output on completion of the job.

If you do not code a MSGCLASS parameter then installation defaults will be used, so it is usually good practice to code this parameter so that you can find your output easily.

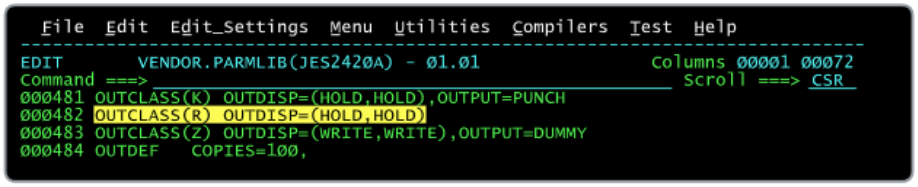
In the example from the previous page, JES initialization statements defined that X class output is not held, and this is why you found it on the SDSF output screen rather than the held output screen. This is not always going to be the case.

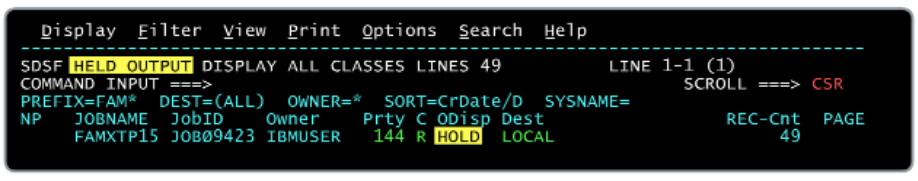




In this example, a MSGCLASS of Z is specified in the JCL. In the JES initialization parameters, notice that for this class it displays OUTPUT=DUMMY, which means that the output will not be available for viewing. You might want to use this class for your job if you are running it many times and do not need to ever view its job log.

◄ Previous Next ►





You can see in the JES initialization parameters at the top that R class output is assigned a HOLD status. If the job had a MSGCLASS of R you would have to search the SDSF held output screen to find it, not the normal output screens previously used.

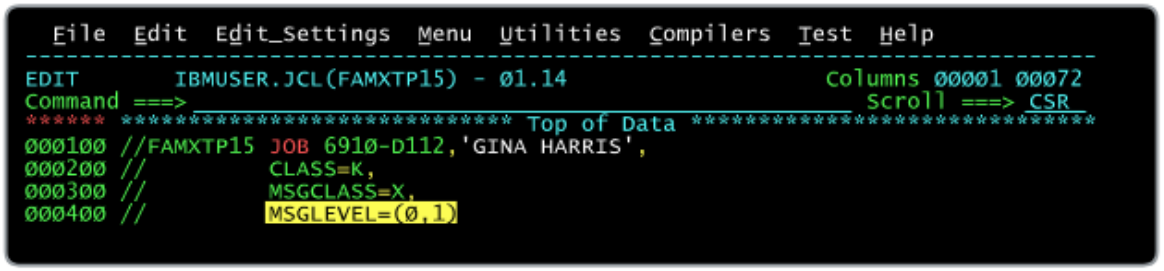
◄ Previous Restart

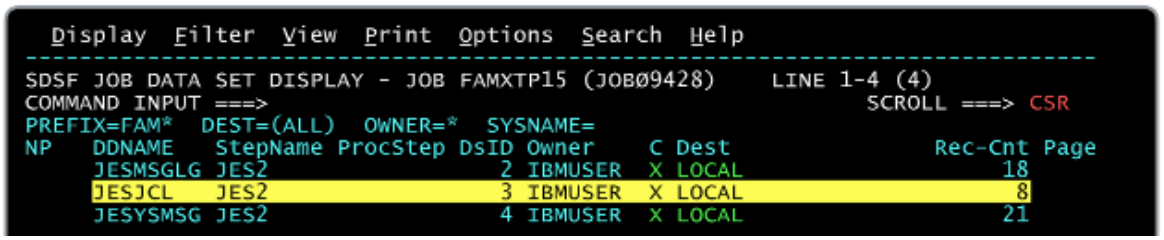
MSGLEVEL Parameter

A job's log output, which was discussed on the previous page, consists of a number of separate output components including the following:

- JES job log
- JCL statements
- Job-related JES and operator messages - system messages

There may be times when you do not need all of this information to be made available because it can clutter the screen making it difficult for you to find what really matters to you.





The MSGLEVEL parameter consists of two sub parameters. The first indicates which statement images to produce. The second sub parameter indicates which system messages to produce. The default is usually MSGLEVEL=(1,1), which will show all JCL statements and messages. A MSGLEVEL default may also be defined for each JES JOBCLASS definition.

In this example, specifying 0 for the first sub parameter will only produce the JOB statement and any comments that appear before the first step. You can see in the output produced that the number of records for the KCL messages have been reduced as a result of this.

```
 Display  Filter  View  Print  Options  Search  Help
------------------------------------------------------------------------------
SDSF JOB DATA SET DISPLAY - JOB ARUNREP  (JOB09429)    LINE 1-7 (7)
COMMAND INPUT ===>                                     SCROLL ===> CSR
PREFIX=ARUN*  DEST=(ALL)  OWNER=*  SYSNAME=
NP    DDNAME   StepName ProcStep DsID Owner    C Dest              Rec-Cnt Page
      JESMSGLG JES2                2 IBMUSER  C LOCAL                  33
      JESJCL   JES2                3 IBMUSER  C LOCAL                  24
      JESYSMSG JES2                4 IBMUSER  C LOCAL                  67
```

```
 Display  Filter  View  Print  Options  Search  Help
------------------------------------------------------------------------------
SDSF JOB DATA SET DISPLAY - JOB ARUNREP  (JOB0943Ø)    LINE 1-7 (7)
COMMAND INPUT ===>                                     SCROLL ===> CSR
PREFIX=ARUN*  DEST=(ALL)  OWNER=*  SYSNAME=
NP    DDNAME   StepName ProcStep DsID Owner    C Dest              Rec-Cnt Page
      JESMSGLG JES2                2 IBMUSER  C LOCAL                  33
      JESJCL   JES2                3 IBMUSER  C LOCAL                   3
      JESYSMSG JES2                4 IBMUSER  C LOCAL                  67
```

Coding 2 for the first sub parameter will produce JCL and JES statements but not procedure statements. The output at the top did not have any MSGLEVEL parameter and you can see that it produced 24 records for the JESJCL part of the output. The same job when submitted with MSGLEVEL=(2,1) produced the output at the bottom showing only 3 records being produced.

```
 Display  Filter  View  Print  Options  Search  Help
------------------------------------------------------------------------------
SDSF JOB DATA SET DISPLAY - JOB FAMXTP15 (JOB09425)    LINE 1-4 (4)
COMMAND INPUT ===>                                     SCROLL ===> CSR
PREFIX=FAM*  DEST=(ALL)  OWNER=*  SYSNAME=
NP    DDNAME   StepName ProcStep DsID Owner    C Dest              Rec-Cnt Page
      JESMSGLG JES2                2 IBMUSER  X LOCAL                  18
      JESJCL   JES2                3 IBMUSER  X LOCAL                  13
      JESYSMSG JES2                4 IBMUSER  X LOCAL                  21
```

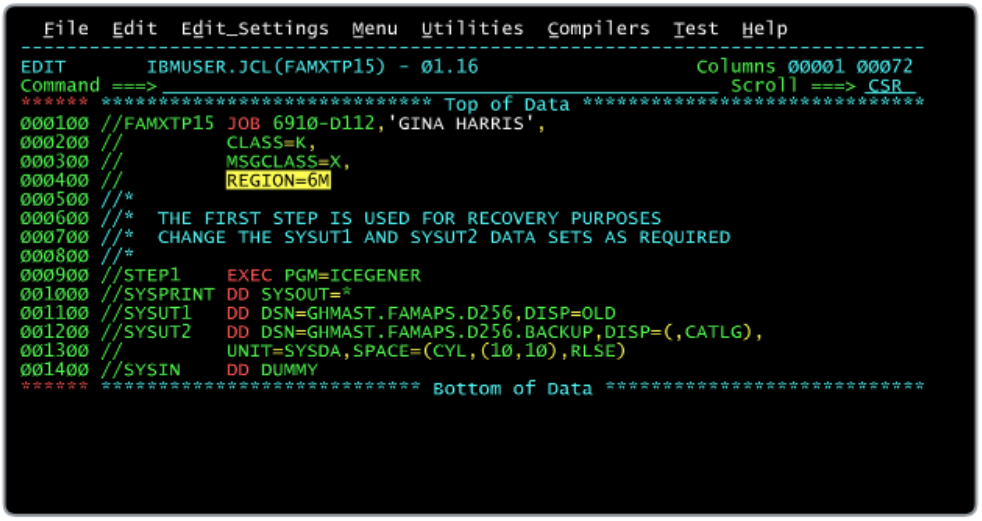
```
 Display  Filter  View  Print  Options  Search  Help
------------------------------------------------------------------------------
SDSF JOB DATA SET DISPLAY - JOB FAMXTP15 (JOB09434)    LINE 1-4 (4)
COMMAND INPUT ===>                                     SCROLL ===> CSR
PREFIX=FAM*  DEST=(ALL)  OWNER=*  SYSNAME=
NP    DDNAME   StepName ProcStep DsID Owner    C Dest              Rec-Cnt Page
      JESMSGLG JES2                2 IBMUSER  X LOCAL                  18
      JESJCL   JES2                3 IBMUSER  X LOCAL                  13
      JESYSMSG JES2                4 IBMUSER  X LOCAL                  11
```

Coding 0 for the second sub parameter will produce only JCL messages, unless the job fails, in which case JES and operator messages will also be produced. In this situation SMS messages will also be shown, if SMS has caused the job to fail. The example at the top is showing all job log output, while the one at the bottom is produced using MSGLEVEL=(1,0).

REGION Parameter

Every program you run is going to need a different amount of memory to run. Many organizations will use a REGION parameter to cap this requirement.

Coding REGION=0M or REGION=0K on the JOB statement provides every program specified in your job with as much virtual storage - memory - as it requires. Depending on your requirements, you can code a specific maximum amount of memory that can be used, in megabytes (M) or kilobytes (K). If REGION is not specified, then a JES initialization default will take effect.

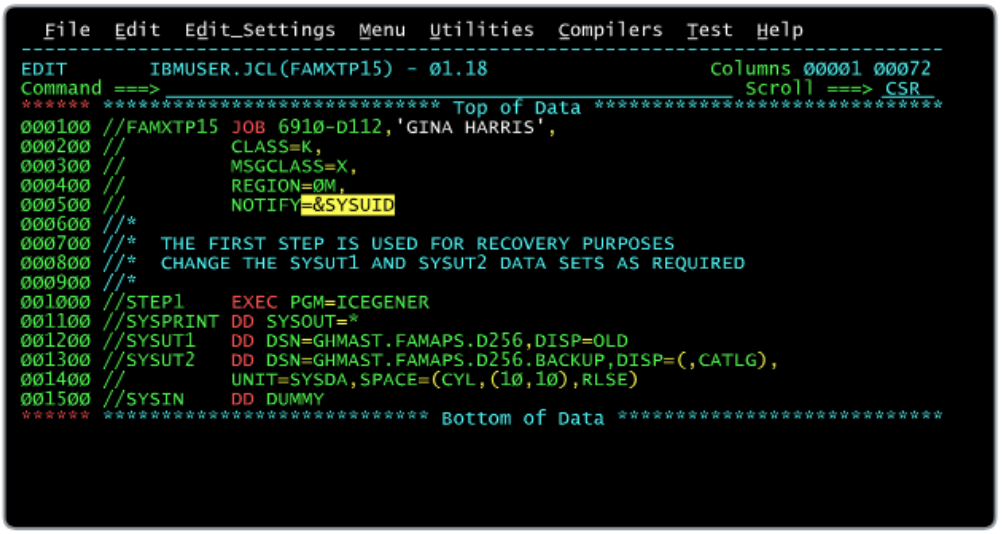


NOTIFY Parameter

When you submit your job to the system, most people will want to be notified once the job has completed, so it can be checked. This task is achieved using the NOTIFY parameter.

The syntax of this command is relatively straightforward. The NOTIFY value is a TSO user ID, usually the person submitting the job.

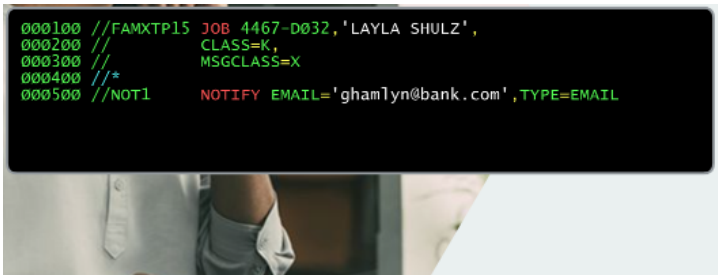
Use &SYSUID - for anyone to use your JCL instead of specifying a specific TSO UserID.



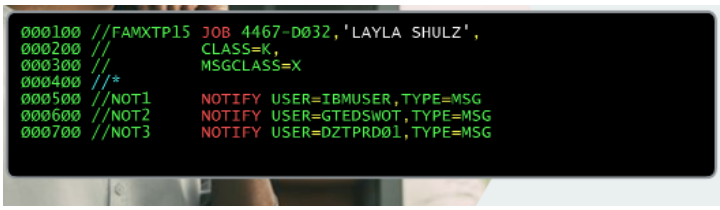
The NOTIFY parameter is quite simple but has a few drawbacks, including the following:

- If the user that the message is to be sent to is not logged on, they will not receive a job completion message until they next log on
- The NOTIFY parameter can only be used to send a message to a single user
- There is no default, so if you forget to code this parameter you will need to monitor the job using other methods, to determine if it has finished

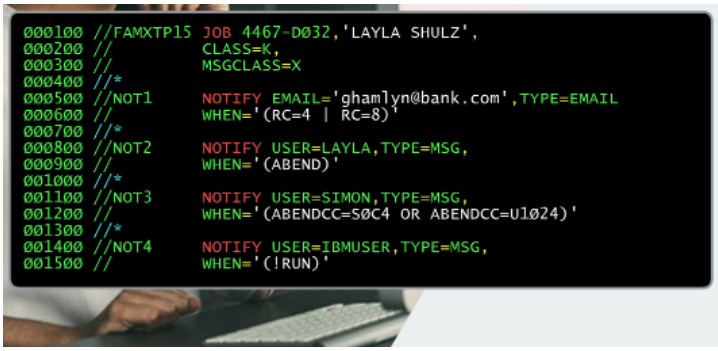
With z/OS 2.3 a new NOTIFY statement provides more flexibility in when and how job completion messages are sent. When specified, it must be placed after the JOB statement and before the first EXEC statement.



This statement name follows the standard naming syntax for other statements, as discussed previously. This is followed by at least one blank and then the statement type: NOTIFY. All parameters used in this statement are keyword, so can be specified in any order. The EMAIL parameter is used to define the email address to whom job completion details will be sent. The TYPE parameter indicates that the message is to be sent as an email message and is the default when the EMAIL parameter is used.



A maximum of eight NOTIFY statements can be specified. In this example the USER parameter is used to identify the TSO user to whom a job completion message will be sent. The TYPE parameter indicates that the notification should be sent by using a TSO message, and is the default when the USER parameter is specified.



The WHEN parameter can be used to define conditions under which notification will be performed. In the NOT1 statement, a confirmation email will be sent only if the job completes with a maximum condition code of 4 or 8. In the NOT2 statement, if an abend occurs then a message will be sent to TSO user LAYLA. The NOT3 statement is more specific as it indicates that either of the abend codes specified need to be produced before the message is sent. In the NOT4 statement if the job did not run - for example, it had a JCL syntax error - then a TSO message will be sent to TSO user IBMUSER. The exclamation mark (!) character indicates a not operation.