PD Tools Safari 2008 Workshop
Lab Exercises

Lab Exercise 1 FA
Use the Online Interface to View a Real-Time Analysis Report

In this exercise you will:

- Use the Fault Analyzer Online Interface to find your Fault Entry
- Use the "V" line command to View a Real-Time report
- View the Real-Time report to see information about the abend

Part 1: Using the Online Interface

1. Log on to TSO (if you are not already logged on).

2. Navigate to the Fault Analyzer Online Interface. Ask your instructor for assistance, if you aren't sure how to get there on your system.

```
IBM Fault Analyzer - Fault Entry List                          Line 1 Col 1 80
Command ===> _____________________________________________ Scroll ===> CSR

Fault History File or View  : 'DEFAULT.FAULT.HISTORY.FILE'_____________________

{The following line commands are available: ? (Query), V (View real-time
report), I (Interactive reanalysis), B (Batch reanalysis), D (Delete), H
(Duplicate history).}

   Fault ID Job/Tran User ID  Program  Sys/Job  Abend  Date       Time
__   F00003 DNET074S DNET074  SAM2     DEMOMVS  S0C7   2005/09/02 18:52:26
__   F00002 DNET074S DNET074  SAM2     DEMOMVS  S0C7   2005/09/02 18:40:24
__   F00001 DNET074S DNET074  SAM2     DEMOMVS  S0C7   2005/09/02 18:37:06

*** Bottom of data.
```

3. Check the name of the Fault History File shown. Verify that it is the history file where your Fault Analyzer stored your Fault Entry. Remember that Fault Analyzer displayed the history file name in the job log.
   - If the Fault History file shown is not the right one, type in the correct name, then press **ENTER**.

4. The correct Fault History file should be displayed. Next, find your fault entry. You can limit the display to only certain entries. Display only entries where the job name matches the first two characters of your job name:
   - Put your cursor on the first entry in the JOB/TRAN column.
   - Type in the first 2 characters of the job name, then asterisk, then space.
   - Press **ENTER**.

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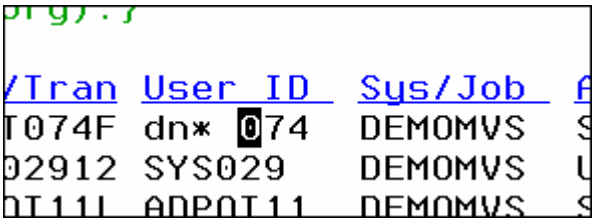
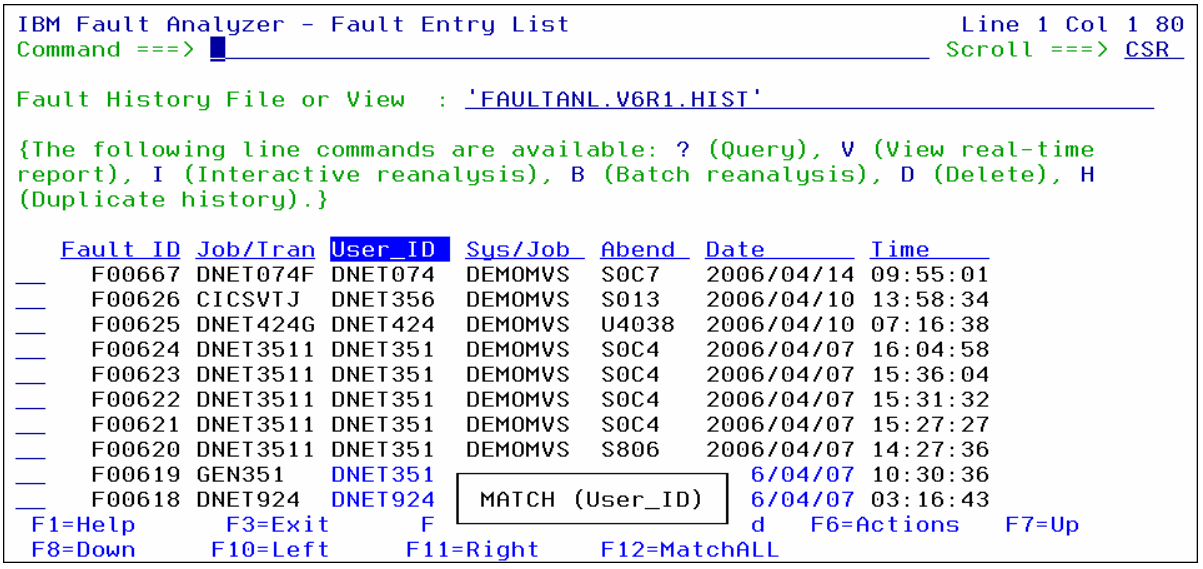


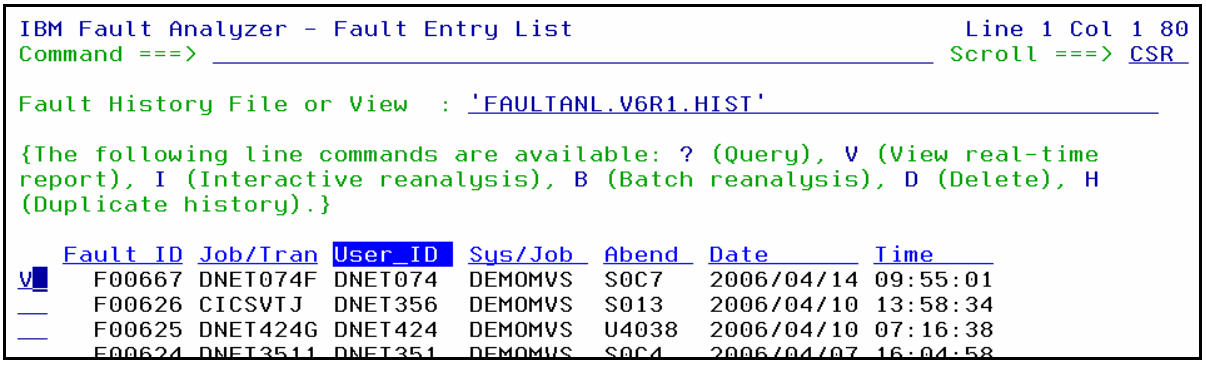
5. Notice that now only matching entries are displayed. You can match on any column, and you can even match on more than one column.



Part 2: View a Real-Time Report

6. Use the "V" line command to view the Real-Time Analysis Report:

   - Type **V** next to your Fault Entry, then **ENTER** .



7. The Real-Time Report is displayed. Notice that you can "Expand" and "Collapse" the report sections. Collapse all sections:

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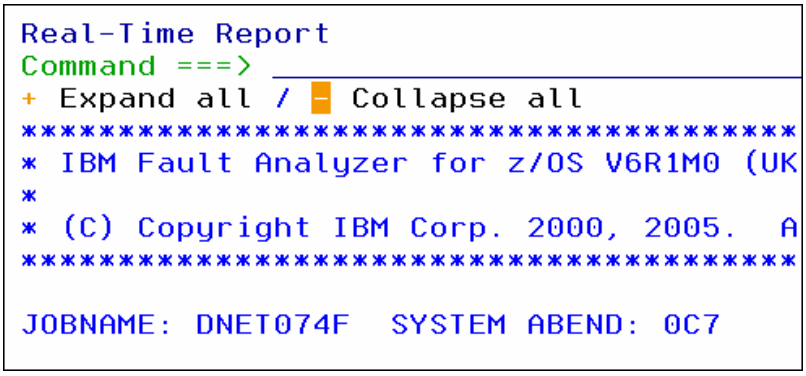
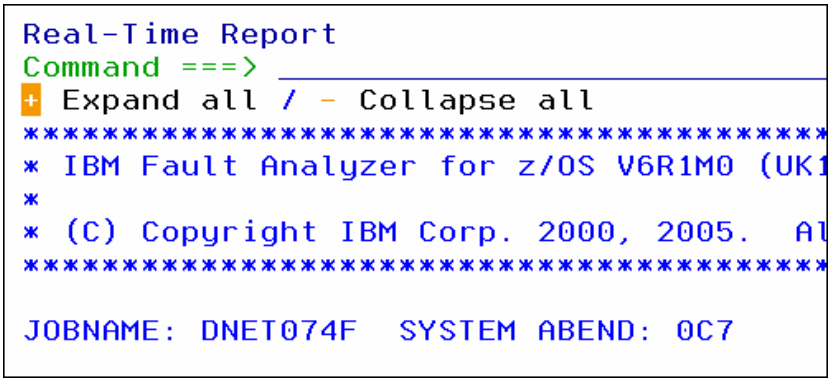
- Put your cursor on the **-** (minus sign) next to "Collapse All", then **ENTER** .
- Notice that the report sections are all collapsed.



8. Expand all sections:
   - Put your cursor on the **+** (plus sign) next to "Expand All", then **ENTER** .
   - Notice that the report sections are all expanded.



9. You can navigate the report using the Find command (for example: F some-text), and the scroll PF keys: PF7 (up), PF8 (down), PF10 (left), and PF11 (right).

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10. Navigate through the report to familiarize yourself with it. Find answers to the following questions. (Answers are on the following page).

- What program was executing when the abend occurred?

_____

- What COBOL statement was executing?

_____

- The program abended because there was bad data in a variable. What variable had the bad data?

_____

- SAM2 is a sub-program. What is the name of the main program?

_____

- There is a variable named CUST-NAME in program SAM2. What value was stored in this variable when the abend occurred?

_____

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11. Answers to above questions:

- **What program was executing when the abend occurred?**

  SAM2. This information is in the Synopsis section.

- **What COBOL statement was executing?**

  COMPUTE CUST-ACCT-BALANCE = CUST-ACCT-BALANCE + WS-UPDATE-NUM. This information is in the Synopsis section.

- **The program abended because there was bad data in a variable. What variable had the bad data?**

  CUST-ACCT-BALANCE. This variable is flagged as "Cause of error" in the Synopsis section. Also, the value is displayed in Hex in the Synopsis, which is an indicates that it has bad data.

- **SAM2 is a sub-program. What is the name of the main program?**

  SAM1. This information is the Event Summary section. The Event summary shows the active CALL chain. The first program in the list is the main program.

- **There is a variable named CUST-NAME in program SAM2. What value was stored in this variable when the abend occurred?**

  "Aster, Dez". This information is shown in the "Associated Storage Areas" section of the detail report for Event 3 (which is program SAM2). The easiest way to get this information is to do a Find command (for example: "F CUST-NAME".

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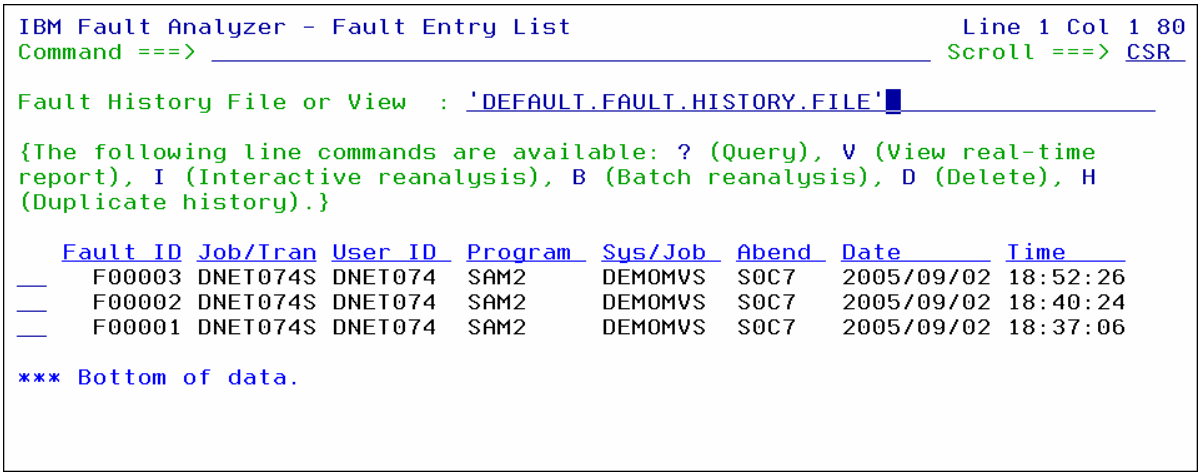
Lab Exercise 2 FA
Using Interactive Re-Analysis

In this exercise you will:

- Become familiar with navigating when using Interactive Re-Analysis

1. Log on to TSO (if you are not already logged on).

2. Navigate to the Fault Analyzer Online Interface. Ask your instructor for assistance, if you aren't sure how to get there on your system.



3. Check the name of the Fault History File shown. Verify that it is the file where your Fault Analyzer stored your Fault Entry. Remember that Fault Analyzer listed the file name in the job log.
   - If the Fault History file shown is not the right one, type in the correct name, then press **ENTER**.

4. Use the "I" line command to view the Real-Time Analysis Report:
   - Type **I** next to your Fault Entry, then **ENTER** .

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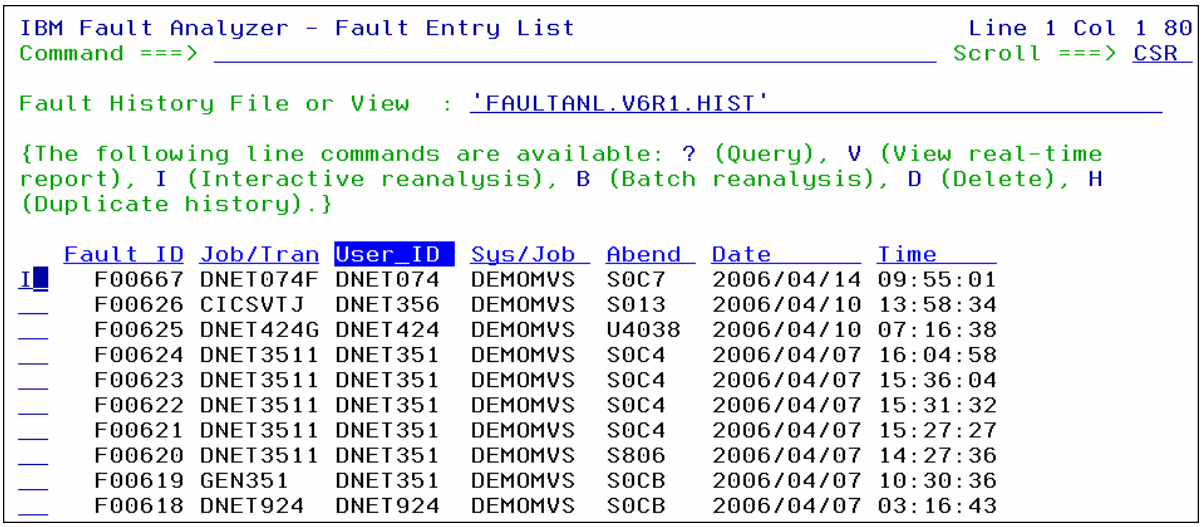
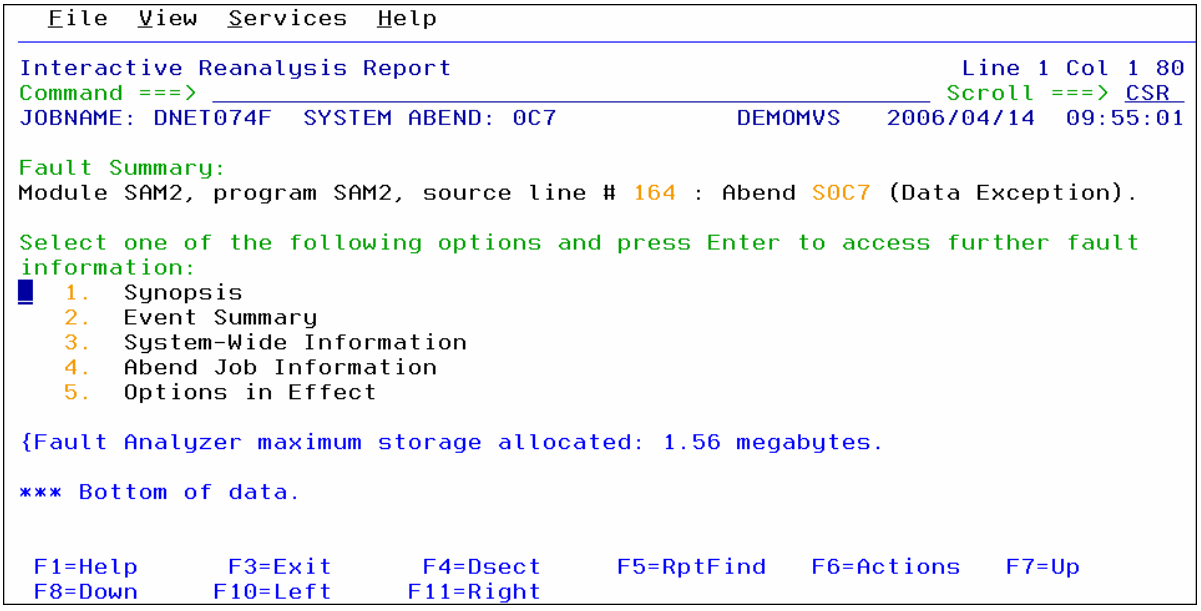


5. The Interactive Analysis Report panel is displayed:



6. Refer to the Workshop manual, and turn to the section titled: “Analyze an Abend”. Perform the step-by-step activities that are shown on those slides. As you go through the process, you will see information about the application that will lead to the reason why this abend occurred.

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Lab Exercise 3 FM
Using a Copybook Template

In this exercise you will:

- Use a copybook to create a Template
- Specify selection criteria to limit records displayed
- Specify field selection to limit fields displayed
- Use the TE command to edit a template
- Use a "temporary" template
- Save a template
- Save a copy of a template with a new name

1. Log on to TSO (if you are not already logged on).

2. Navigate to the File Manager menu.

Part 1: Specify a Copybook

3. Select the Edit option.

   - Type **2** on the command line, then **ENTER**.

```
File Manager                    Primary Option Menu
Command ===> 2

0  Settings      Set processing options                    User I
1  Browse        Browse data                               System
2  Edit          Edit data                                 Appl I
3  Utilities     Perform utility functions                 Versio
4  Tapes         Tape specific functions                   Termin
5  Disk/VSAM     Disk track and VSAM CI functions          Screen
6  OAM           Work with OAM objects                     Date.
7  Templates     Template and copybook utilities           Time.
8  HFS           Access Hierarchical File System
X  Exit          Terminate File Manager
```

4. The Edit Entry Panel is displayed. Next, you will name a copybook that will be used to create a template.

   - Type (or verify) **ADLAB.CUST1** in the Data set/path name field.
   - Type **ADLAB.COPYLIB(CUST1)** in the Copybook or Template: Data set name field.

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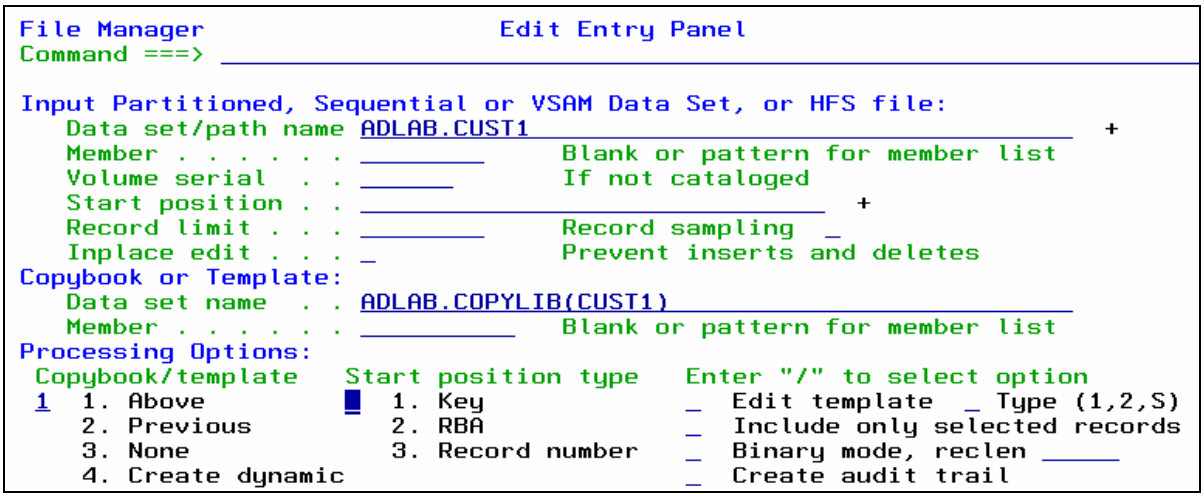
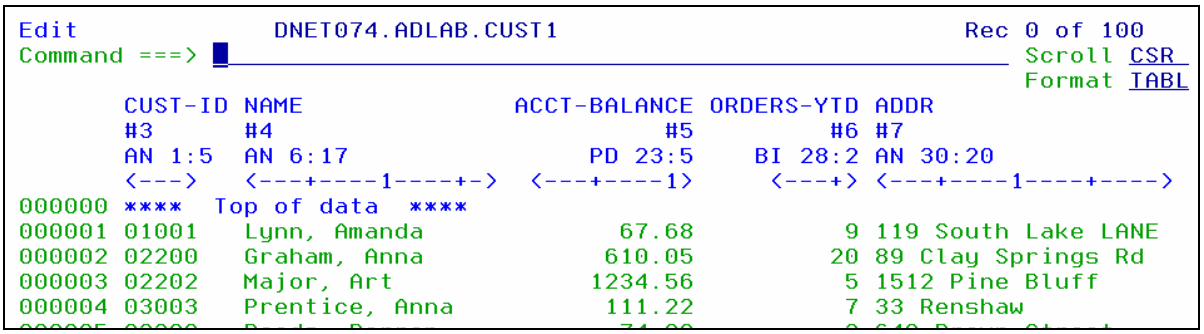
- Type **1** (above) in the "Copybook / Template" option field.
- Press **ENTER.**



5. The Edit panel is displayed. File manager compiled the copybook and created a "template", which is used to format the records.



Part 2: Editing a Template

6. There are different ways to navigate to the Template Edit panel. The "TE" (Template Edit) command is one way.

- Type **TE** (Template Edit) on the command line, then **ENTER.**

7. The Template Edit panel is displayed.

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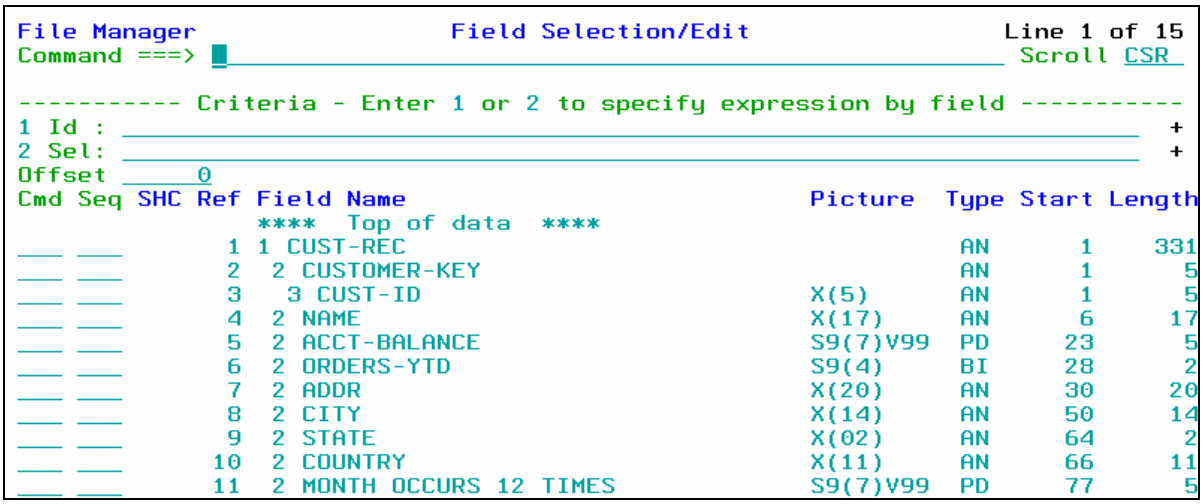

8. Note: From this panel, you can specify selection criteria and field formatting, among other things. **Remember that you can use the "TE" command at any time during your edit session to view or change the template.**

9. In a few steps you will update the template, but right now, exit from Template Edit:

   - Press **PF12** (Cancel).

10. The Edit panel is displayed. Exit from the editor:

    - Press **PF3.**

11. Next, you will specify record selection criteria in the template. There are two methods to specify criteria: 1) as a free format expression, or 2) "by field". In the next steps you will use the free format method.

12. The Edit Entry panel is displayed. Leave all of the fields unchanged, except:

    - Type / (slash) in the Edit Template field.
    - Press **ENTER.**

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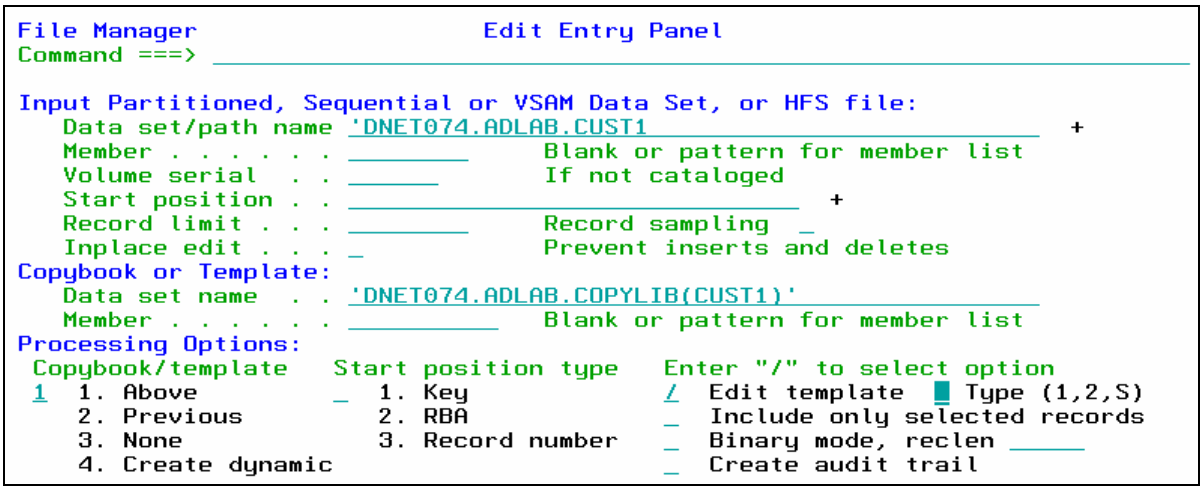

Part 3: Selecting Records

13. Note: The Field Selection / Edit panel is displayed. You can enter free format selection here.

14. Enter criteria to select all records where the Acct-Balance is greater than 1000:

- Type **#5 > 1000** in the Sel field.
- Note: this uses the field reference number (#5) for the ACCT-BALANCE field. Free format criteria have the syntax of a REXX condition. In free-format criteria, you can also use REXX functions and REXX-like functions that are provided by File Manager. The File Manager User's Guide and Reference manual describes available functions.
- You have the option to use the template without saving it ("run temporary"), or to save the template. Run the template without saving it:

__ 1. Press **PF6** . PF6 is set to the "RUNTEMP" (run temporary) command.

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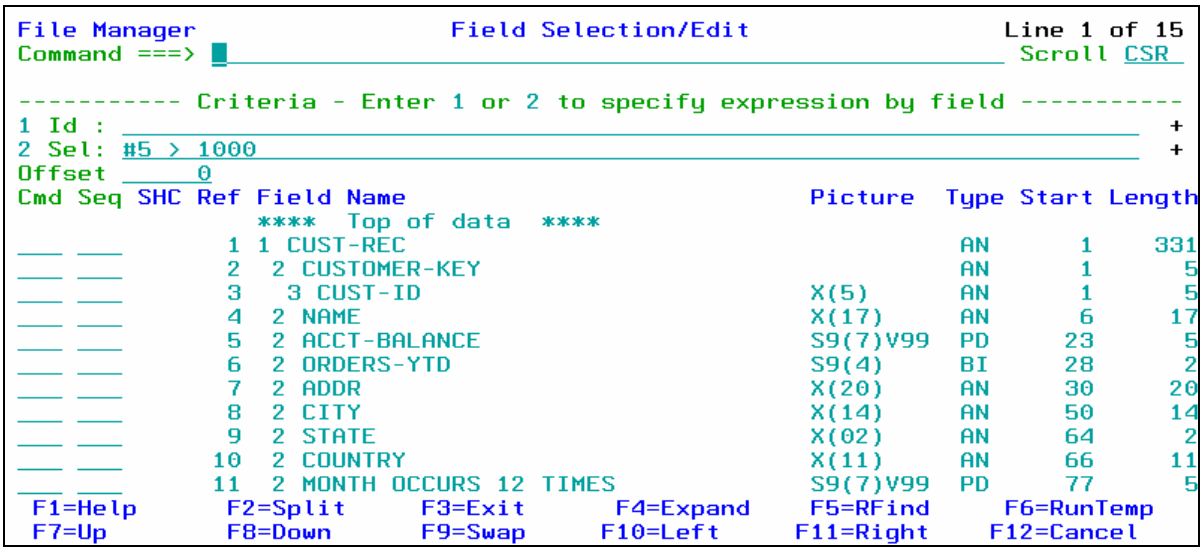
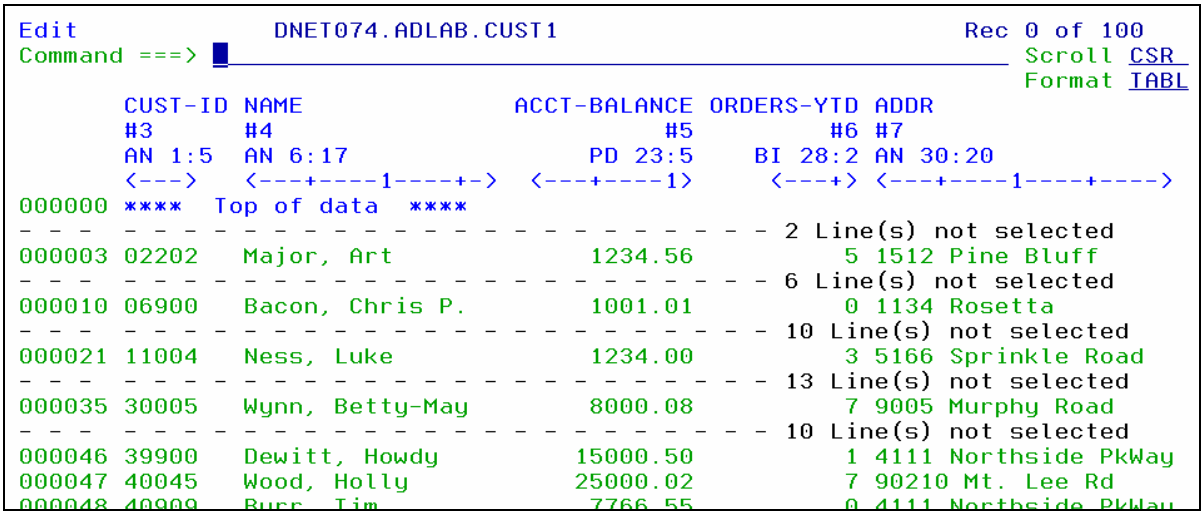


15. The Edit panel is displayed. Notice that there are some "Not Selected" lines. These are the records that did not match the selection criteria. Verify that only records with Acct-Balance greater than 1000 are displayed, as shown:

- IF your results are not correct, then check that you entered your selection criteria correctly. Use the **TE** command to edit the template. This will give you a chance to test what you have learned so far about using a template. Hint: After fixing your selection criteria on the template Field Selection / Edit panel, use PF6 (Run Temporary) to return to the Edit panel.



16. The Edit panel is displayed. Exit from the editor:

- Press **PF3**.

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17. In the previous steps, you entered selection criteria using a free format expression. In the next steps, you will use a different method to enter selection criteria: the "by field" method.

18. The Edit Entry Panel is displayed. Leave all of the fields unchanged, except:

- Type **/** (slash) in the Edit Template field.
- Press **ENTER.**

```
File Manager                    Edit Entry Panel
Command ===> ____________________________________________________________

Input Partitioned, Sequential or VSAM Data Set, or HFS file:
   Data set/path name 'DNET074.ADLAB.CUST1                          +
   Member . . . . . _________     Blank or pattern for member list
   Volume serial  . _______       If not cataloged
   Start position . _____________________________ +
   Record limit . . _________     Record sampling  _
   Inplace edit . . _             Prevent inserts and deletes
Copybook or Template:
   Data set name  . 'DNET074.ADLAB.COPYLIB(CUST1)'
   Member . . . . . __________    Blank or pattern for member list
Processing Options:
 Copybook/template   Start position type   Enter "/" to select option
 1  1. Above         _  1. Key             /  Edit template  Type (1,2,S)
    2. Previous         2. RBA             _  Include only selected records
    3. None             3. Record number   _  Binary mode, reclen _____
    4. Create dynamic                      _  Create audit trail
```

19. The Field Selection / Edit panel is displayed. Choose "By Field" selection:

20. Type **2** on the command line, then **ENTER.**

```
File Manager                  Field Selection/Edit                    Li
Command ===> 2                                                         S

----------- Criteria - Enter 1 or 2 to specify expression by field -
1 Id :
2 Sel:
Offset     0
Cmd Seq SHC Ref Field Name                                Picture  Type S
```

21. The Record Selection Criteria panel is displayed. Enter criteria to select records where the Acct-Balance field is greater than 1000:

- On the line for the "Acct-Balance" field, type **>** (greater than) in the Operator column.
- On the line for the "Acct-Balance" field, type **1000** in the Value column.
- Note: If needed, help is available by pressing PF1.
- Press **PF3** .

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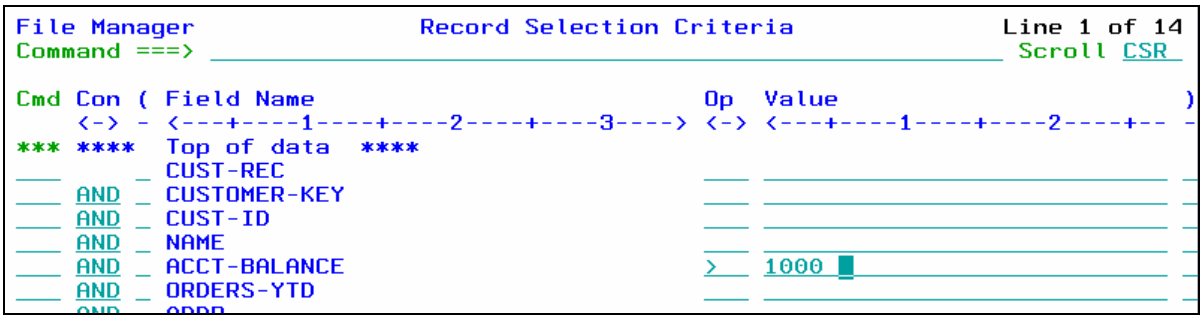
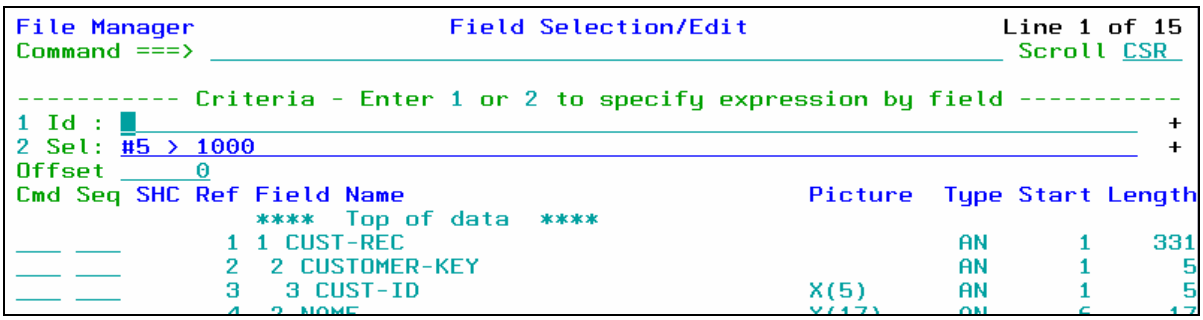


22. The Field Selection / Edit panel is displayed. Notice that File Manager automatically formatted the free format criteria on this panel. Exit from this panel:

    - Press **PF3.**



23. The Template Save panel is displayed. You have the option to save the template, or use the template without saving it ("run temporary"). Save the template:

    - Type **ADLAB.TEMPLATE(CUST1)** in the Data set/path name field.
        - This will save the template with the name CUST1 in your template library. A template library can be any PDS or PDSE with LRECL=80 and RECFM=FB.
        - Note: depending on your TSO profile settings, you may need to type the full data set name with your personal file prefix.
    - Press **PF3** to save the template.

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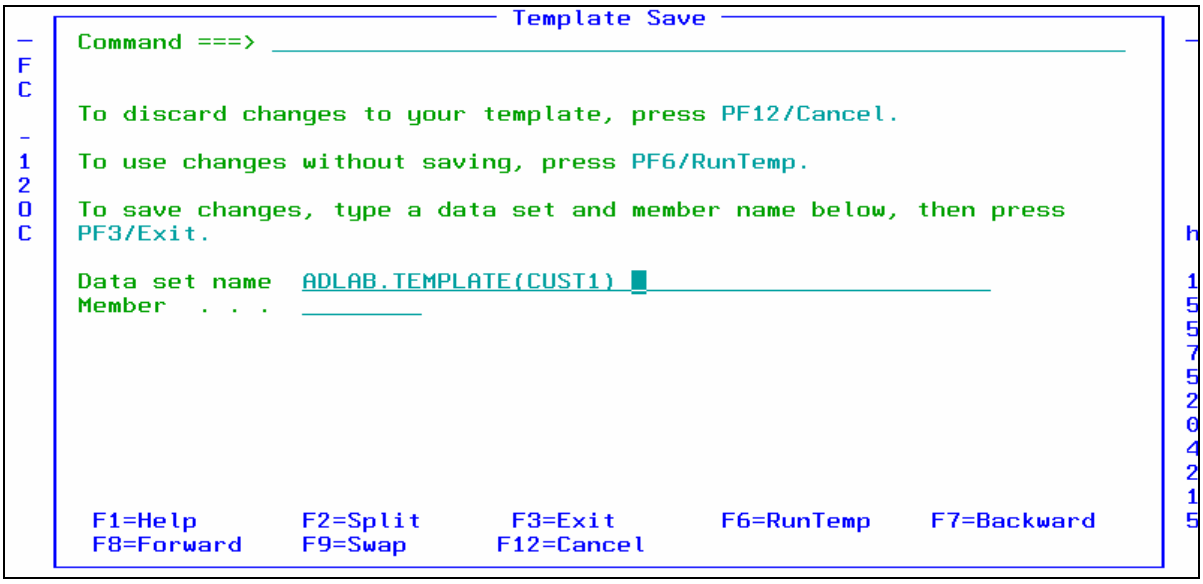
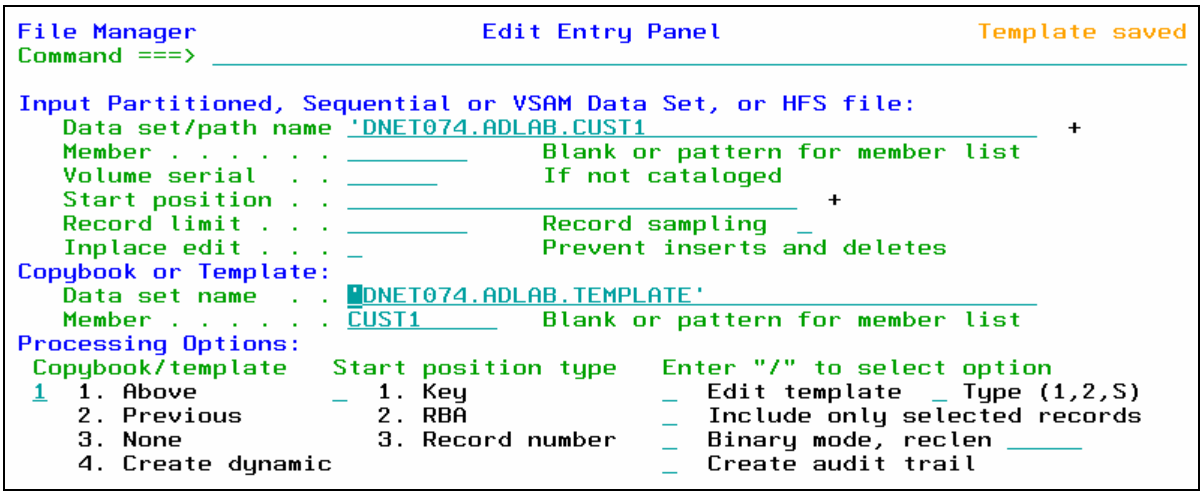


24. The Edit Entry Panel is displayed.

- Notice that the template was saved, and the name of the new template was automatically filled in.
- Press **ENTER.**



25. The Edit panel is displayed. Notice that there are some "Not Selected" lines. These are the records that did not match the selection criteria. Verify that only records with Acct-Balance greater than 1000 are displayed, as shown:

- IF your results are not correct, then check that you entered your selection criteria correctly. Use the **TE** command to edit the template.

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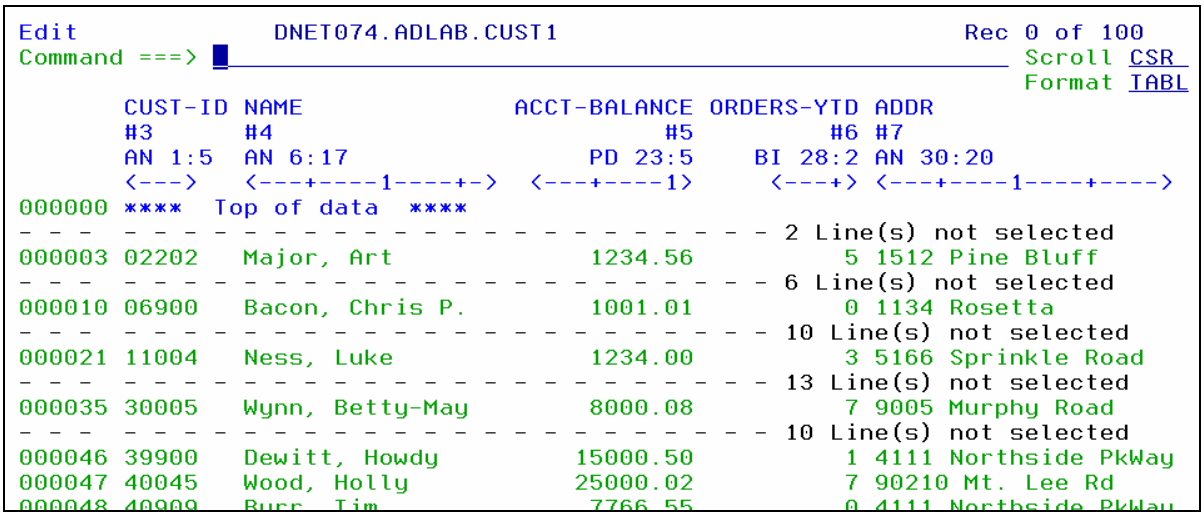

26. The Edit panel is displayed. "Not Selected" lines are one type of shadow line. You can use the SHADOW command to display or hide shadow lines:
    - Type **SHADOW ALL OFF** on the command line, then **ENTER.**
    - Notice that the "Not Selected" lines disappear.
    - Type **SHADOW ALL ON** on the command line, then **ENTER.**
    - Notice that the "Not Selected" lines are displayed.

27. The RECSTATS command can be used to get record counts.
    - Type **RECSTATS** on the command line, then **ENTER.**
    - Notice that information about the file is displayed, such as record lengths and how many changes are pending**.**
    - Type **PF8** (scroll forward).
    - Notice that the number of records selected, and not selected, are displayed.
    - Press **PF3** to exit the RECSTATS display.

Part 4: Selecting Fields

28. In the next steps, you will select only certain fields for display. Edit the template:
    - Type **TE** (Template Edit) on the command line, then **ENTER.**

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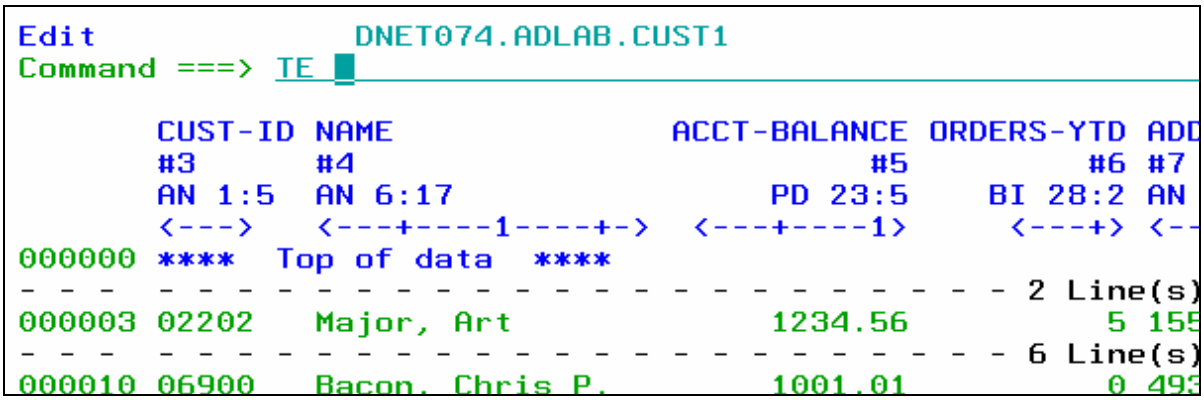

29. By default, all elementary fields are displayed. Select the fields to be displayed, specify the order in which fields are displayed, and "hold" a field (to keep it on the display when scrolling)::

- Type **S** (select) in the Cmd column next to the following fields:
  - CUST-ID
  - NAME
  - ACCT-BALANCE
  - ADDR
  - CITY
  - OCCUPATION (you may need to scroll forward (PF8) to see this field)
- In the Seq (sequence) column:
  - Type **1** for the NAME field.
  - Type **2** for the OCCUPATION field.
- Press **ENTER** .

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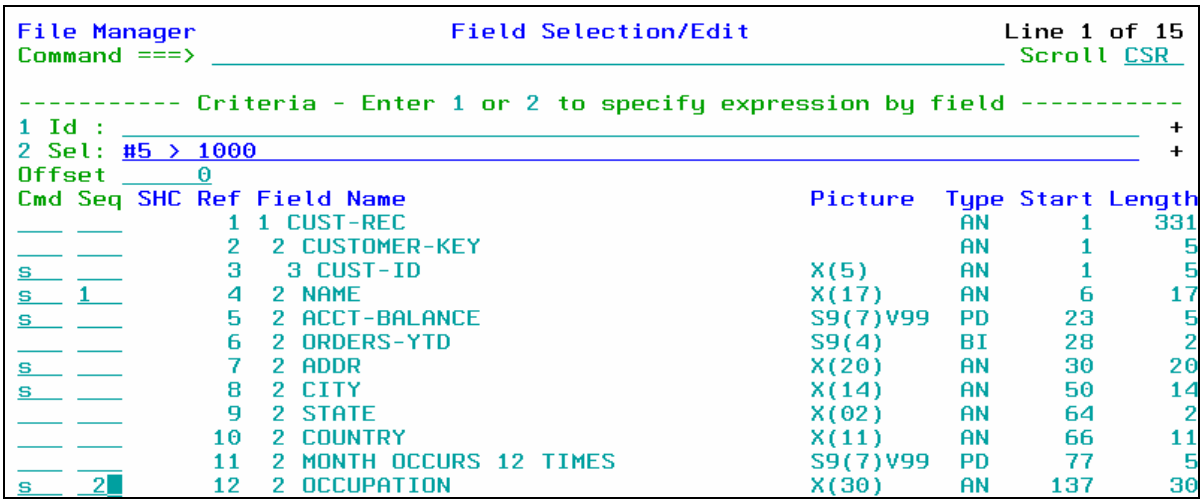
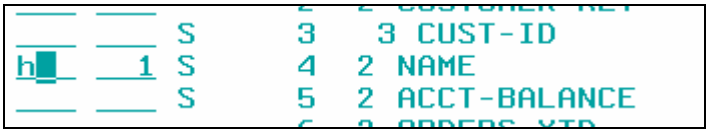
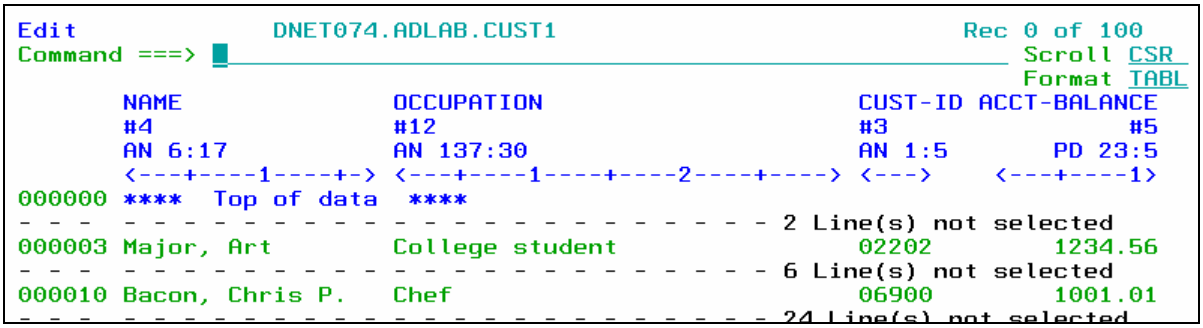


- Type **H** (hold) in the Cmd column for the NAME field.



- Press **PF3** .

30. The Edit panel is displayed. Notice that only the selected fields are displayed. Name and Occupation are the first fields displayed, as shown here:



31. IF your results are not correct, then check that you selected the fields correctly. You can use the TE command to get started.

32. Scroll to the right.

- Press **PF11.**
- Notice that the NAME field is still displayed. It is a “held” field.

33. Switch to SNGL format.

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- Type **FS** on the command line, then **ENTER.**

34. Notice that only the selected fields are shown in SNGL format.

Part 5: Make a copy of a Template

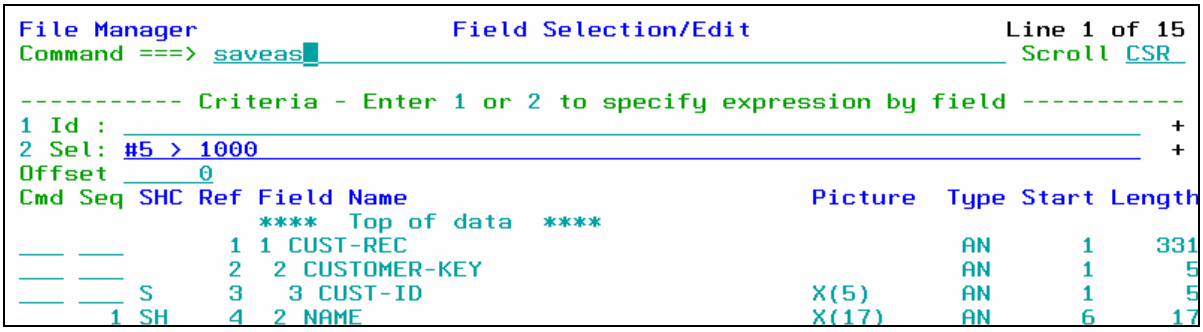
35. Note: Sometimes you may want to save a copy of a template, so that you can make changes to the copy while leaving the original template unchanged. In the next steps you will make a copy of a template.

36. Edit the template:

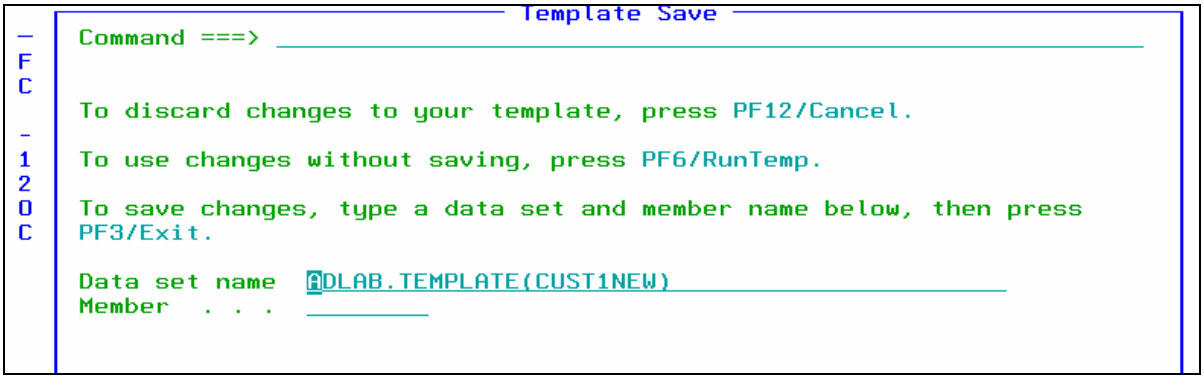
- Type **TE** (Template Edit) on the command line, , then **ENTER.**

37. The Field Selection / Edit panel is displayed. Save the template with a new name:

- Type **SAVEAS** on the command line, then **ENTER**.



- The Template Save panel is displayed.
- Type **ADLAB.TEMPLATE(CUST1NEW)** in the Data set name field.
  - Note: depending on your TSO profile settings, you may need to type the full data set name with your personal file prefix.
- Press **PF3** .



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38. The Field Selection / Edit panel is displayed. The DESCRIBE command can be used to show information about a template:
    - Type **DESCRIBE** on the command line, then **ENTER**.
39. Notice that you are now using the new template named CUST1NEW.
40. Exit from the editor:
    - Press **PF3** several times until you exit from the editor.

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Lab Exercise 3 DT

In this exercise you will:

- Run a TSO command to run an EXEC that will run a program and start Debug Tool
- Get ready for exercise 4 by starting a Debug Tool session

IMPORTANT NOTE:

- **This exercise will walk you through an easy way to run a sample program and start Debug Tool so you can do exercise 5. You will run a special REXX EXEC that will be used only for this workshop. This is not the method you will use to start Debug Tool with your own applications. Exercises 6, 7, 8, 9, and 10 will all show more general-purpose methods for starting Debug Tool with batch programs.**

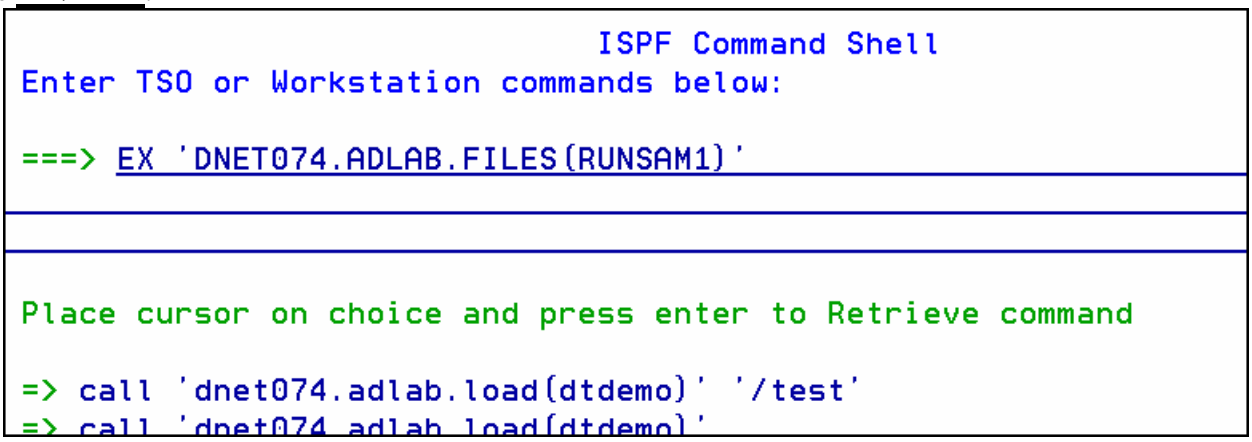
1. Log on to TSO.

2. Navigate to the ISPF Command shell panel. (This is usually option 6 from the main menu).

3. Type in the following command:

   EX 'your-tso-id.ADLAB.FILES(RUNSAM1)'

   Press **ENTER**.



4. When the program executes, Debug Tool will appear on your TSO terminal.

   SUCCESS! Debug Tool appears.

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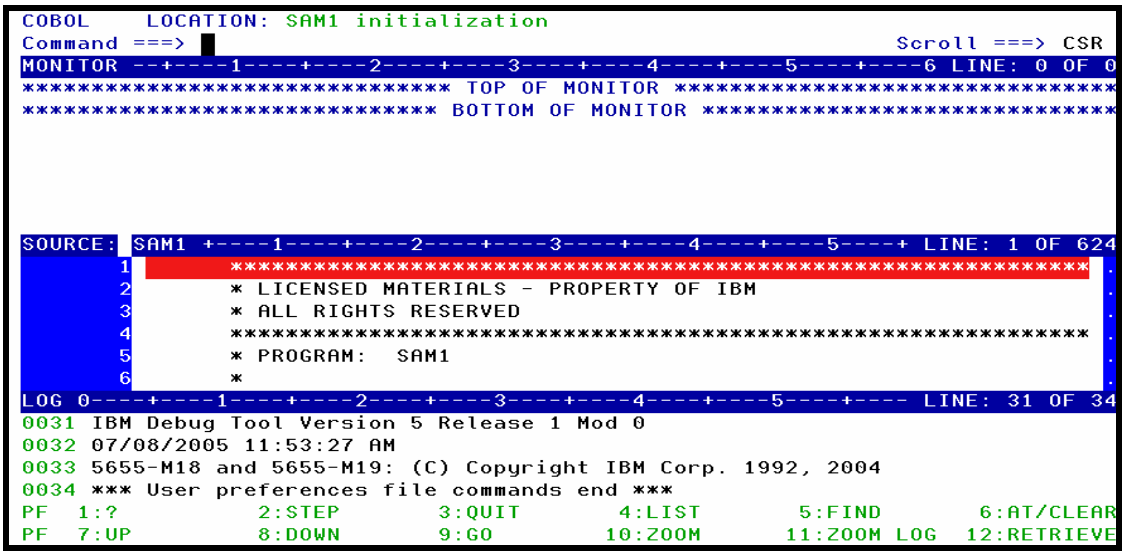

Note: You may see error messages in the log window (bottom window) as Debug Tool tries to open the Preferences file (INSPPREF) and the Log file (INSPLOG). IGNORE these errors. They are normal, and the files will not be needed yet.

5. You have an active Debug Tool session, and you are ready for exercise 4 DT.

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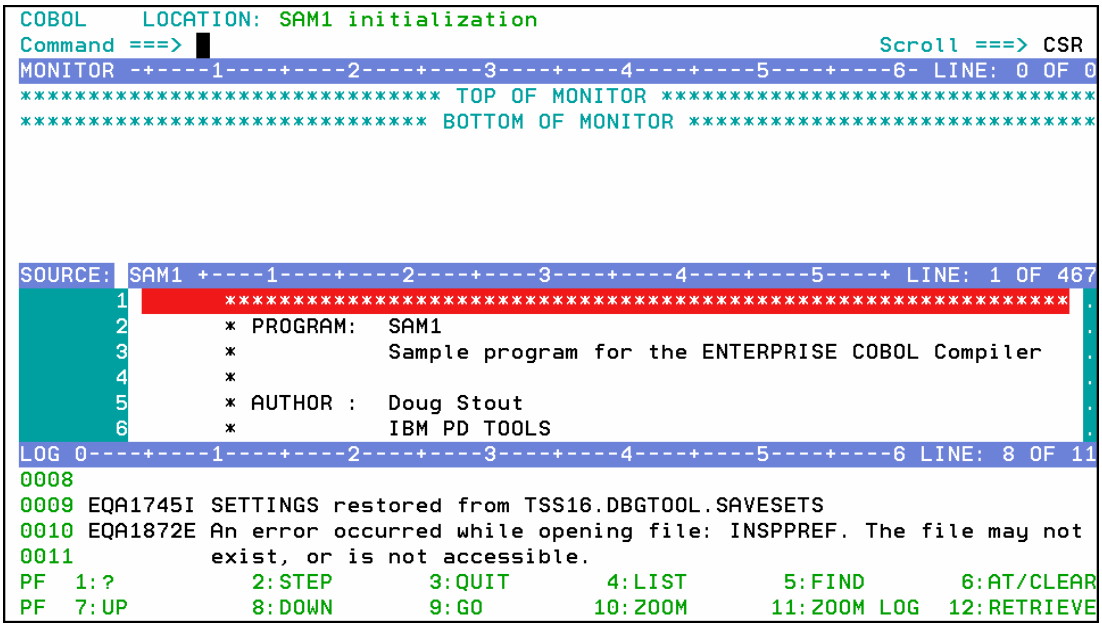
Lab Exercise 4 DT

In this exercise you will:

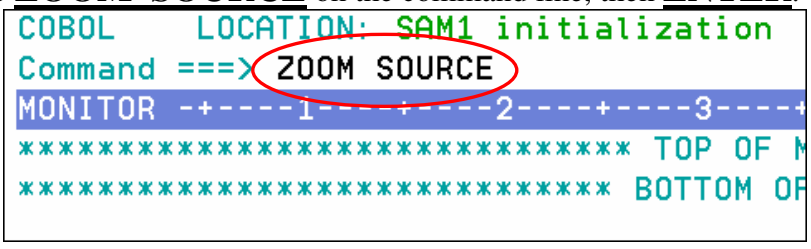
- Learn the basic Debug Tool commands.



1. Notice that the Debug Tool screen has a command line and three windows. The "Monitor window" is typically used to view and change variables, as you will see later. The "Source window", seen in the middle of the screen, is where program source is shown, and the "Log window" is where your commands are logged and Debug Tool messages are displayed.

2. You can see all three windows on the screen at the same time, or you can "zoom" to one window. For example, you can zoom to the source window.

   - Type **ZOOM SOURCE** on the command line, then **ENTER**.



   - The source window will be displayed in zoom (full screen) mode. Sometimes it is easier to zoom into a window so you can see more lines of information.

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- The ZOOM command will zoom in and also zoom out. Type **ZOOM** on the command line, then **ENTER**.
- Notice that all three windows are displayed again. The zoom commands are: ZOOM MONITOR, ZOOM SOURCE, ZOOM LOG, and ZOOM MEMORY (for the memory window). Tip: Debug Tool commands can be abbreviated. For example, you can shorten ZOOM SOURCE to just Z S, or ZOOM MONITOR can be shortened to Z MO.

3. Notice that PF10 is set to the ZOOM command. It will zoom in and also zoom out.
   - Press **PF10** to zoom to the log window.
   - Notice that only the log window is displayed.
   - Press **PF10** or **PF11** to zoom out.
   - Notice that all three windows are displayed again.
4. A "?" (question mark) character can be used to get help about Debug Tool commands. If "?" is entered as a command by itself, a list of all commands is displayed in the log.
   - Type **?** on the command line and **ENTER**.
   - Notice that you can see some commands listed in the log window. Only the last few lines of the log are visible on the screen now, so zoom into the log: type **ZOOM LOG** on the command line, then **ENTER**.
   - Now you are zoomed into the log window.
5. A "?" typed as part of a command will result in a list of matching commands displayed in the log window. Next you will display the different options of the "AT" command (used to set breakpoints):
   - Type **AT ?** on the command line and **ENTER**.
   - A list of the things that you can type in a command after the word "AT" is displayed.

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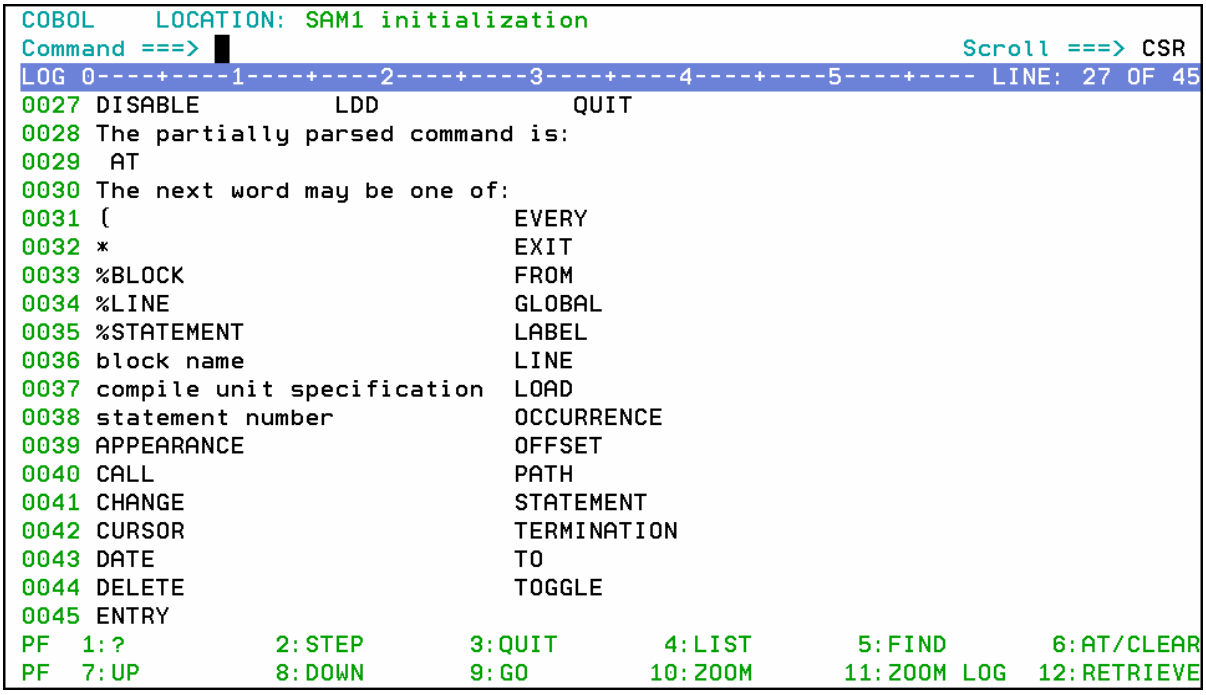

6. Zoom out of the log window to display all three windows again. You can use either of these methods:

   - Type **ZOOM** on the command line, then **ENTER**, **or**
   - Press **PF10** or **PF11** .
   - All three windows should be displayed again.

7. The STEP command can be used to execute statements. Try both of these methods:

   - Type **STEP** on the command line, then **ENTER.**
   - Press **PF2**.

8. You can scroll in the Source window by using the scroll keys: PF7 (up) and PF8 (down).

   - Press **PF8** a few times to scroll the source window down.
   - Press **PF7** a few times to scroll up.
   - Tip: You can scroll the other windows (the Log and Monitor windows) by placing your cursor in those windows before you press PF7 or PF8.

9. Set breakpoints at program statements. Try each of these different methods:

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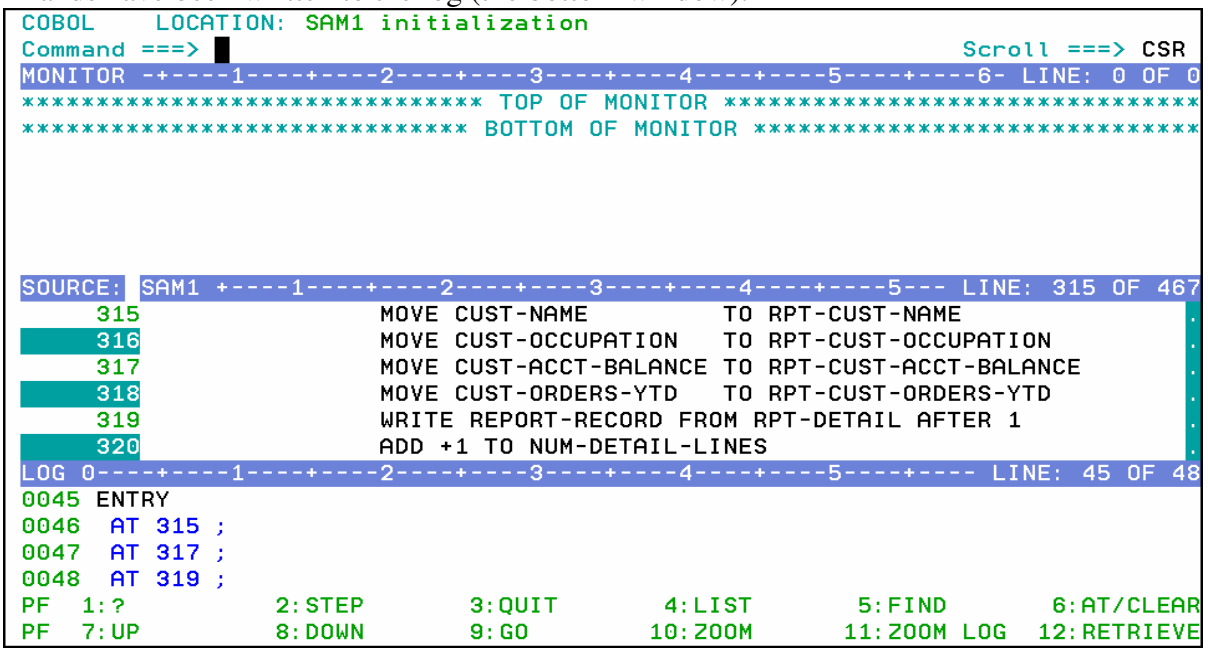
- First, scroll the source window until you can see statement 315. You can use either of these methods:
  - Scroll forward with **PF8** until you get to statement 315, **or**
  - Type **TOP** on the command line and press **ENTER**, then type **315** on the command line and then press **PF8** .
- Place the cursor on statement 315 in the Source window and then press **PF6.**
- Type **AT 317** on the command line (where 317 is a valid statement number) then **ENTER**.
- Type **A** (for AT) in the prefix area (the numbered area to the left of the program) of statement 319 in the Source window, then **ENTER**.

10. You should have some breakpoints set now. Notice that the colors are reversed in the prefix area (on the left side of the screen) next to the statements with breakpoints. Also notice that all of your commands have been written to the log (the bottom window).



11. You can display (List) your breakpoints:

- Type **LIST AT** on the command line, then **ENTER**.

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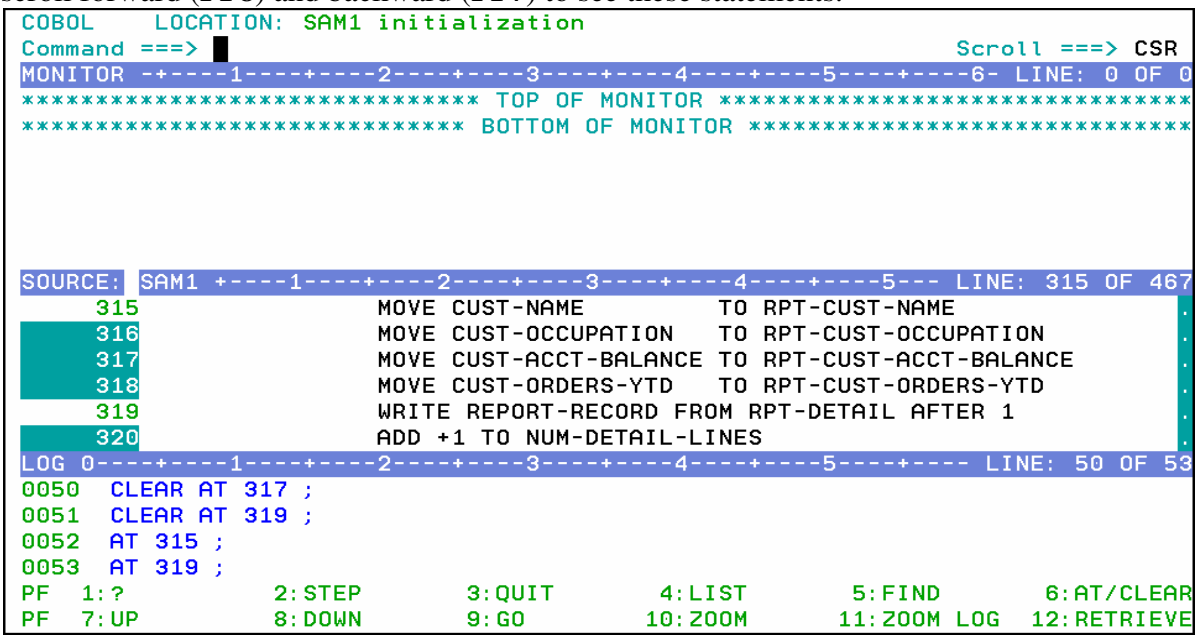
- Your breakpoints are displayed in the log window. You *may* need to use PF11 (or the "Zoom Log" command) to see the entire log window. If you do, you can use PF11 again to re-display all windows.

12. Clear statement breakpoints. Try all of these different methods:

- Place the cursor on statement 319, and press **PF6.** Notice that PF6 will toggle breakpoints on and off.
- Type **CLEAR AT 315** on the command line (where 315 is a statement that already has a breakpoint) then **ENTER**.
- Type **C** (for Clear) in the prefix area (the numbered area to the left of the program) of a statement with a breakpoint, then **ENTER**.
- To clear all breakpoints with a single command, type **CLEAR AT** on the command line, then **ENTER**.

13. Set breakpoints at statements 315 and 319. It's OK if you have other breakpoints set. If needed, you can scroll forward (**PF8**) and backward (**PF7**) to see these statements.



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14. Run the program until it reaches a breakpoint.

    - Type **GO** on the command line, then ENTER.
        - The program should be stopped at a breakpoint.
        - If you see messages from the program displayed on the screen with three asterisks (***), press ENTER to continue.
        - If the program ended (and the Debug Tool session ended), then you probably did not have a breakpoint set where it would be reached. If that happened, re-run the program (see exercise 3) to start Debug Tool again. Re-run the program as many times as needed throughout this exercise.
    - PF9 is set to the GO command. Make sure you have a breakpoint that will be reached. Then, press **PF9** to GO.

15. Practice setting, clearing, and running to breakpoints at statements until you are familiar with:
    - the "AT #" and "CLEAR AT #" commands
    - PF6 as a toggle to turn breakpoints on or off
    - the "A" (At) and "C" (Clear) line commands
    - PF9 or the "GO" command to run the program until it reaches a breakpoint

16. You can use the JUMPTO command to "jump" to a statement and continue execution at this statement. This is sometimes helpful to re-execute a few statements in the program. Try the following:
    - Make sure you have a breakpoint at statement 319.
    - Run the program (GO or PF9) until it is stopped at statement 319.
    - Type **JUMPTO 308** on the command line, then ENTER.
    - The program should be stopped at statement 308.

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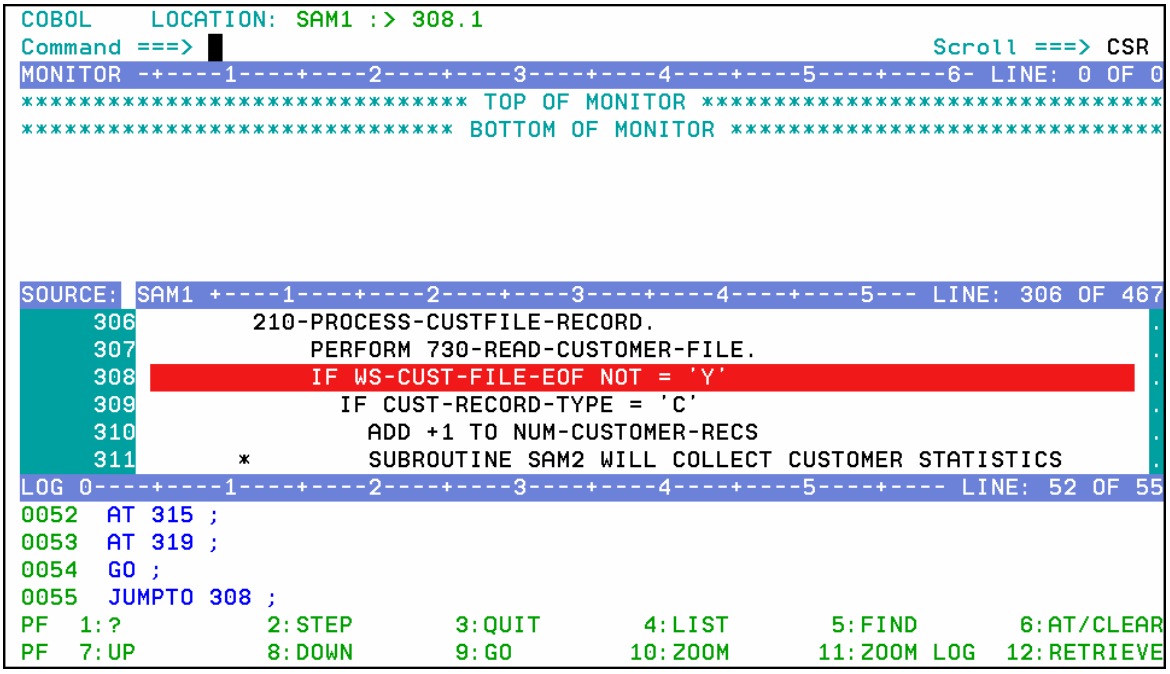

- The program will continue to run from statement 308. Use the **STEP** command (or **PF2**) 2 or 3 times run a few statements.

17. You can use the GOTO command instead of JUMPTO. It is similar to JUMPTO, but it does not stop at the statement. It jumps to the statement and the program immediately continues to run. The program will automatically run to the next breakpoint (or the end of the program).

    - Make sure you have a breakpoints at statements 315 and 319.
    - Run the program (the GO command or PF9) until it is stopped at statement 319.
    - Type **GOTO 308** on the command line, then ENTER.
    - The program continued to execute from statement 308, but Debug Tool did not wait there. A GOTO command will not stop at the target statement unless you have a breakpoint there. The program is stopped at the next breakpoint that it reached.

18. Display the value of a program variable in the Log. Try these different methods:

    - Type **LIST CUST-NAME** on the command line and **ENTER**. (CUST-NAME is a variable in the program.)
    - Type **LIST** on the command line, then place the cursor directly on any variable that appears in the Source window, then press **ENTER**.

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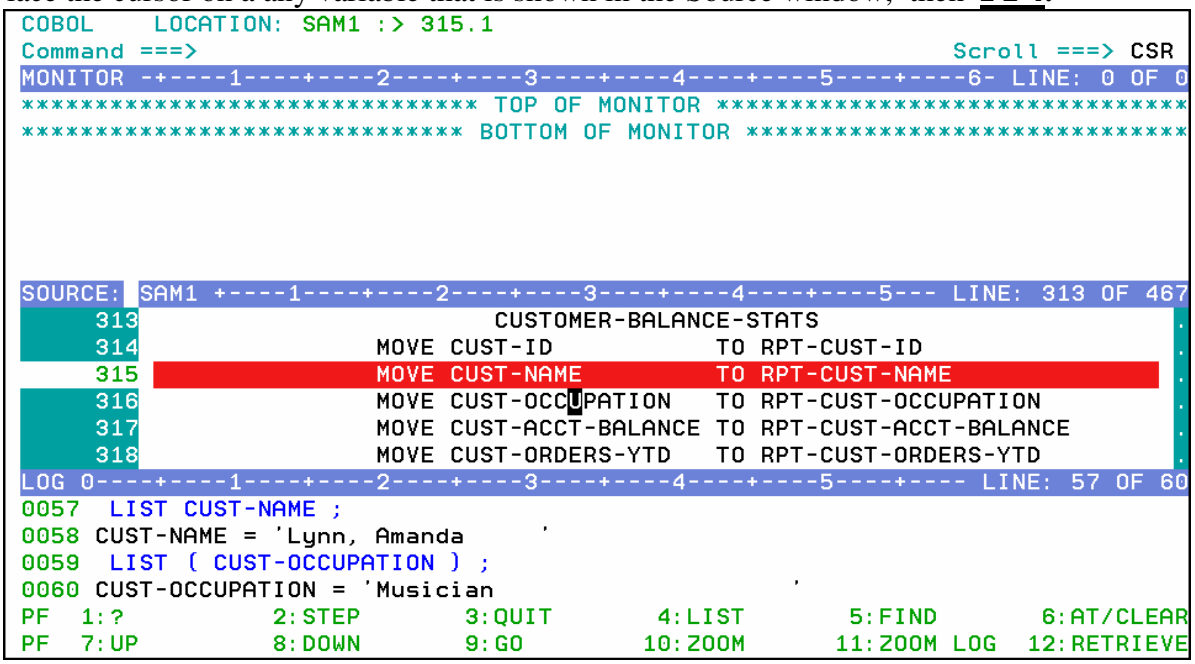
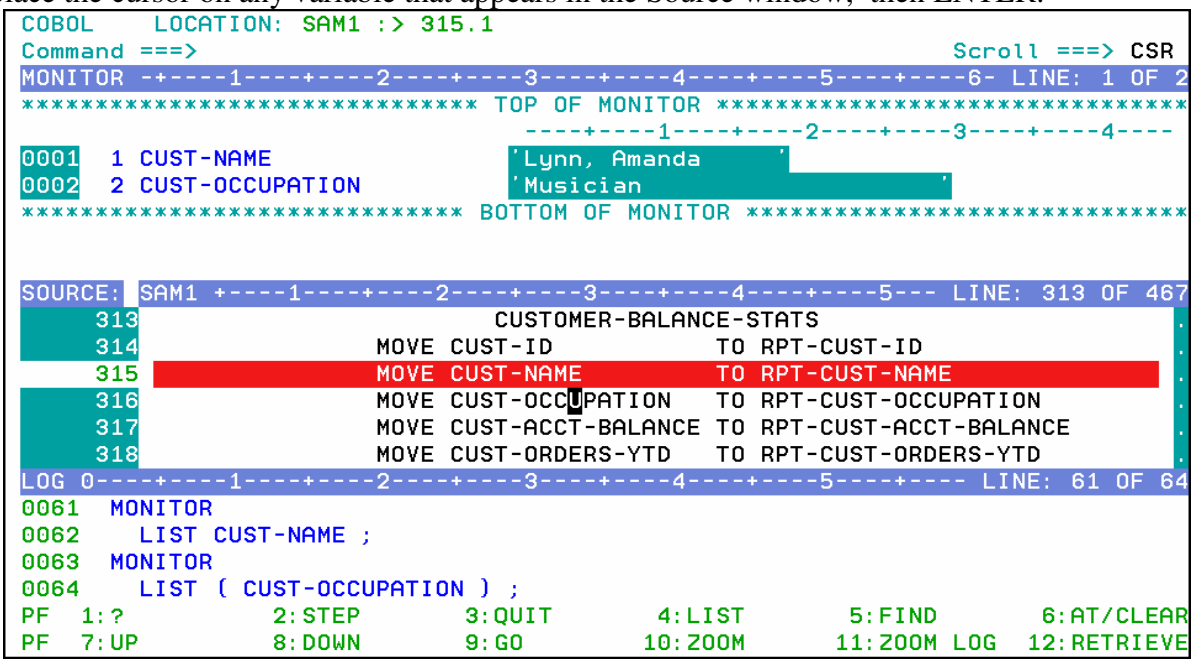
- Place the cursor on a any variable that is shown in the Source window, then **PF4.**



19. Display a variable in the monitor window. Try different methods:

- Type **MONITOR LIST CUST-NAME** then **ENTER**. Try abbreviating this command... For example: MON LI *variable-name*

- Type **MON LIS** (an abbreviation for MONITOR LIST) on the command line, then place the cursor on any variable that appears in the Source window, then ENTER.



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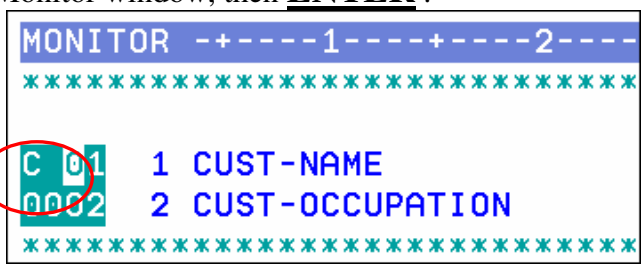
20. Note: Most items that you can display in the log with a LIST command, you can also display in the monitor window with MONITOR LIST command.

21. Remove items from the Monitor Window:

- Type **C** (for Clear) next to a variable in the prefix area (the numbers on the left) of the Monitor window, then **ENTER** .



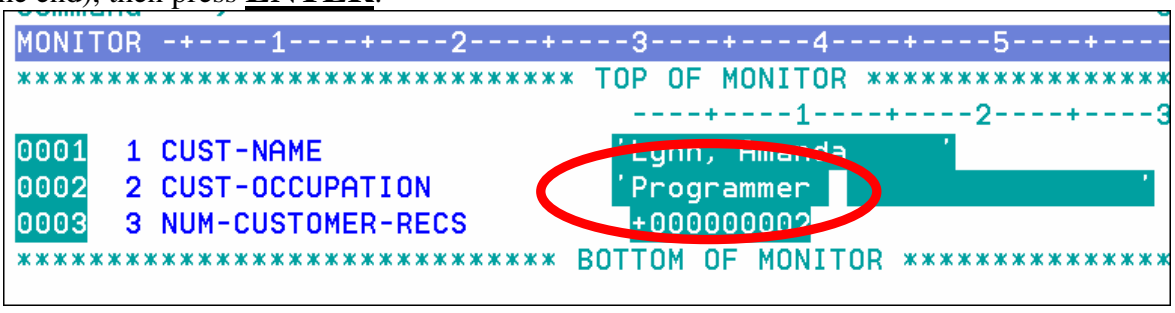
- To remove all items from the Monitor Window: Type **CLEAR MONITOR** on the command line, then **ENTER**. (Or abbreviate the command, for example : CLE MON)

22. Using MONITOR LIST commands, as described in the last few steps, put the following variables in the Monitor Window:
    - NUM-CUSTOMER-RECS
    - CUST-NAME
    - CUST-OCCUPATION

23. Modify a variable value.

- Tab to the data area of the CUST-OCCUPATION variable in the Monitor window.

- Change the data to **'Programmer**, blank out any remaining text (but leave the quote at the end), then press **ENTER**.



24. You can use the "automonitor" to automatically display active variables in the Monitor window.

- Turn on the Automonitor: Type **SET AUTO ON** on the command line, then **ENTER**.

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- The "Automonitor" appears at the bottom of the Monitor window. You may have to scroll forward in the Monitor to see it. This will automatically display variables referenced by the current statement in the program.

- Use **PF2** (or the STEP command) a few times. Notice that as you step, the Automonitor changes to show variables referenced by the current statement.

25. You can set a breakpoint that will stop when a variable changes.

- First, clear ALL of your breakpoints:
  - Type **CLEAR AT** on the command line, then **ENTER**.
- Verify that the CUST-NAME variable is already displayed in the monitor. If it is not, add it now with a MON LIST command.
- Set an 'AT CHANGE' breakpoint based on the CUST-NAME variable:
  - Type **AT CHANGE CUST-NAME** on the command line, then **ENTER**.
- Notice the value of CUST-NAME in the monitor.
- Press **PF9** (the GO command).
- Notice that the value of CUST-NAME has changed. Debug Tool has stopped at the statement AFTER the next statement that changed variable CUST-NAME. In this example, it stopped after reading a new input record, which changed the value of the variable.
- Tip: You can stop when a condition is true, using a "WHEN" clause. For example:
  AT CHANGE NUM-CUSTFILE-RECS WHEN NUM-CUSTFILE-RECS > 5
  Here's another example. If a program reads a file, and a variable named CUST-ID is in the record, you could stop when the program gets to the right record by setting a breakpoint such as:
  AT CHANGE CUST-ID WHEN CUST-ID = '07008'

26. Clear the AT CHANGE breakpoint:

- For your reference, list your breakpoints. Type **LIST AT** on the command line, then **ENTER**.
- Notice the CHANGE breakpoint is listed in the log.
- Type **CLEAR AT CHANGE CUST-NAME** on the command line, then **ENTER**.

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- Type **LIST AT** on the command line again, then **ENTER**. Notice that the last LIST AT command in the log does not show the breakpoint.

27. You can set a breakpoint to stop at a sub-program. In this example, the main program SAM1 calls a sub-program named SAM2.

    - Set a breakpoint to stop when execution reaches (enters) sub-program SAM2:
        - Type **AT ENTRY SAM2** on the command line, then **ENTER**.
    - Run the program:
        - Press **PF9** (the GO command) .
    - The program should be stopped in sub-program SAM2. If your Debug session ended, re-start the program and try again.
    - Tip: You can also enter a sub-program by running the program to a CALL statement, and then using a STEP command (or PF2) at the CALL. You can use an 'AT CALL program-name' command or set a statement breakpoint manually on the CALL statement, and then run to the breakpoint. To enter a sub-program, it should be compiled correctly for Debug Tool.

28. Now that you are in a sub-program, you can set breakpoints in it and continue to run. If you want to continue execution until it returns to the main program, there are several ways to do it.

    - Tip: If you already have breakpoints in the main program, you can use a GO command (or PF9) to run to the breakpoint.
    - Tip: If you want to set new breakpoints in the main program, you could set them now. To do it, first "qualify" to the main program by overtyping the program name in the title line of the source window and pressing enter to display the main program. Once the main program is displayed in the source window, you can set new breakpoints.
    - Tip: You could continue to STEP through the sub-program until it returns, and follow the logic back to the main program. But that could take you a long time if the sub-program is large.
    - Run the sub-program until it returns to the program that called it:
        - Type **STEP RETURN** on the command line, then **ENTER**.
    - The program is stopped in the main program, SAM1, immediately after the CALL statement.

29. You can easily locate the current statement:

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- First, scroll forward in the Source window by pressing **PF8** a few times.
- Type **QUALIFY RESET** on the command line, then **ENTER**. (it can be abbreviated, such as QUAL RES).

30. You can copy one or more executed commands from the log window to the command line and re-execute them:
    - Tab to the data area of the CUST-OCCUPATION variable in the Monitor window.
    - Change the data to **'Manager**, blank out any remaining text (but leave the quote at the end), then press **ENTER**.
    - Notice that a MOVE statement was added to the log. In the log window, overtype the word Manager with **Director**, leave your cursor on the changed line, then press **ENTER**.
    - The command is copied to the command line. You can make further changes (if desired), and **ENTER** to execute the copied command.
31. You can copy one or more program statements to the command line, and execute them.
    - Put the cursor on any MOVE or COMPUTE statement in the source window, and overtype any character on that statement.
        - Hint: You can overtype a character with the same character. For example, change MOVE to mOVE
    - Press **ENTER**.
    - The statement is copied to the command line. If the command is long, or if you overtype multiple statements, they may be placed into a temporary expanded command area below the command line. You can make changes (if desired).
    - If the statement contains a period, you must remove it.
    - Press **ENTER** to execute the statement.
32. You can continue a long command with a dash (**-**). This can be helpful if you need to type a command that is too long to fit on the command line.
    - On the command line type **MONITOR LIST -** then **ENTER**.
    - Debug Tool will prompt for the rest of the command.

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- On the command line, type any valid variable name, such as: **CUST-NAME** , then **ENTER**.

33. End the Debug Tool session:

- Type **QUIT** on the command line, then **ENTER**.
- When you receive the "Do you really want to …" prompt, type Type **Y** on the command line, then **ENTER**.
- Tip: To avoid the "Do you really want to…" prompt, use the QQ command.

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Lab Exercise 5 APA

In this exercise you will:

- Use the 'R' line command to view APA Reports
- Navigate and review a sampling of reports including the:
- Measurement Overview – S01 Report
- CPU Usage by Category – C01 Report
- Source Program Mapping – A01 Report
- CPU Usage by Category (with drill down to source) – C01 Report
- Wait Time by Task/Category – W01 Report
- Wait Time Referred Attribution – W03 Report
- Identify information on the reports by answering some common questions regarding the reports being reviewed
- Discuss performance improvements to this example based on the reports viewed

1. Log on to TSO.

2. Navigate to the Application Performance Analyzer main panel. Using the output of the previous exercise, select the report viewing panel.

   Type "**R**" on the first character of the Request Number. Press "**Enter**".

   Did You Know: You can also use an "S" line command to select the report viewing screen? Either and "R" or and "S" will navigate you to the report selection panel.

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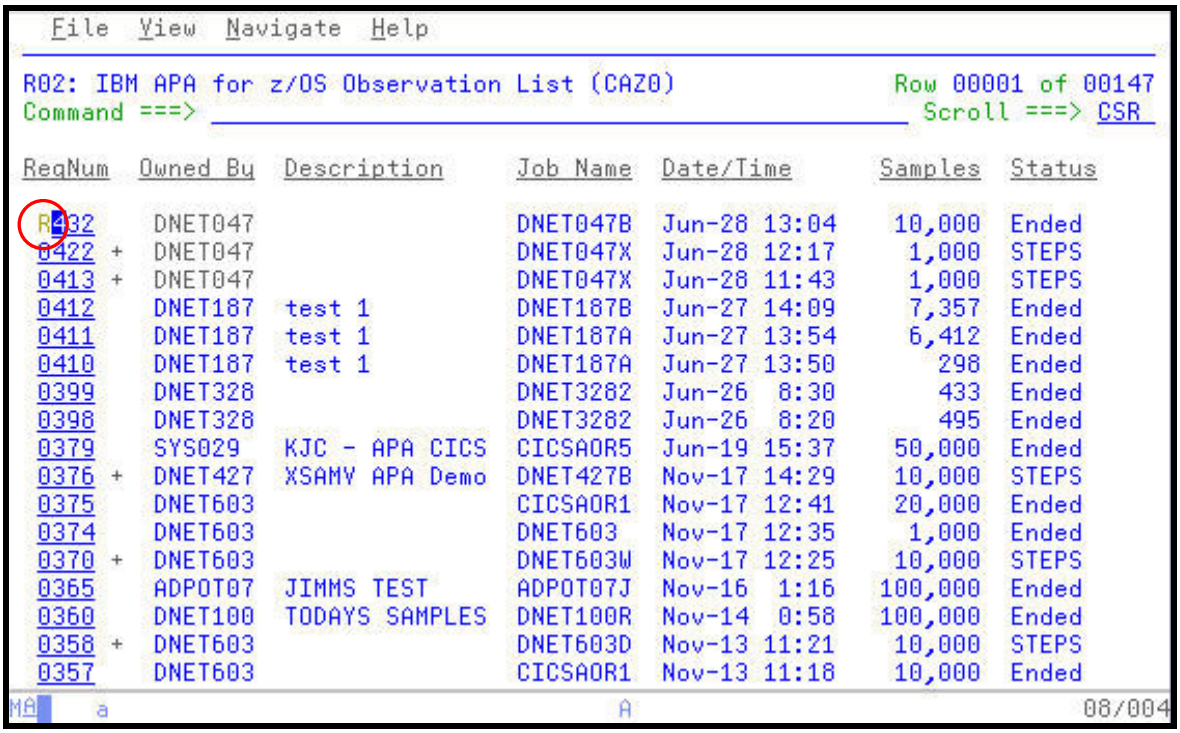
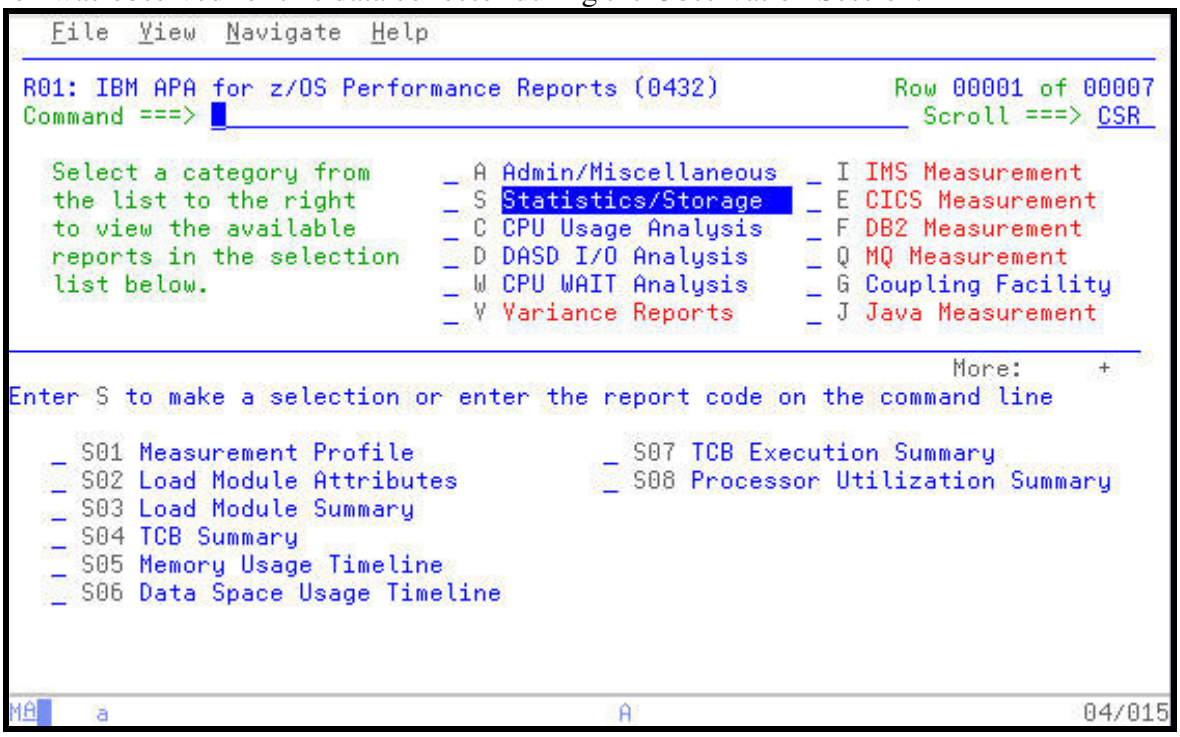


3. The resulting panel displays the reports that are available for this Observation Request. In this sample the reports that do not appear as highlighted (V, I, E, F Q, J, etc) indicate one of two things. Either the data collector (option) was not turned on to capture the information or that no information was observed for this data collector during the Observation Session.



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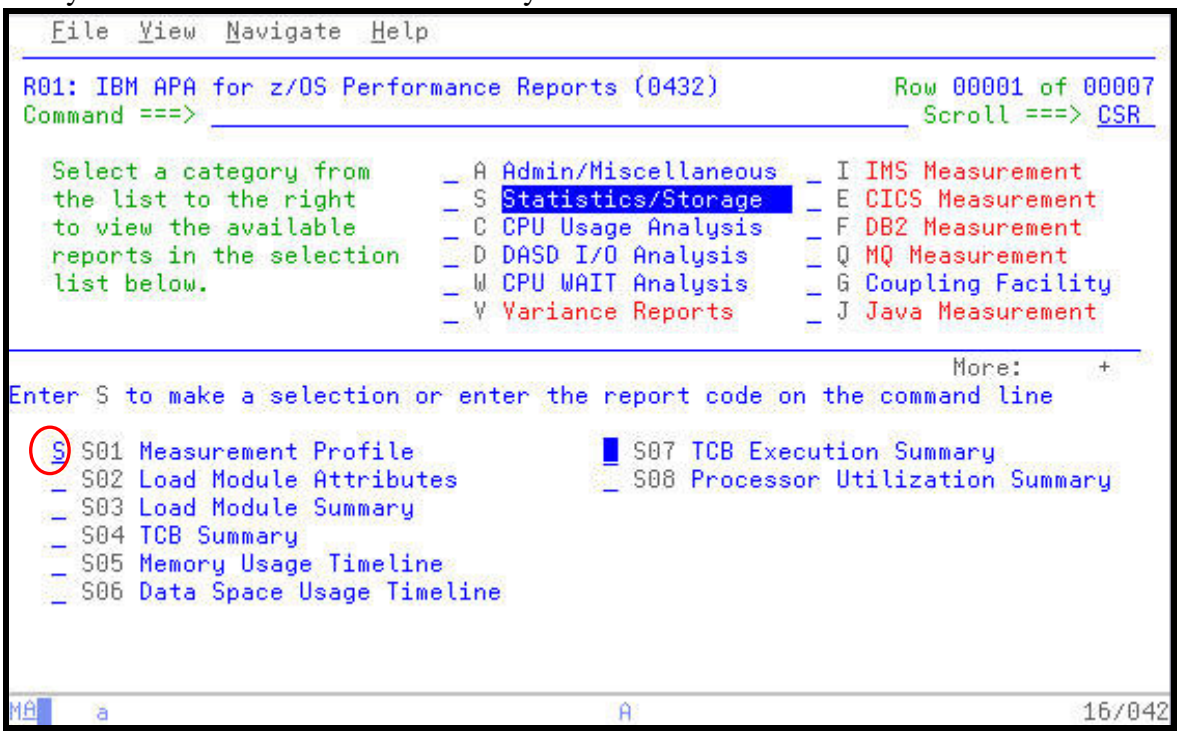
4. Select the S01 Measurement Profile report for viewing

   Type "**S**" next to the report number S01. Press "**Enter**".

   Did You Know: Each report is numbered for ease of navigation? As you become more familiar with APA you may navigate to specific reports simply by typing the report number, such as "**C01**" directly on the Command Line followed by an Enter.



5. The Measurement Profile report is displayed. During the Observation Session a majority of the samples collected, 84+% occurred when the CPU was active. An additional 11+% occurred when the application was in a WAIT state. These statistics appear in the first box of the report. To the right are ISPF "Hot Spots" that can quickly link to other APA reports where more detail on the statistics to the left can be found.

   Notice the next box down. The CPU Usage Distribution uses the number from the CPU Active Samples to further define what occurred during the Observation Session. In this case almost and equal number of samples were attributed to the Application code and the System level. Again, to the box at the right you can see additional APA reports that provide more detail on these statistics.

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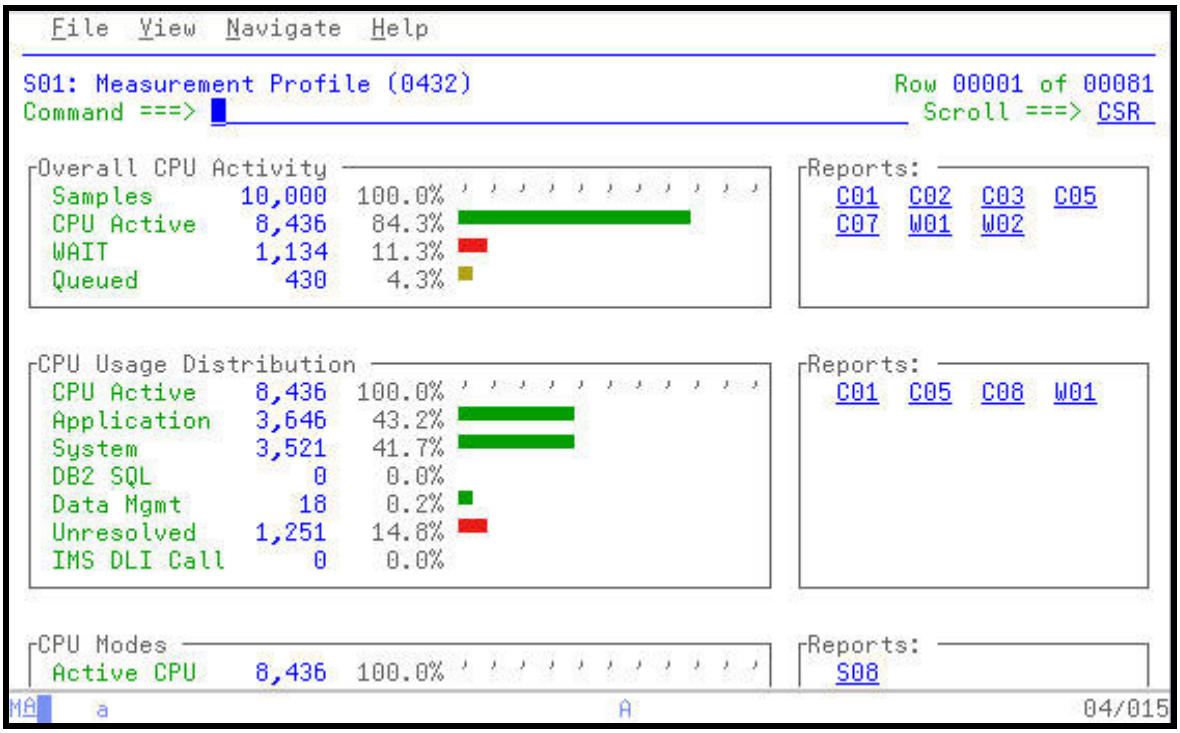

6. Press "**PF8**" to PageDn to other areas of the Measurement Profile.

   99+% of the samples observe red occurred in the Problem Mode, indicating that the application was not waiting on any assignment or Supervisor Mode (system resources) to be allocated to the application. Notice also , that the application did not take advantage of any resources above the 64M line.

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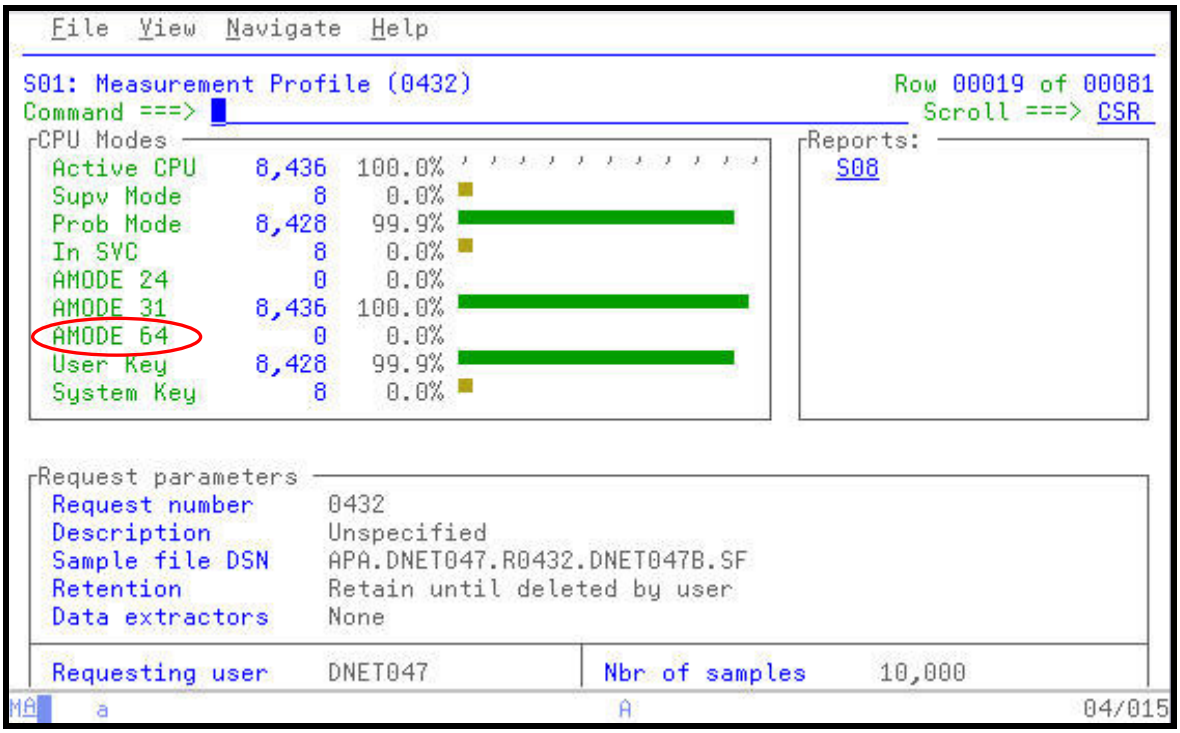

7. Press "**PF8**" to PageDn to other areas of the Measurement Profile.

   - Notice the name of the Sample File that was automatically created by APA to hold the results of the Observation Session. This file is tied directly to the Observation Request Number. When the Observation Session is deleted using a "D" line command on the main APA panel, the accompanying Sample File is automatically deleted.

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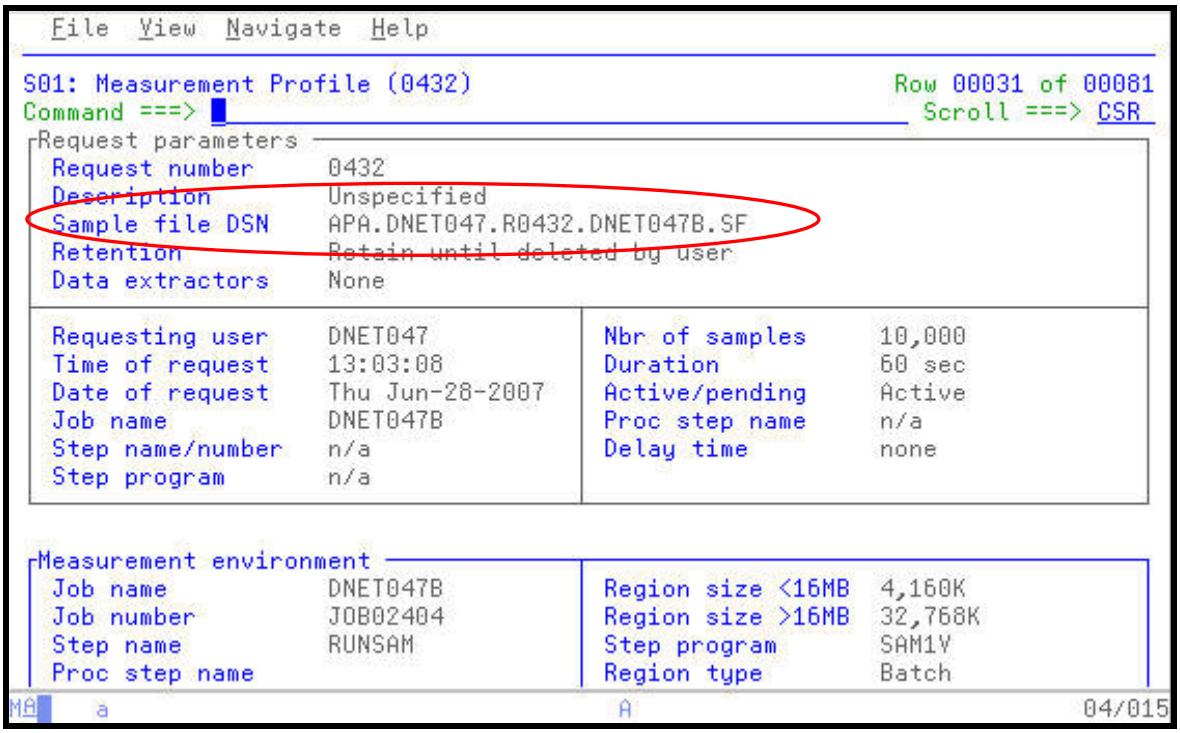

-
- Press “PF8” to PageDn to further into the Measurement Profile.

  APA indicates the number of CPU’s in use at the SYSPLEX.

  Did You Know: ZIPP and ZAPP processors used in many DB2 and IMS environments are supported by APA. These processors are included in the Number of CPUs count. The S08 Processor Utilization Summary provides a further breakdown of the CPU usage by the application. ZIPP and ZAPP processors appear in this report simply as an available engine. No distinction is made in the processor name or number.

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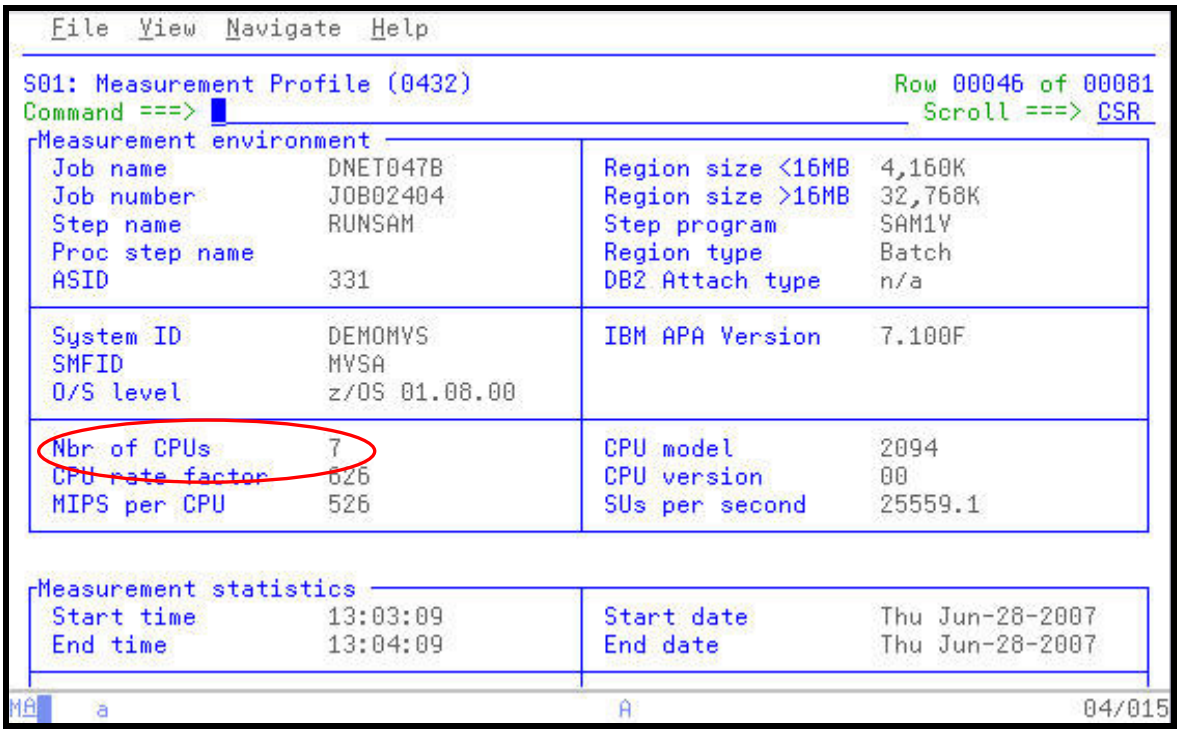

8. Press **"PF8"** once more to move the bottom of the report.

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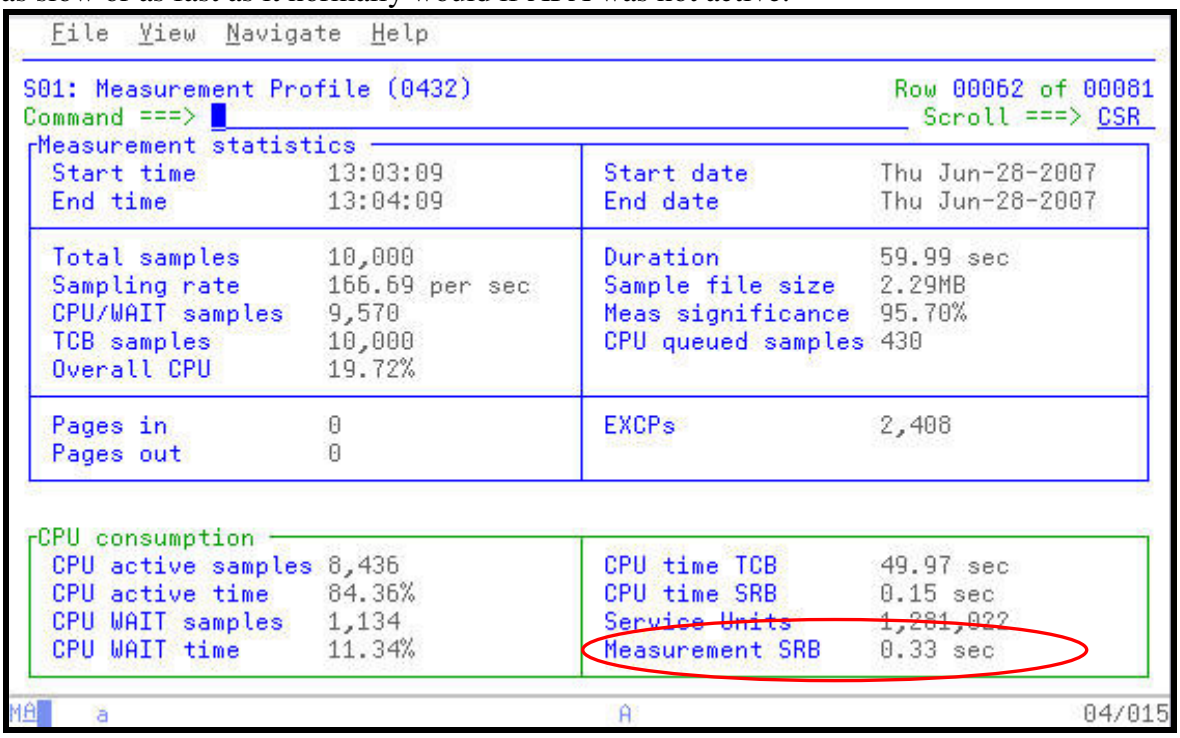
9. APA is a non-intrusive 'self reporting' tool. In other words it does not attach anything to the application in order observe the application running AND it reports how much time it took to conduct the Observation Session. This can be found Measurement SRB value. The application will run as slow or as fast as it normally would if APA was not active.



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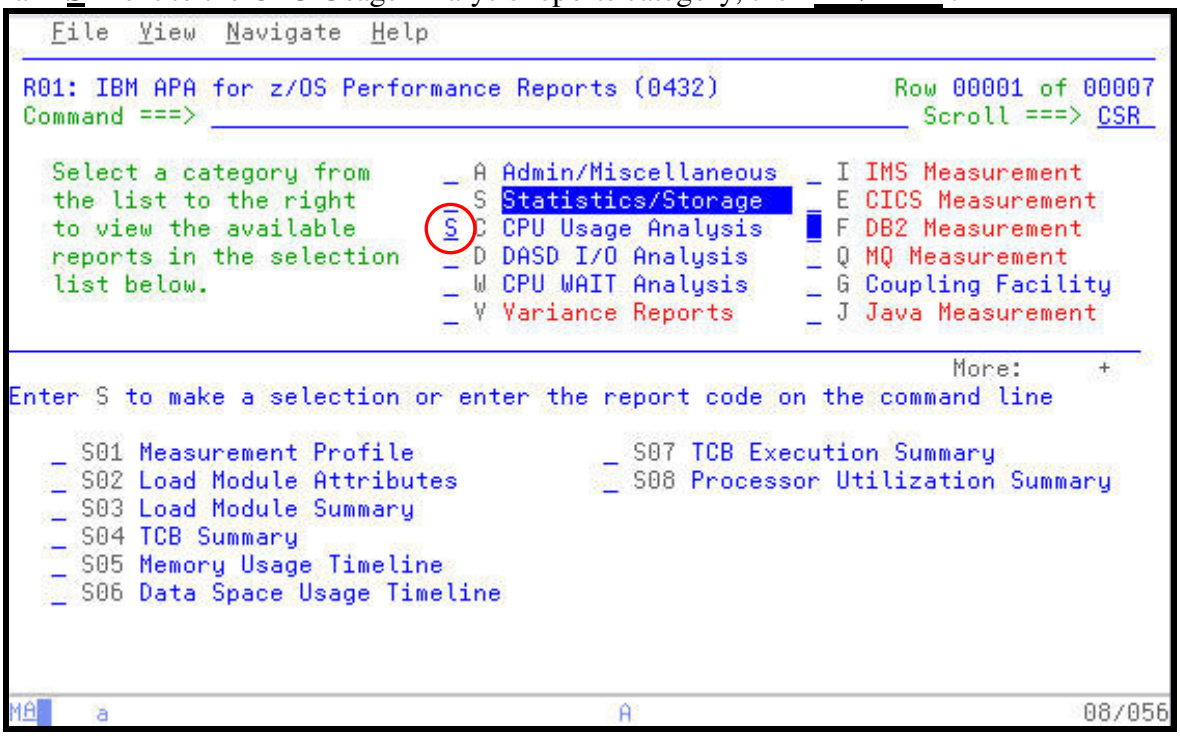
10. Return to the Performance Reports panel and select the CPU Usage Analysis category of reports.

- Press "**PF3**" to return to the main Performance Reports panel .
- Type an "**S**" next to the CPU Usage Analysis reports category, then **ENTER** .



11. Select the CPU Usage by Category report.

Place and "**S**" next to the C01 CPU Usage by Category report, then **ENTER**.

Tip: You could also type "**C01**" in the Command Line followed by **ENTER** to bring up this report.

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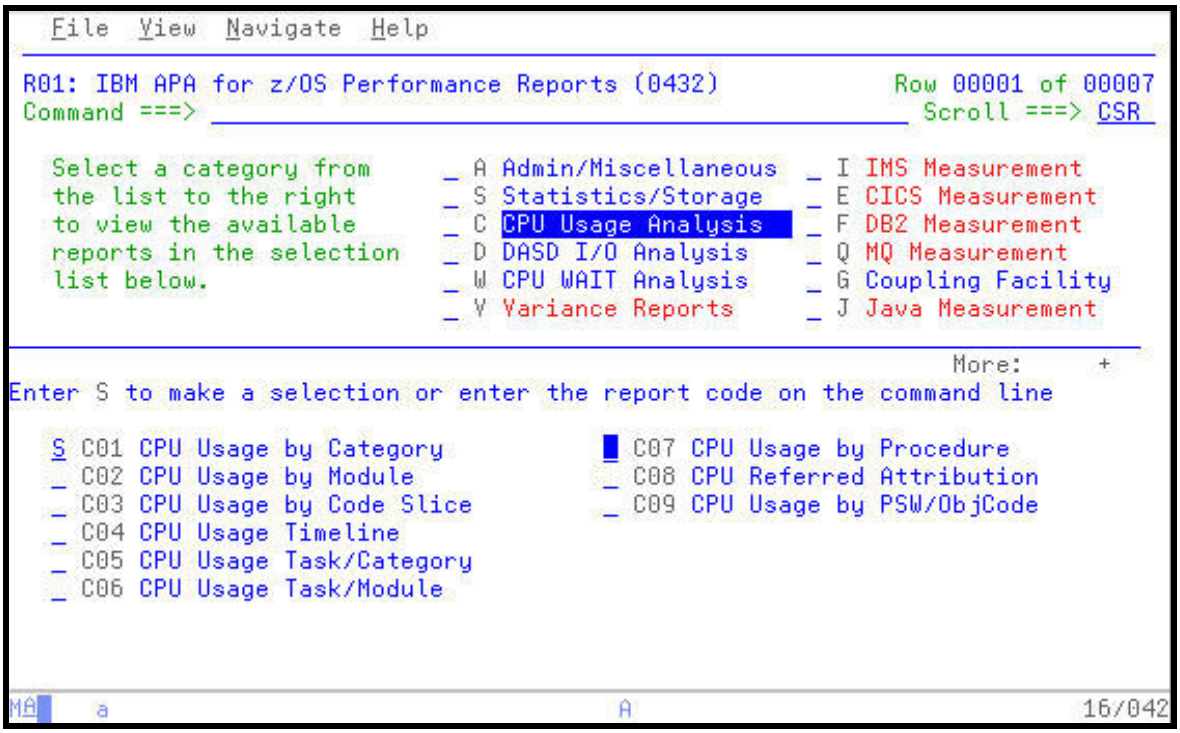
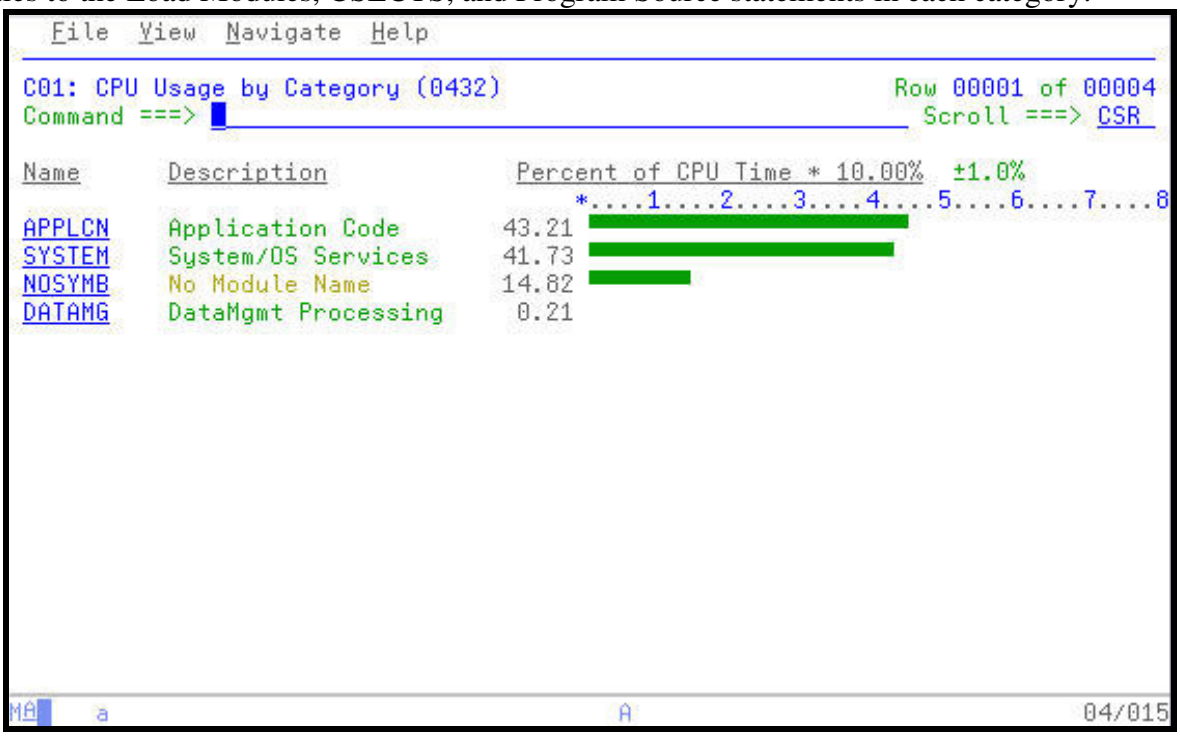


12. The CPU Usage by Category shows the major collections of CPU activity with drill down capabilities to the Load Modules, CSECTS, and Program Source statements in each category.



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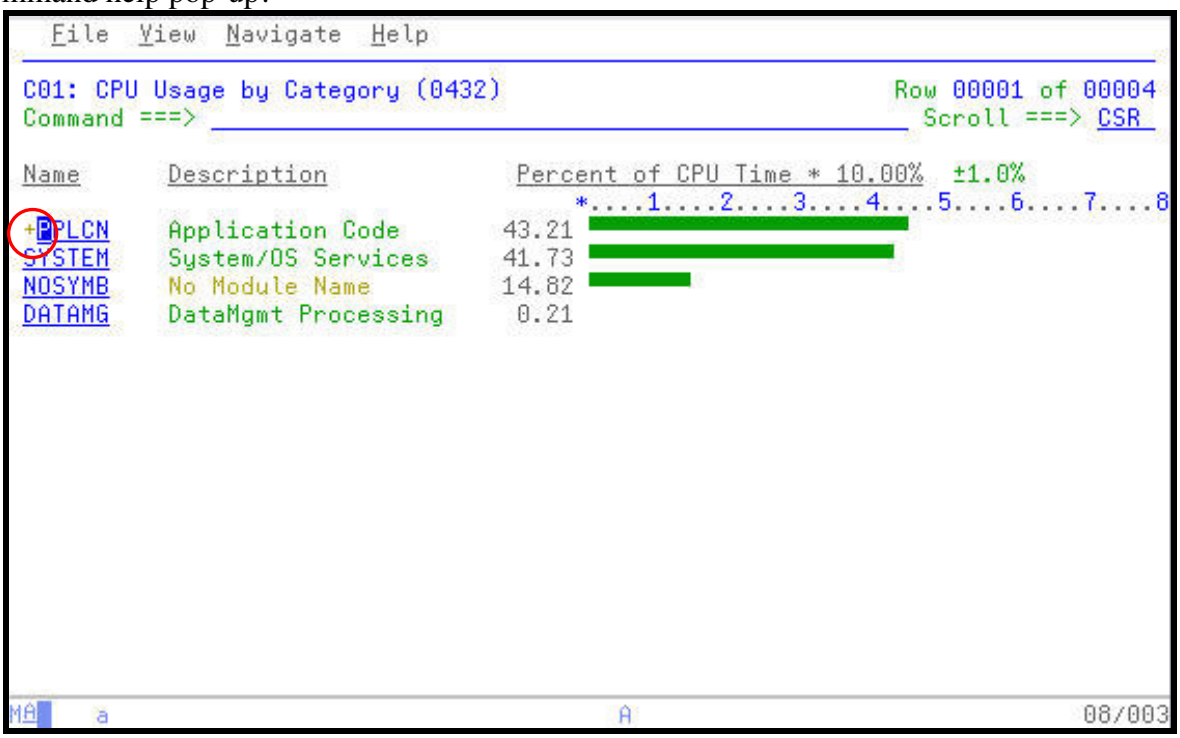
13. Open the APPLCN collection to see the names of the Load Modules which appear in the sampling.

    Type **"+"** line command over the APPLCN group, then **ENTER**.

    Did You Know: Similar to a workstation product, APA uses familiar "+" and "-" signs to expand and collapse various sections of the reports. Remember the "/" is always available to provide a quick command help pop-up!



14. The only Load Module in the APPLCN collection is the SAV2V Load Module. SAM2V consumed all of the CPU resource attributed to the APPLCN collection.

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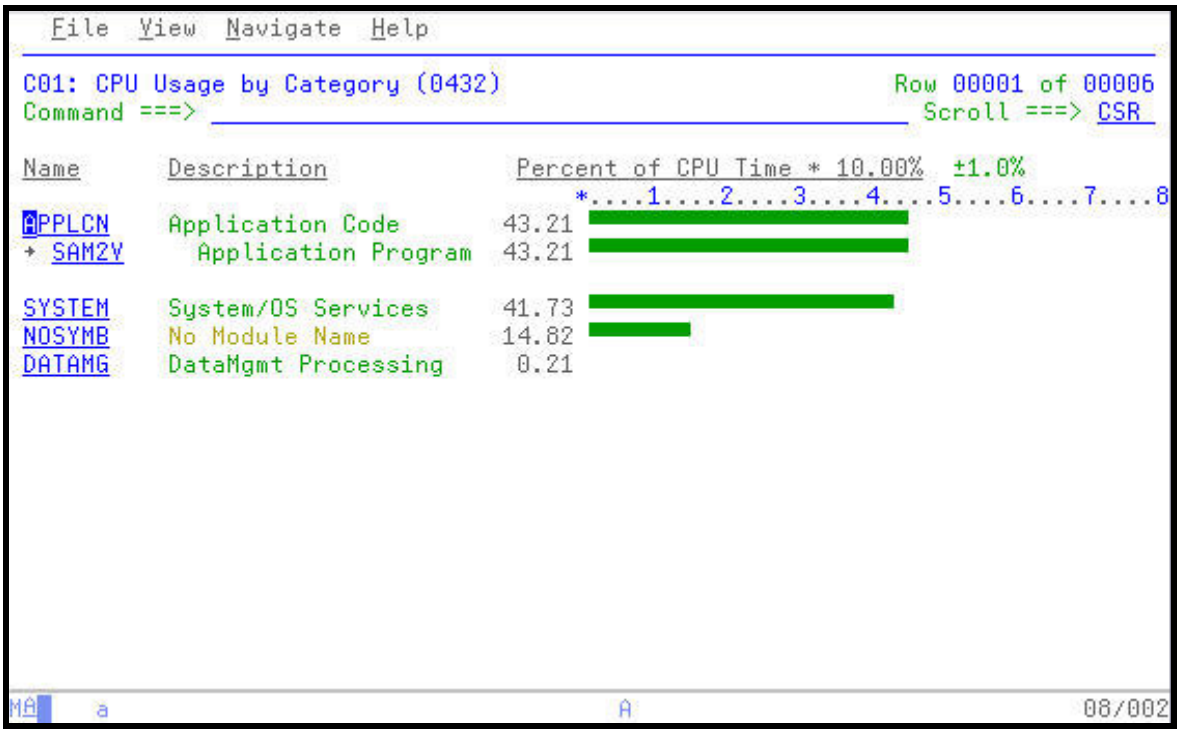

15. Since Load Modules can contain multiple programs or CSECTS which are link-edited together for execution, expand the SAM2V program to reveal the individual programs that were observed during the Observation Session.

    Type a **"+"** over the SAM2V Load Module Name, and then **ENTER**.

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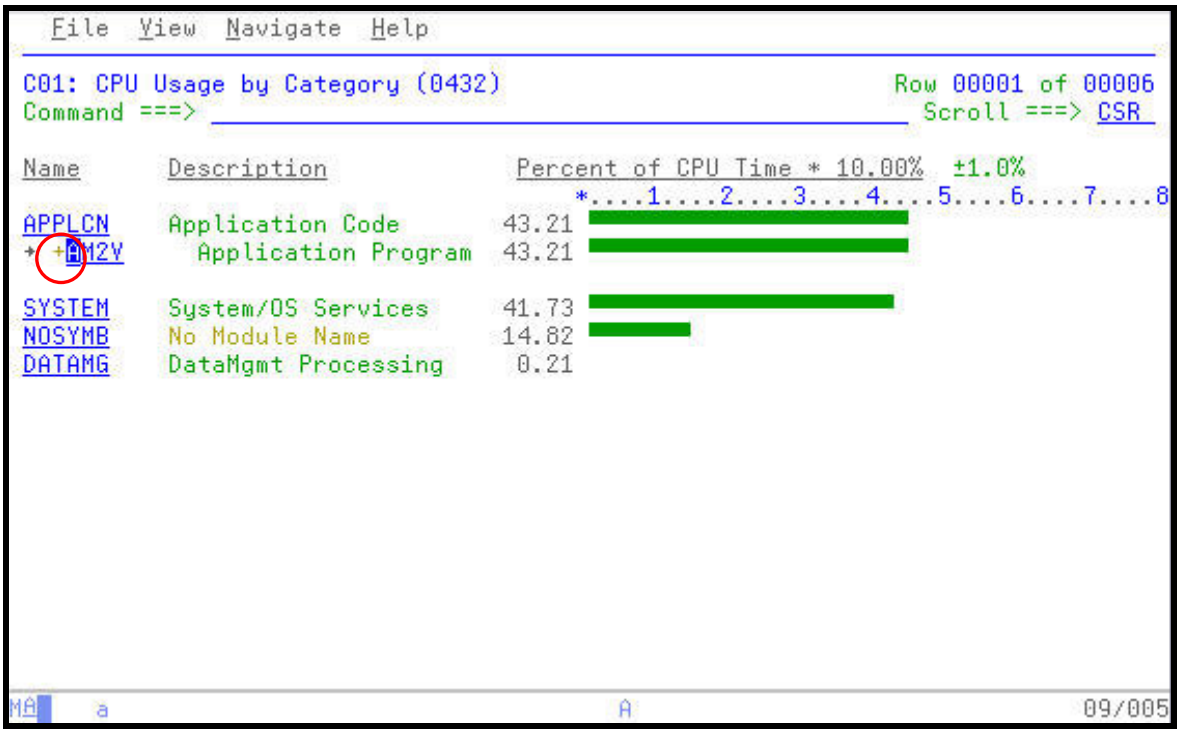

16. The resulting panel shows that only one application level CSECT was observed during the Observation Session.

    Tip: You can easily expand all collection to the lowest level in a single command. Place the same **"+"** used to open a collection level over the column heading and press **ENTER**.

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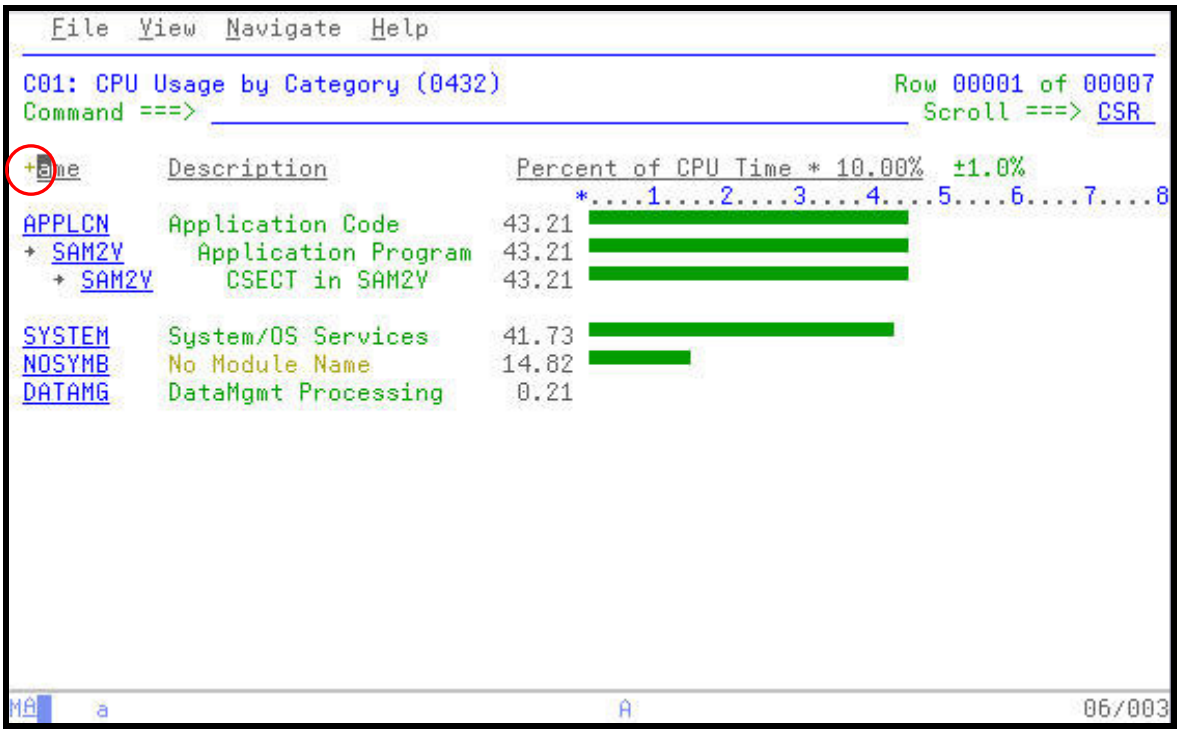

17. APA provides the ability to view the Program Source statements for CSECTS.

    Use the TAB Key to navigate to the SAM2V CSECT entry.
    Type "**P**" over the SAM2V entry to access the Program Source, and then **ENTER**.

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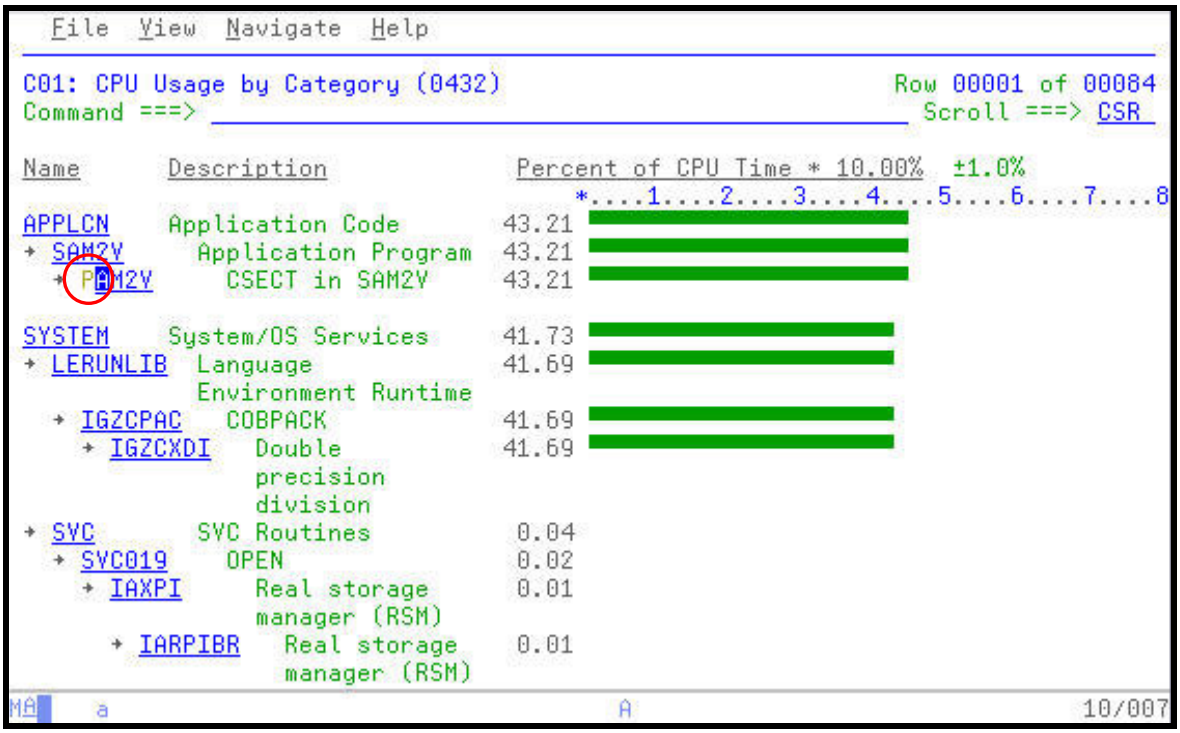

18. Notice the short message area in the upper right hand corner. This message, “No source map data” indicates that APA does not know where to find the compiler listings to display the Program Source.

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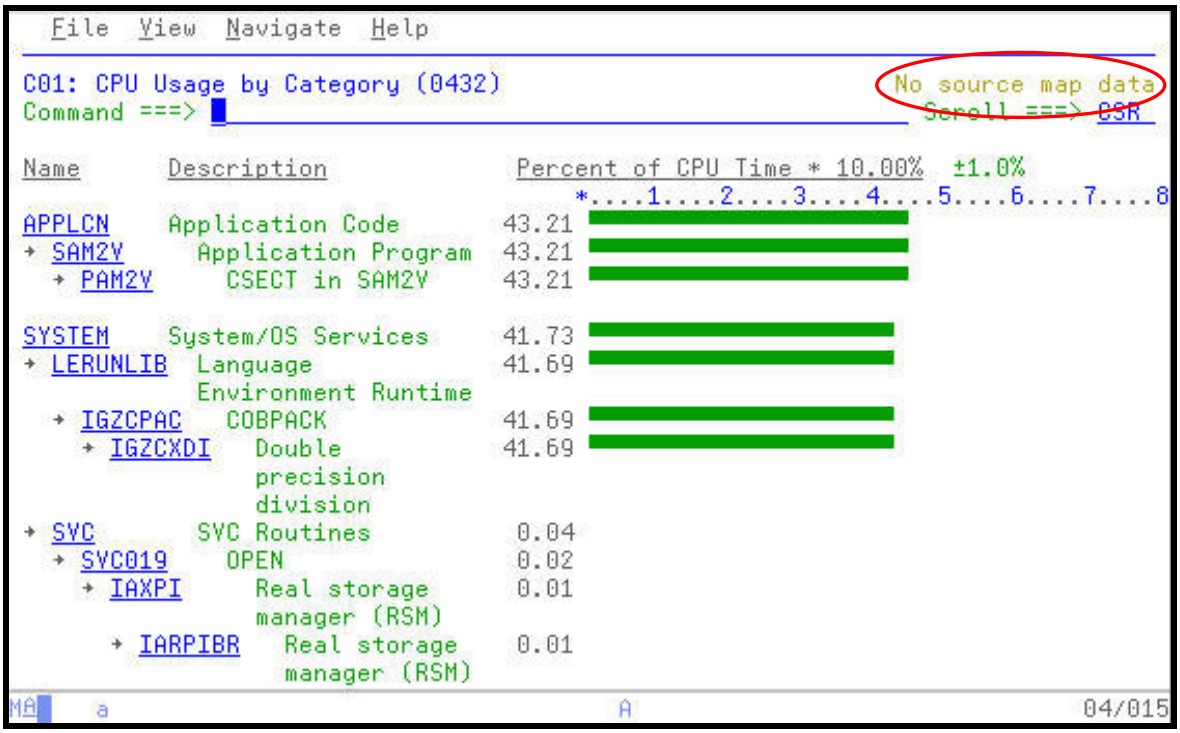

19. Defining the location of the compiler/source files is an administrative function in APA. COBOL, Assember, and PL/I compiler listings may be defined on the A01 panel. Navigate to the A01 Source Program Mapping panel:

    Type "**A01**" in the command line, and then **ENTER**.

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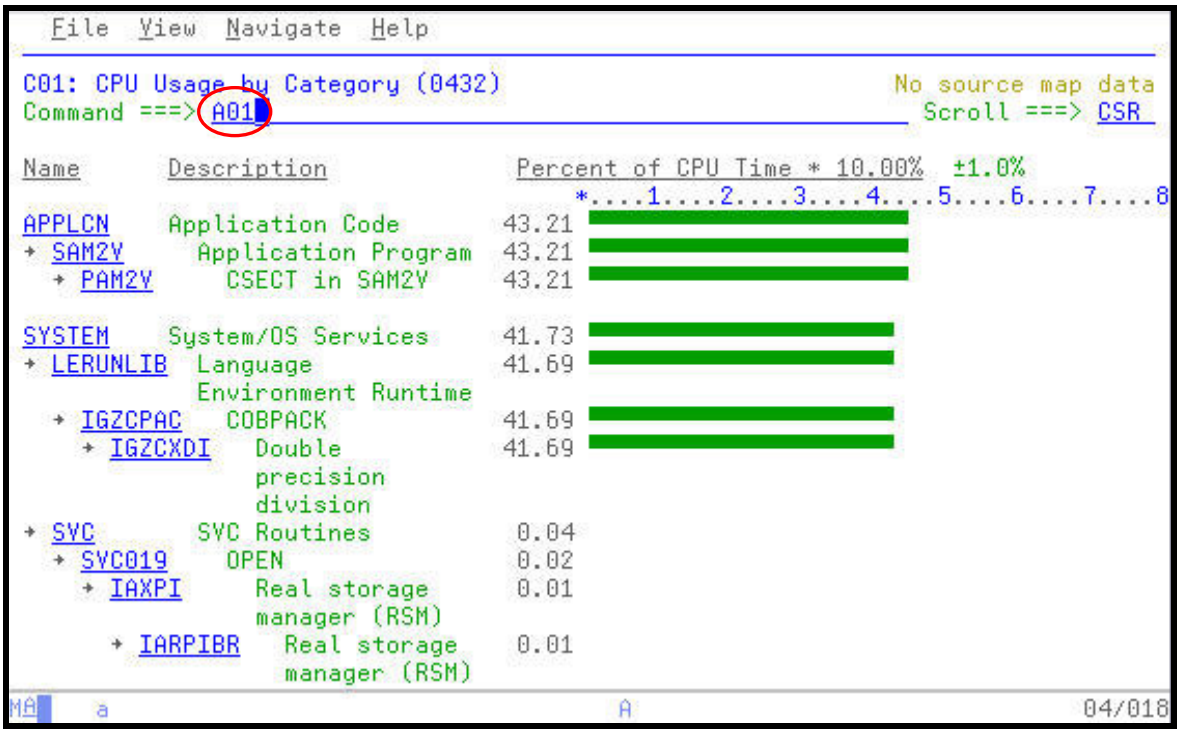

20. For this exercise, our compiler listings were stored in a SYSDEBUG formatted datasets. To communicate this to APA:

    Type "**D**" in the File Type prompt, for SYSDEBUG.
    At the Data Set Name prompt, type "***your-tso-id*.ADLAB.SYSDEBUG**" replacing your-tso-id with your userID.
    Type the name of the CSECT, "**SAM2V**" in the Member Name prompt, and then **ENTER**.

    Did You Know: APA can accept several compiler/assembly listing formats. Consult the APA Users Guide for the meaning of each dataset type or your Systems Program for the listing type used by your installation.

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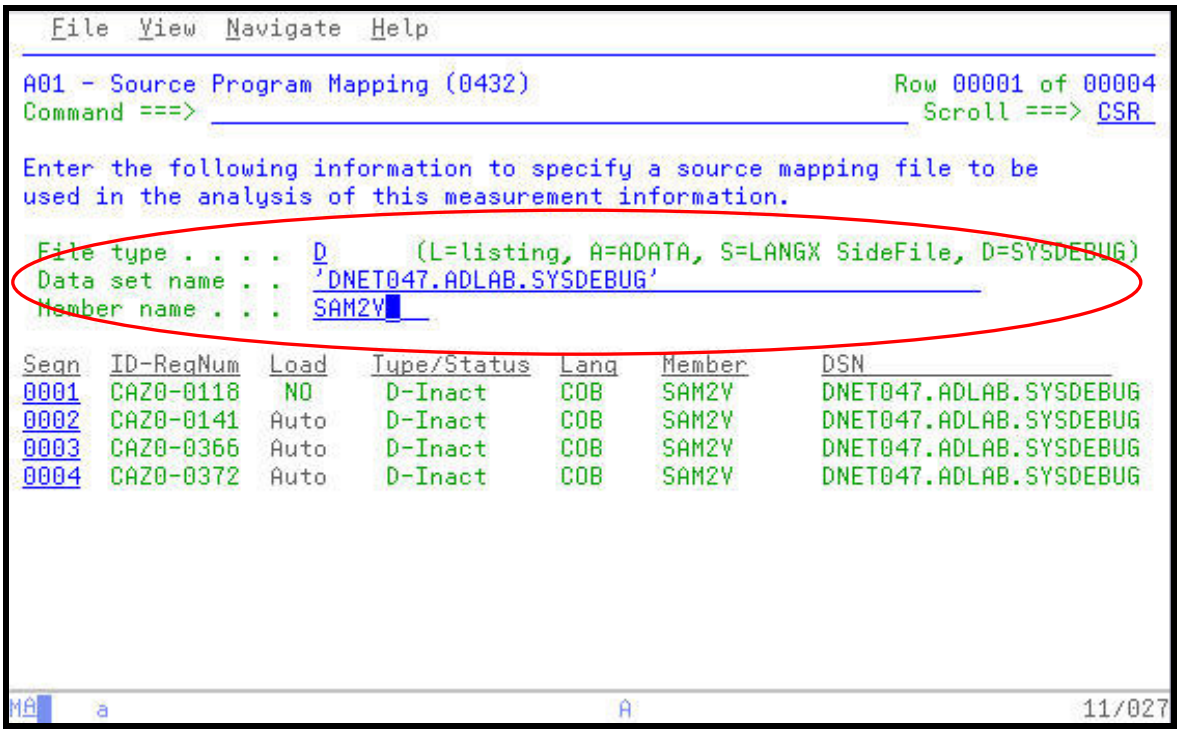

21. APA ties the program listings to the specific Observation Session request number. In this case, the request number being viewed is 0432. The pop-up Help panel is also available on this panel.

    Type a **"/"** over the first character in the Seqn (sequence number) column, and then **ENTER**.

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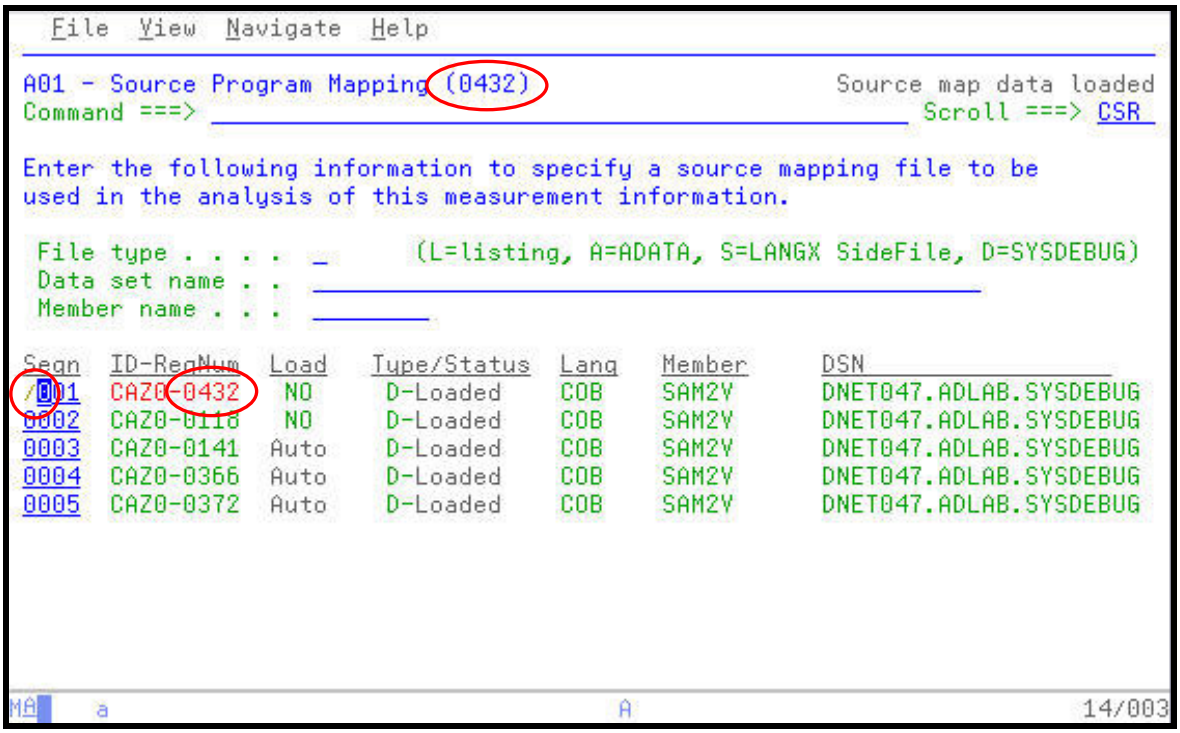

22. The entries which appear in the pop-up help panel allow for simple management of the Source Program Mapping entries via line commands.

    Tip: Source Program Mapping is loaded by APA when the entry is first defined. To have APA automatically load the Source Program Mapping entry the next time this request number is viewed, type an "A" line command on the source entry.

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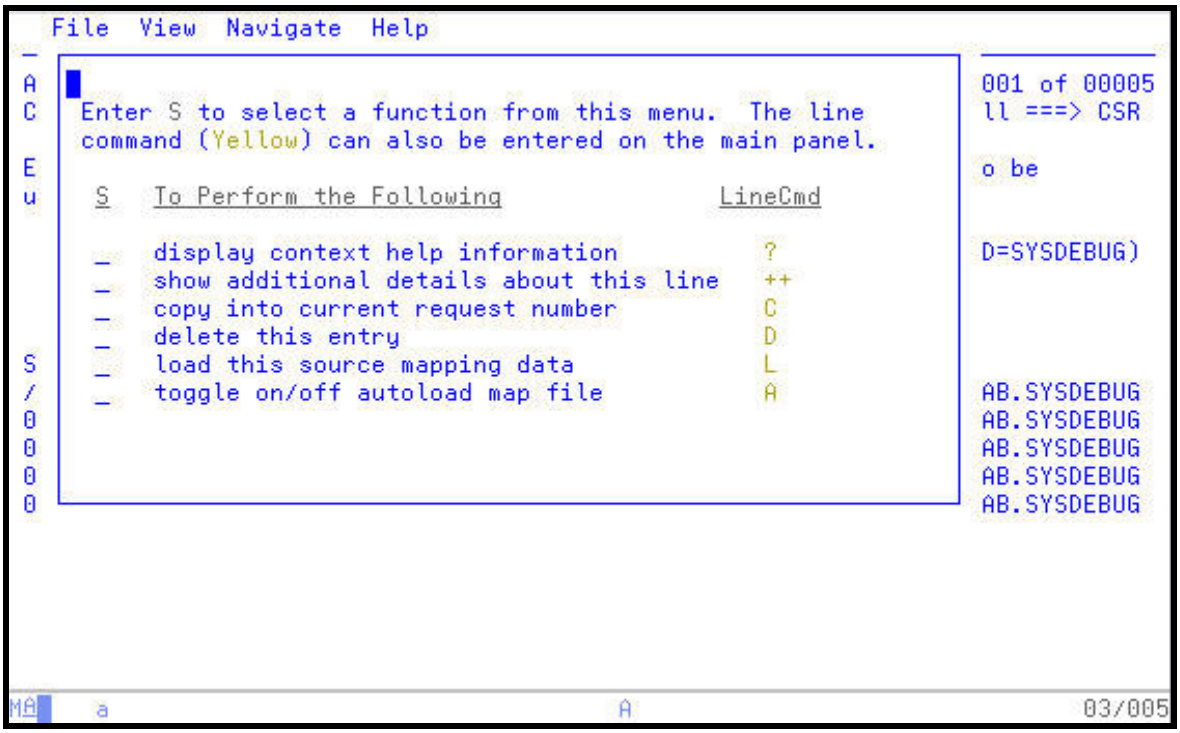

23. Return to the C01 CPU Usage by Category report and use the Program Source command to access the source listing for the CSECT SAM2V.

    Press "**PF3**" which returns back to the C01 report.
    Type "**P**" over the SAM2V CSECT name, and then press **ENTER**.

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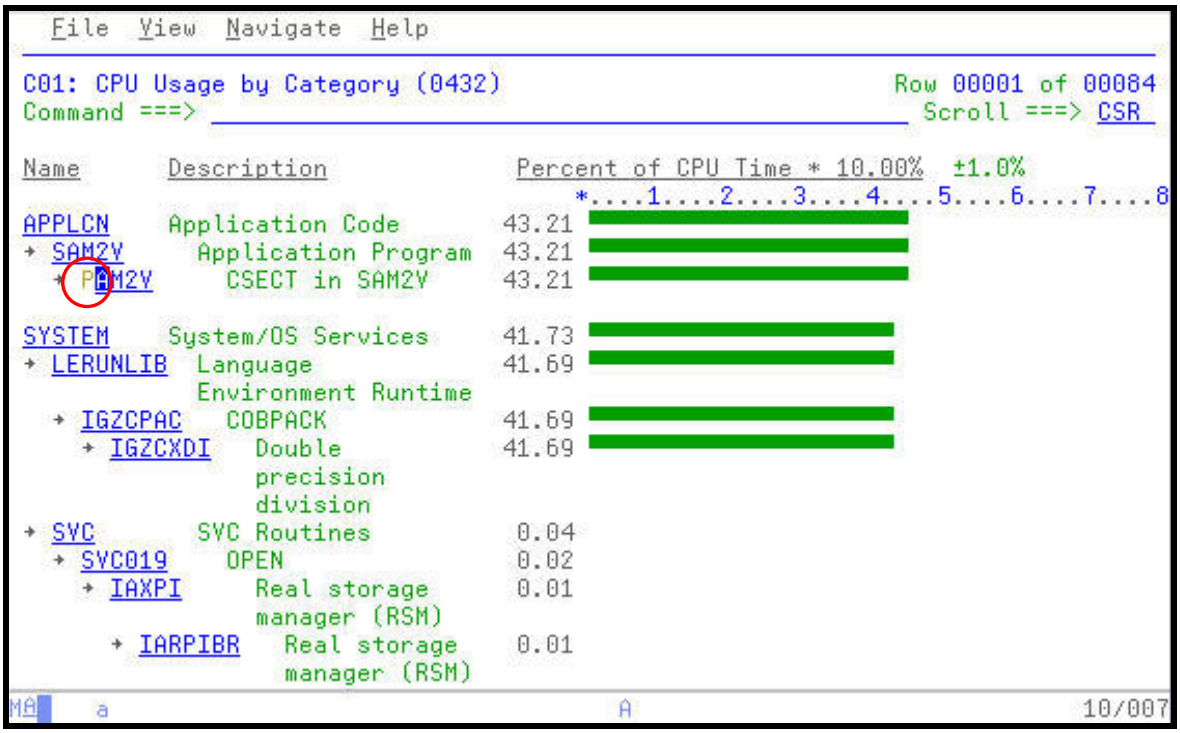

24. The Count column indicates how many times APA saw this statement executing during the sampling process.

    Did You Know: You may use ISPF "**FIND**" commands to review data items or to find other areas of the listing. You may also use the "**SETUP**" command to customize the view of this listing.

    Question?: From reviewing the source listing with the APA counts, what have you observed from the statements indicated as high usage/executed statements?

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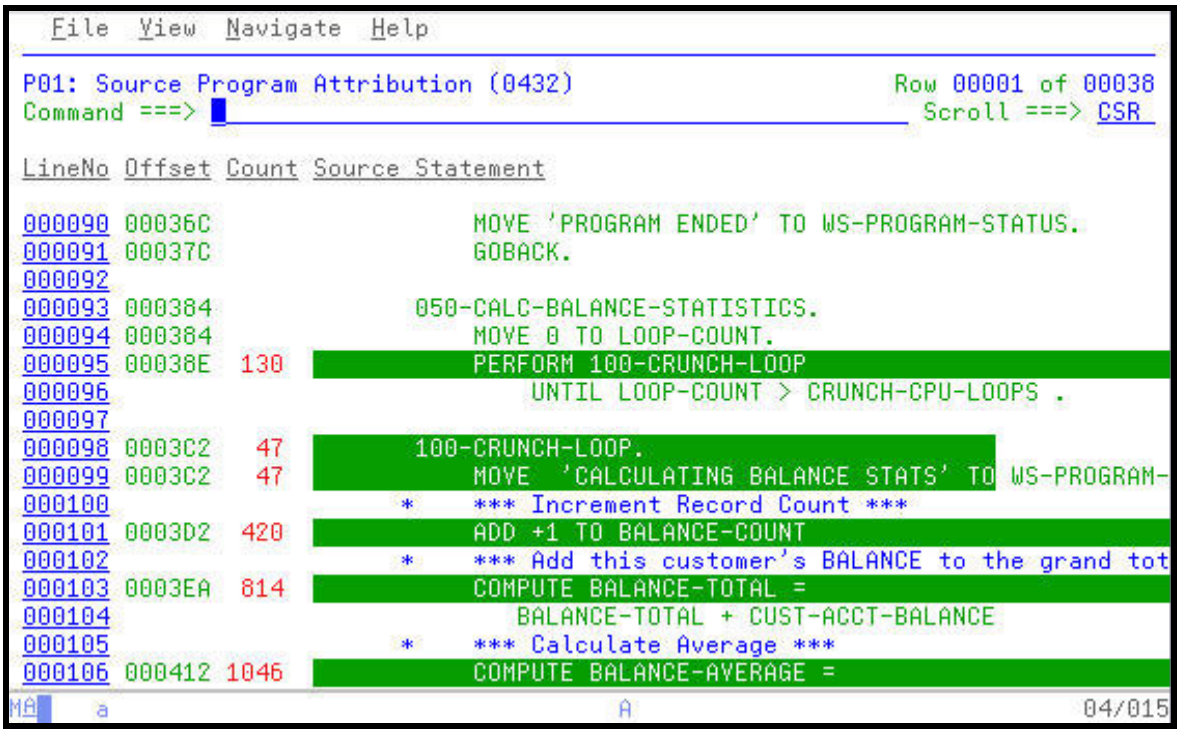

25. APA also indicates when system level activity is taking place on behalf of a source statement. In this example the Count column carries a high number and the statement under the Compute indicates that the SYSTEM is executing logic on behalf of the Compute statement.

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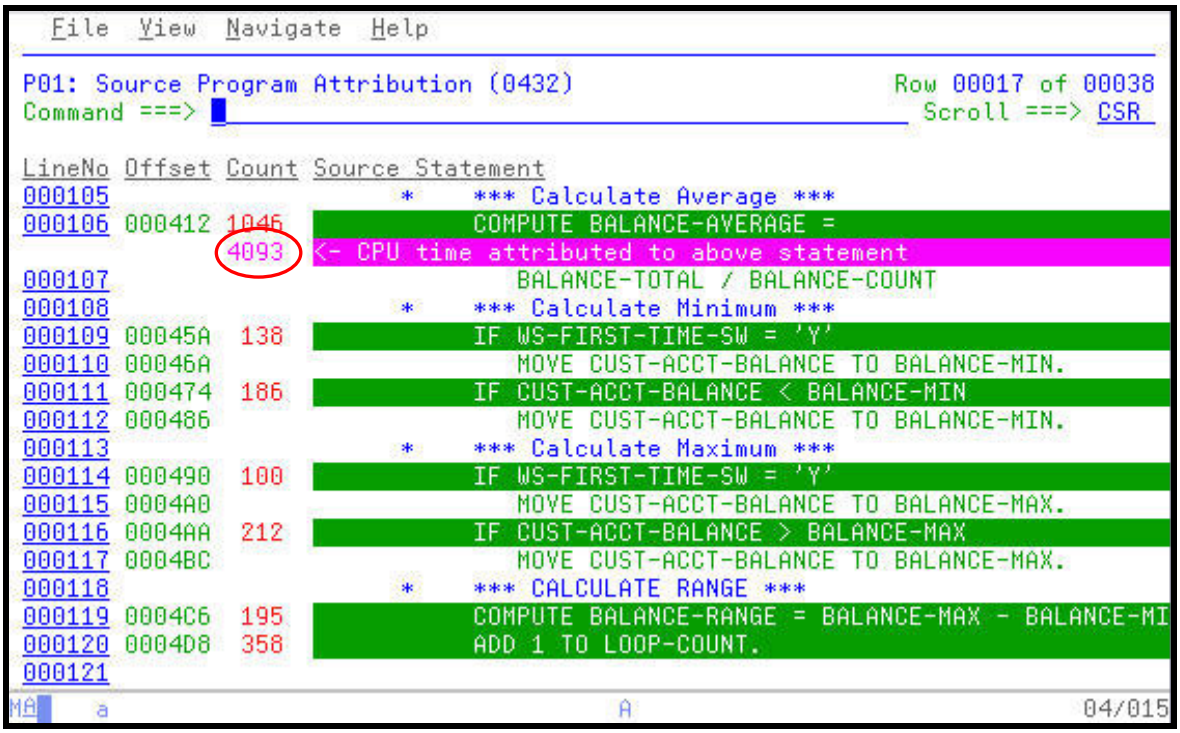

26. Navigate to the WAIT series of reports to investigate the cause of the WAITs in the Observation Session.

    Type "**W01**" in the command line to access the WAIT Time by Task/Category report, and then **ENTER**.

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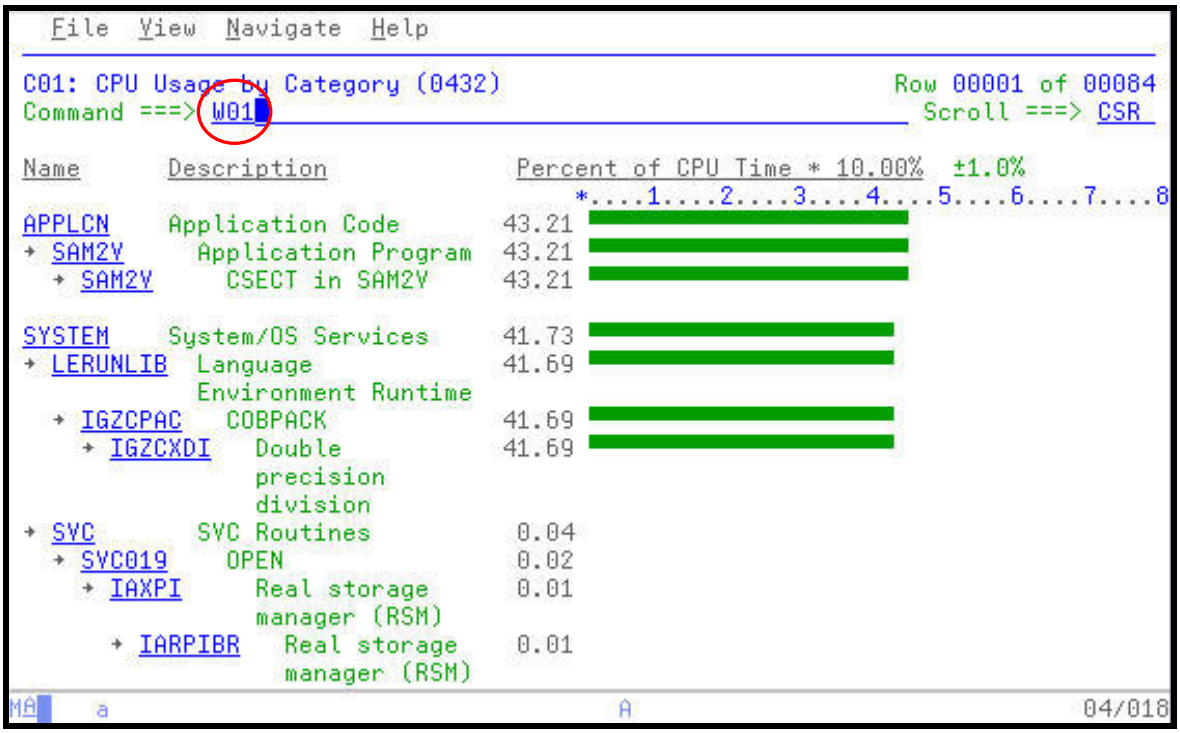

27. Most the WAIT activity is indicated to have occurred in the SAM1V module.

Did You Know: APA reports usage down to the hundredth of a percent. The modules prefixed by IEA and IEF are internal IBM modules and appear on the this report with a 0.00% entry because their activity was in the thousandth of a percent, but still contributed to a WAIT condition.

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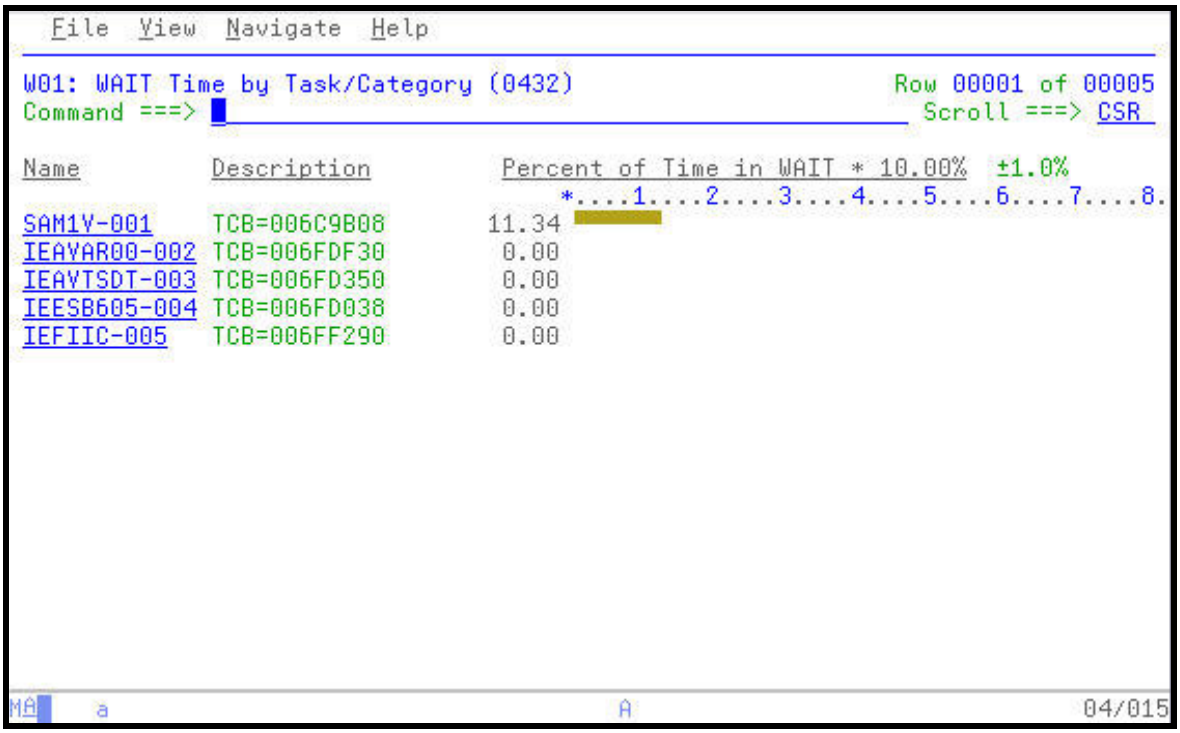

28. Expand the SAM1V entry to reveal additional levels of detail on the WAIT.

    Type **"+4**" to indicate to APA that it should expand the SAM1V CSECT to 4 levels of detail, then press **ENTER**.

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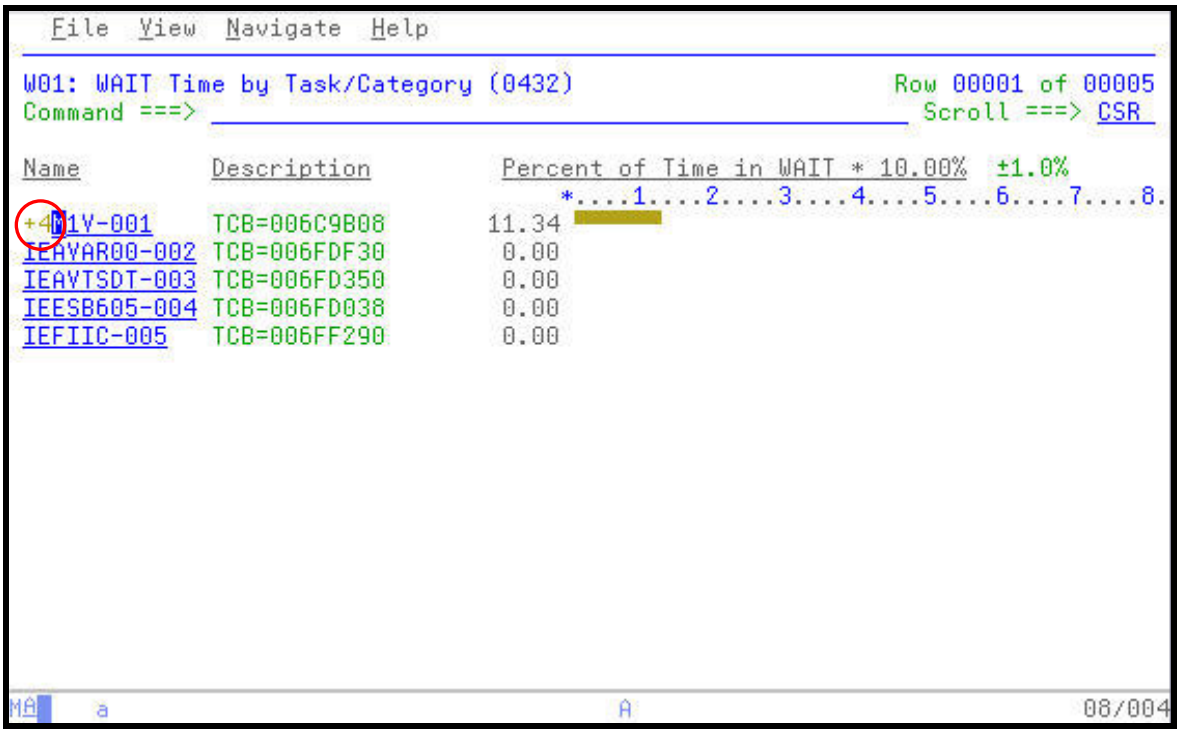

29. The report now shows 4 levels of detail on the WAIT condition.

Question?: What is occurring in the application that is causing a majority of the 10.47% WAIT? What DD statement is being observed by APA? What is the module name? Is there a specific location in the module where this condition is occurring?

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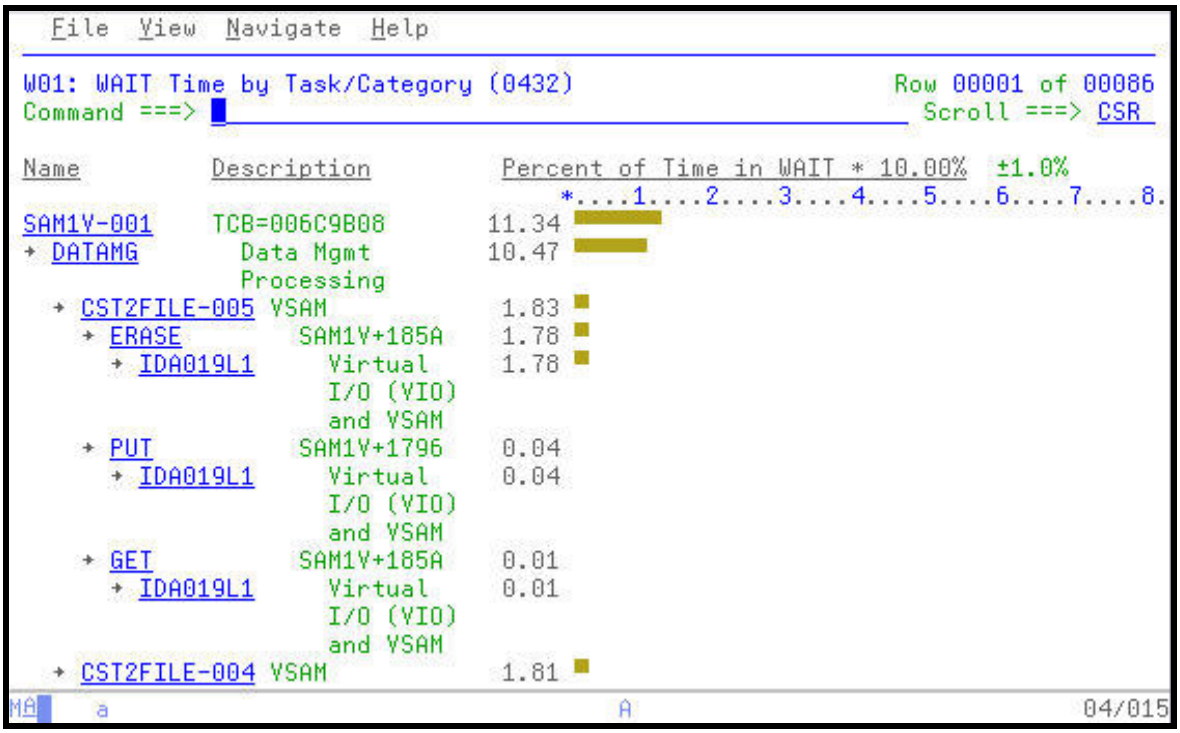

30. At it's lowest level of detail, APA can display pop-up panels containing information about specific components of the application being Observed.

    Type **"++"** over the CUST2FLE entry, followed by **ENTER**.

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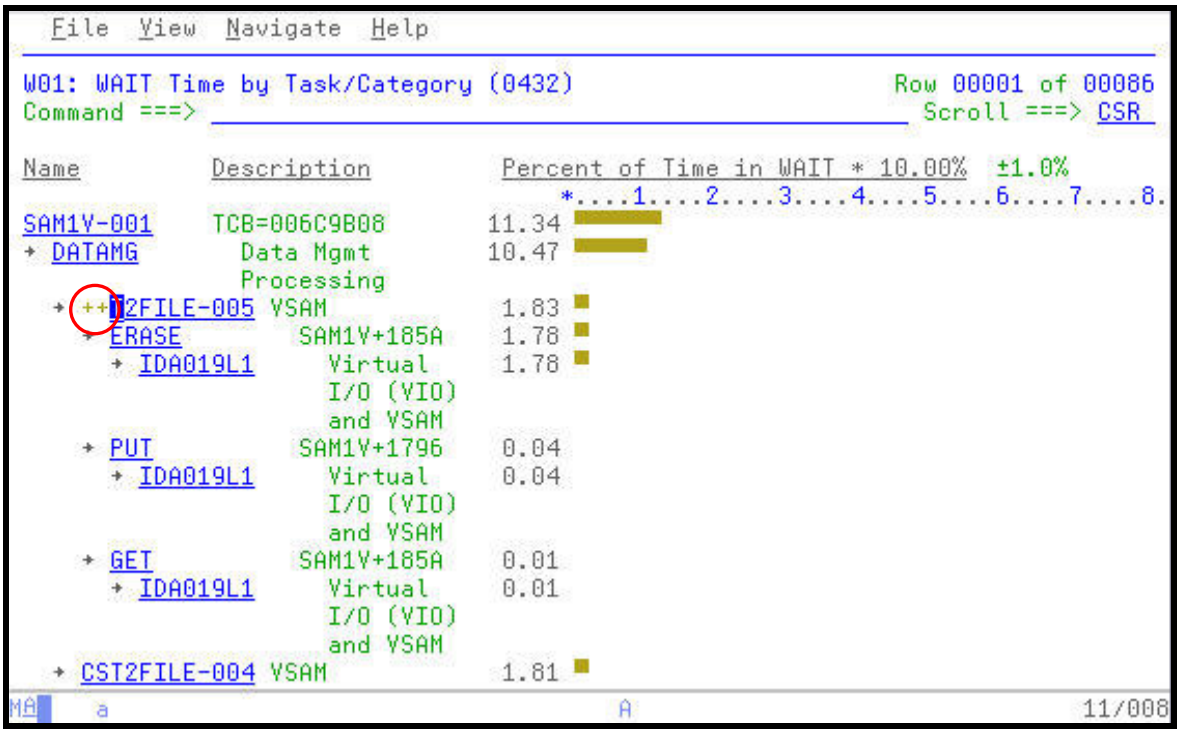

31. The pop-up panel shows information about the VSAM file in use. This scrollable panel shows detailed information on how the file and it's components were allocated and the results of processing this file during the Observation Session.

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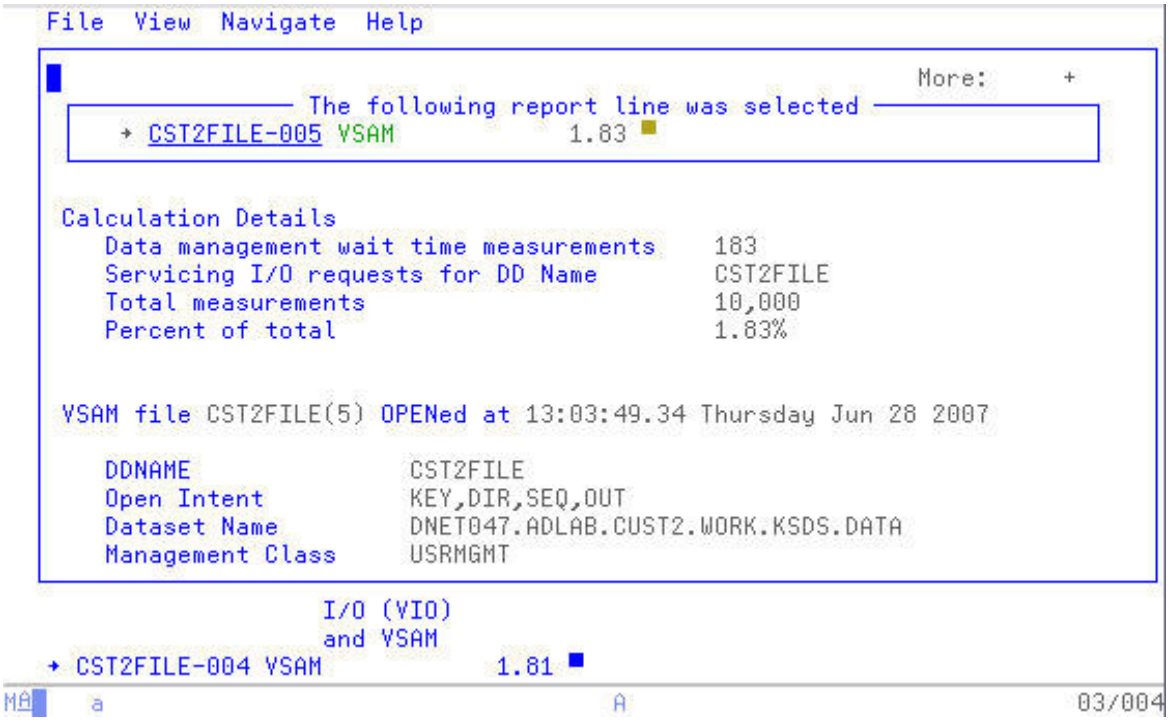
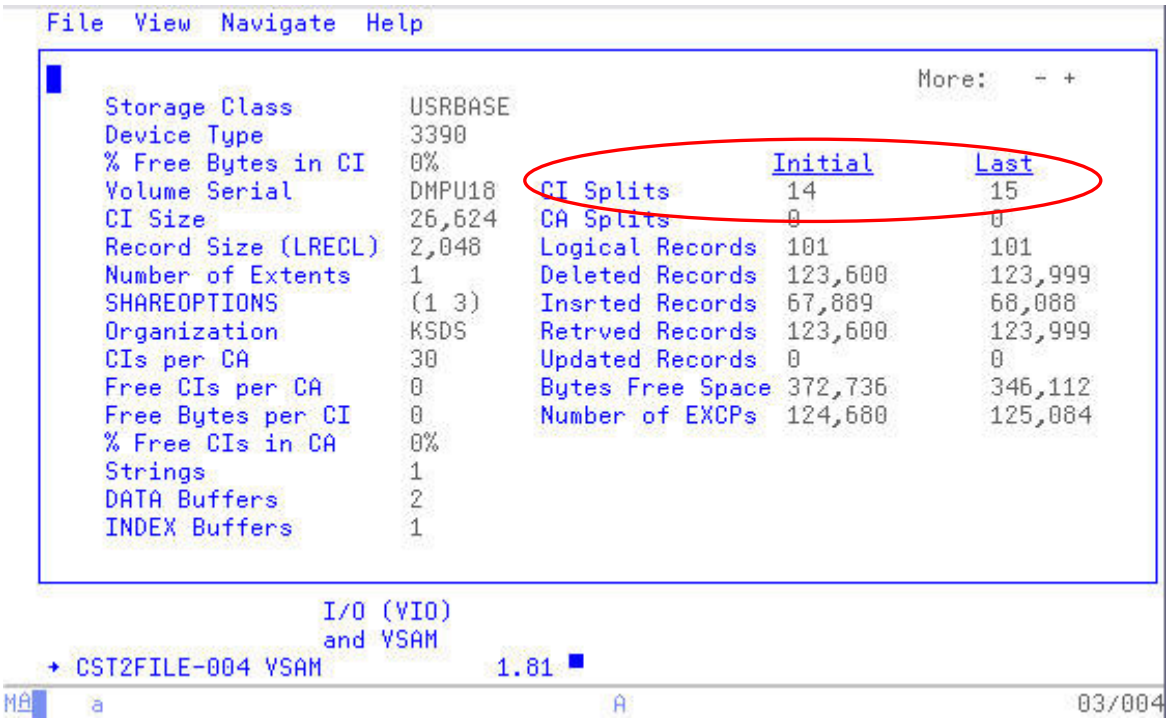


32. "PF7" and "PF8" will scroll up and down through the open windows. Performance tuning can include the initial and last counts columns, number of data buffers, and other aspects of the VSAM definition.



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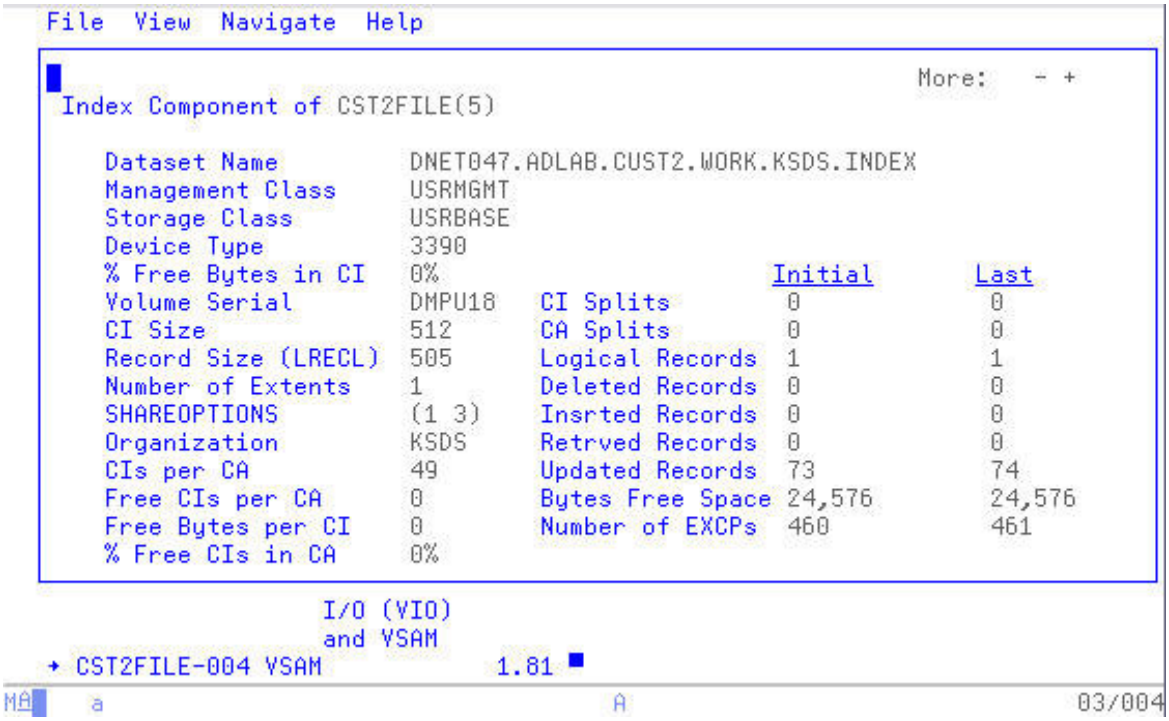
33. APA displays information on the both the Cluster and Index portion of the VSAM file.



34. Review the W03 Referred Attribution by Task report.

Press "**PF3**" to exit the detail pop-up windows.
Type "**W03**" in the command line, followed by **ENTER** to navigate to the W03 report.

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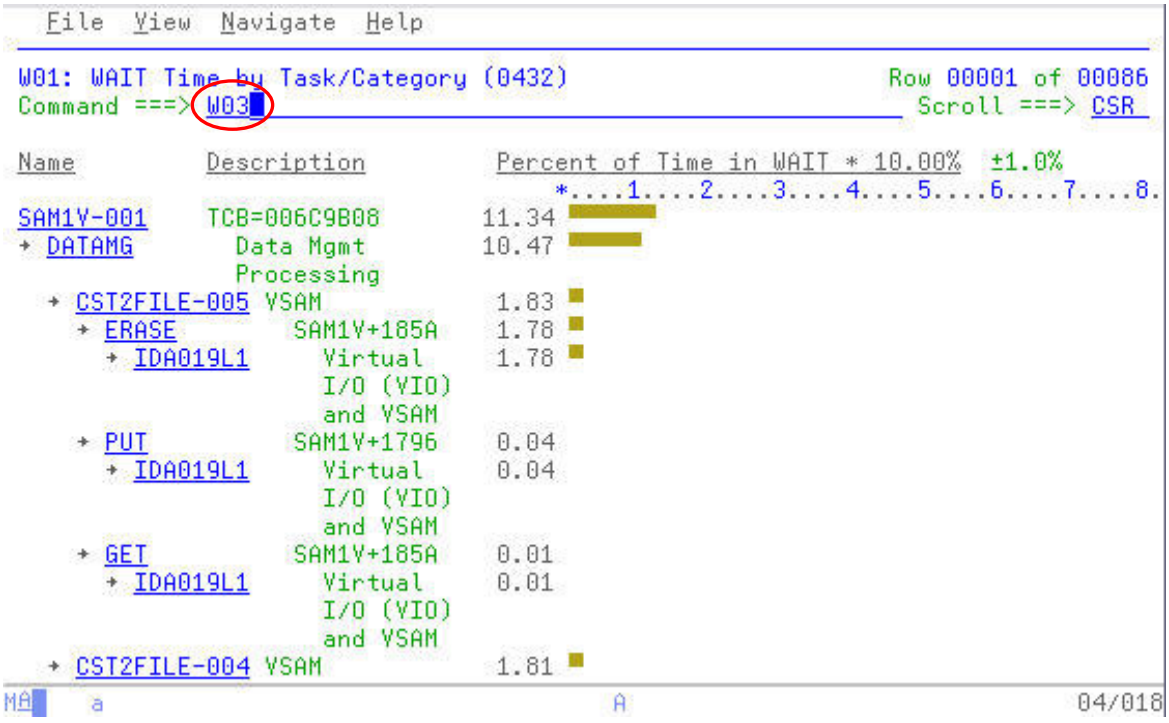
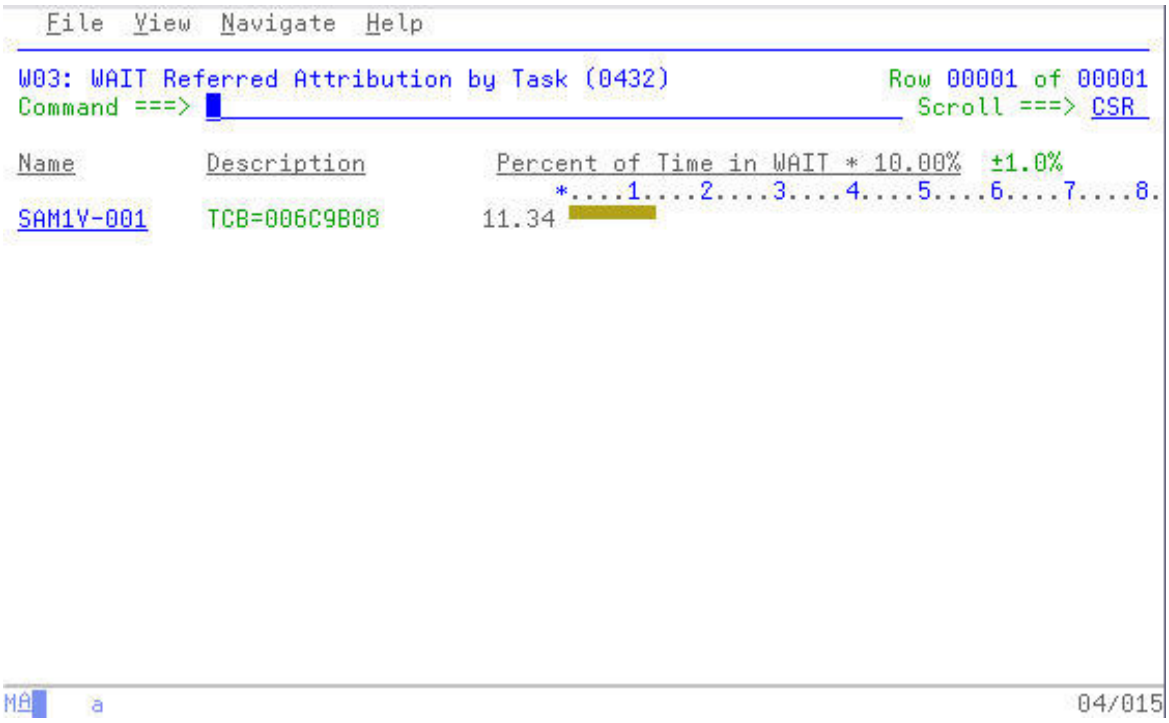


35. Expand all of the entries in the W03 report.

Type **"+"** on the column heading "**Name**", followed by **ENTER.** (not shown)



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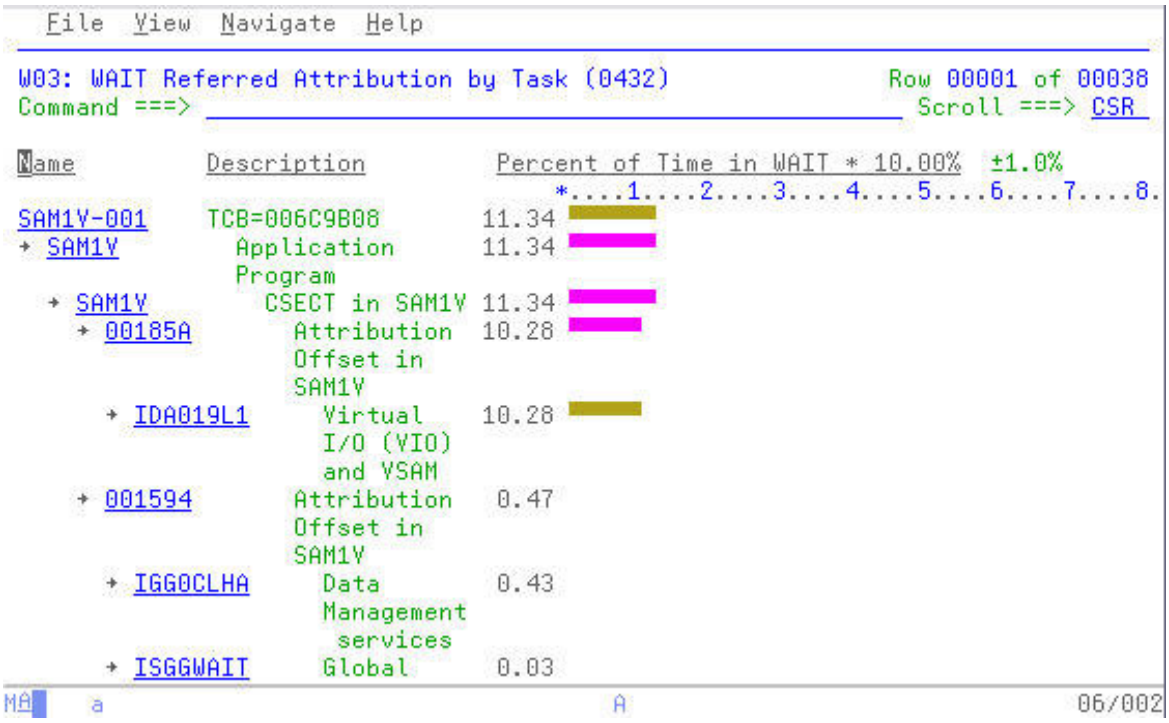
36. In this report it is easier to see that all of the 11.34% is attributed to the SAM1V Load Module and CSECT. Specifically, 10.28% of the 11.34% total occurs at offset 00185A in the SAM1V CSECT.



37. Display the Program Source for the SAM1V CSECT.

    Type "**P**" on the line containing the SAM1V CSECT name, followed by **ENTER**.

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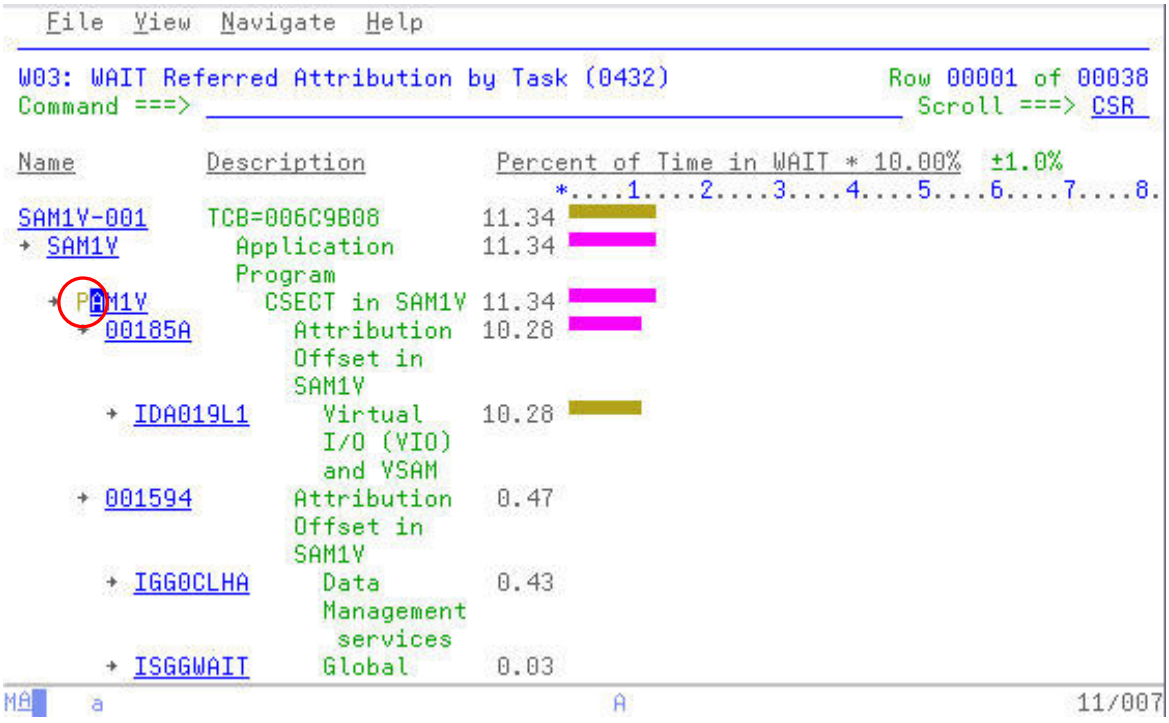
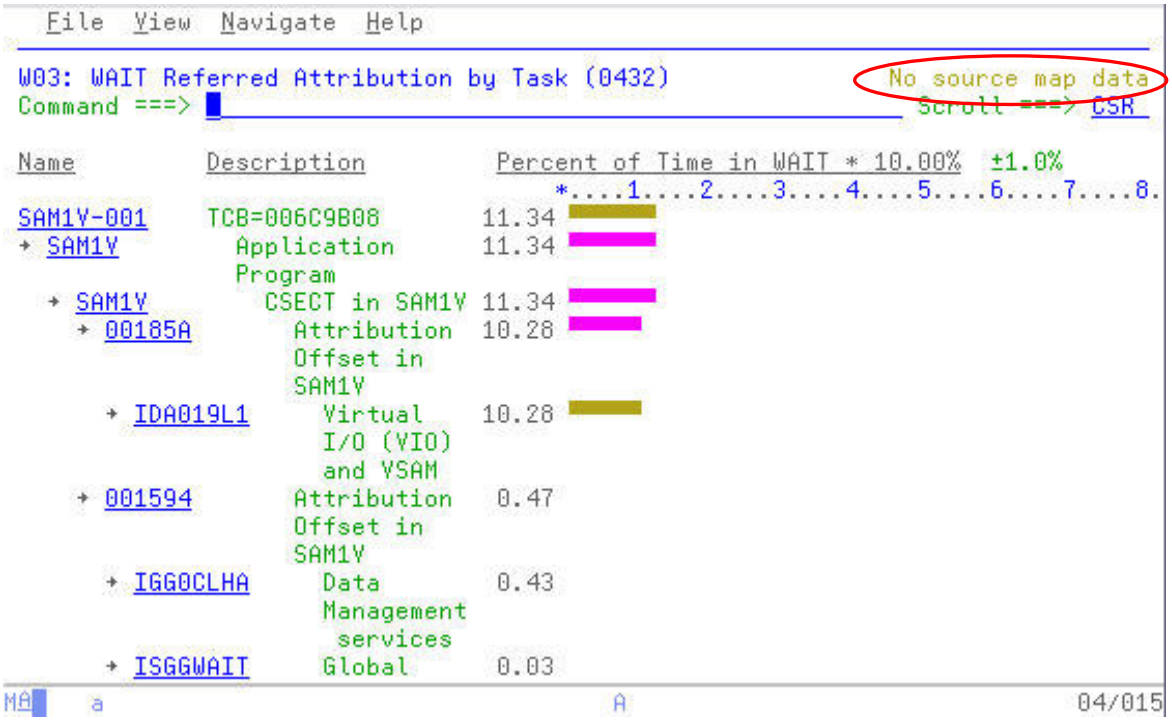


38. The short message area displays and informational message that the source for this program, SAM1V has not been defined to APA.



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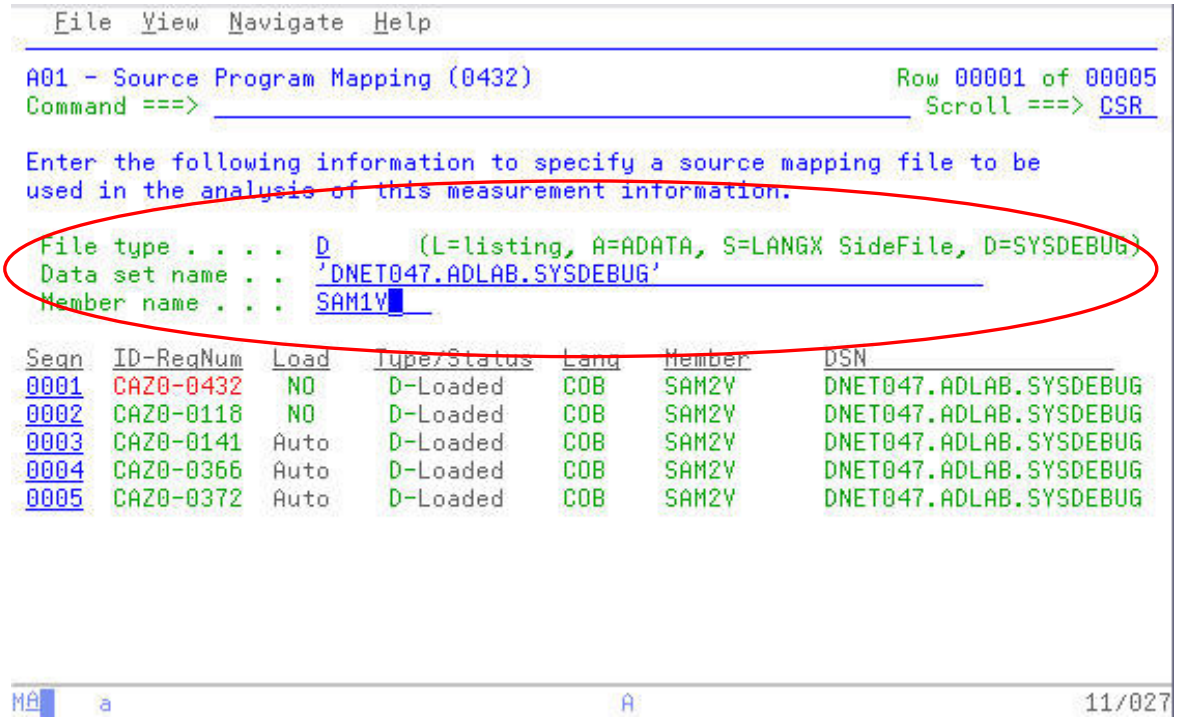
39. Navigate to the A01 Source Program Mapping panel to define the location of the source listing for the SAM1V module.

    Type "**A01**" in the command line, followed by **ENTER**. (not shown)
    Type "**D**" in the File Type prompt, for SYSDEBUG.
    At the Data Set Name prompt, type "***your-tso-id*.ADLAB.SYSDEBUG**" replacing your-tso-id with your userID.
    Type the name of the CSECT, "**SAM1V**" in the Member Name prompt, and then **ENTER**.



40. The resulting screen shows that the listing file has been added for this request number.

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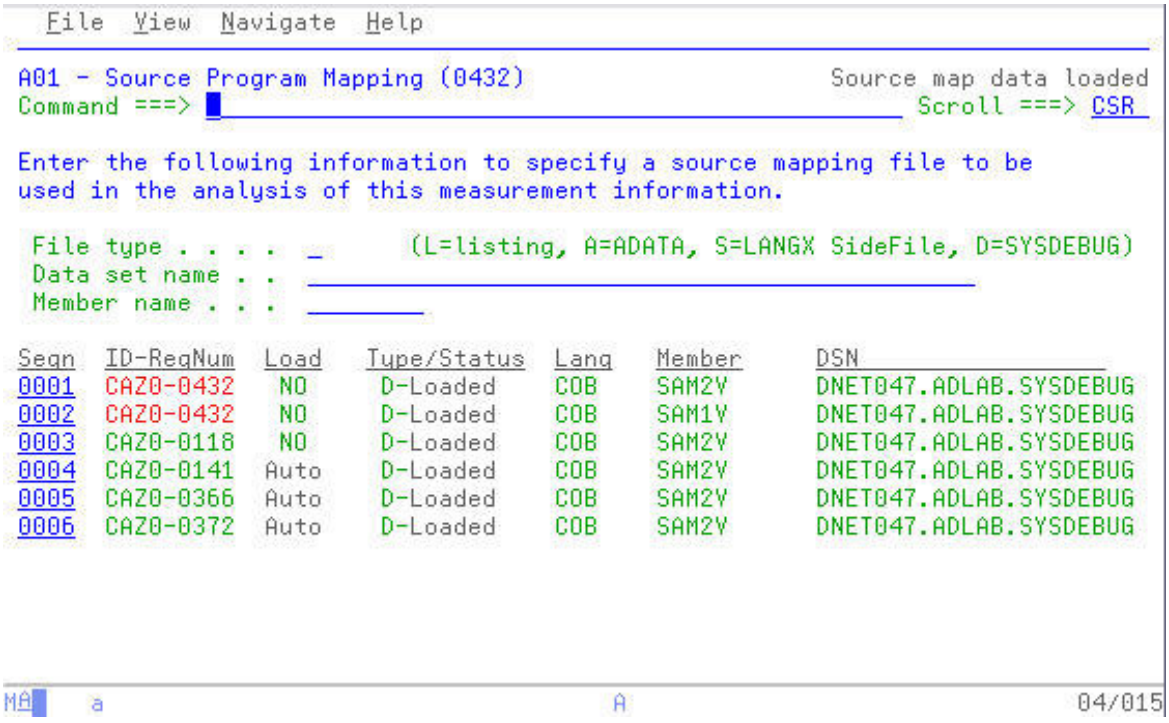

41. Navigate back to the W03 report and access the Program Source for the SAM1V module.

    Press "**PF3**" to return to the W03 report.
    Type "**P**" on the SAM1V CSECT, followed by **ENTER** to access the Program Source for SAM1V.

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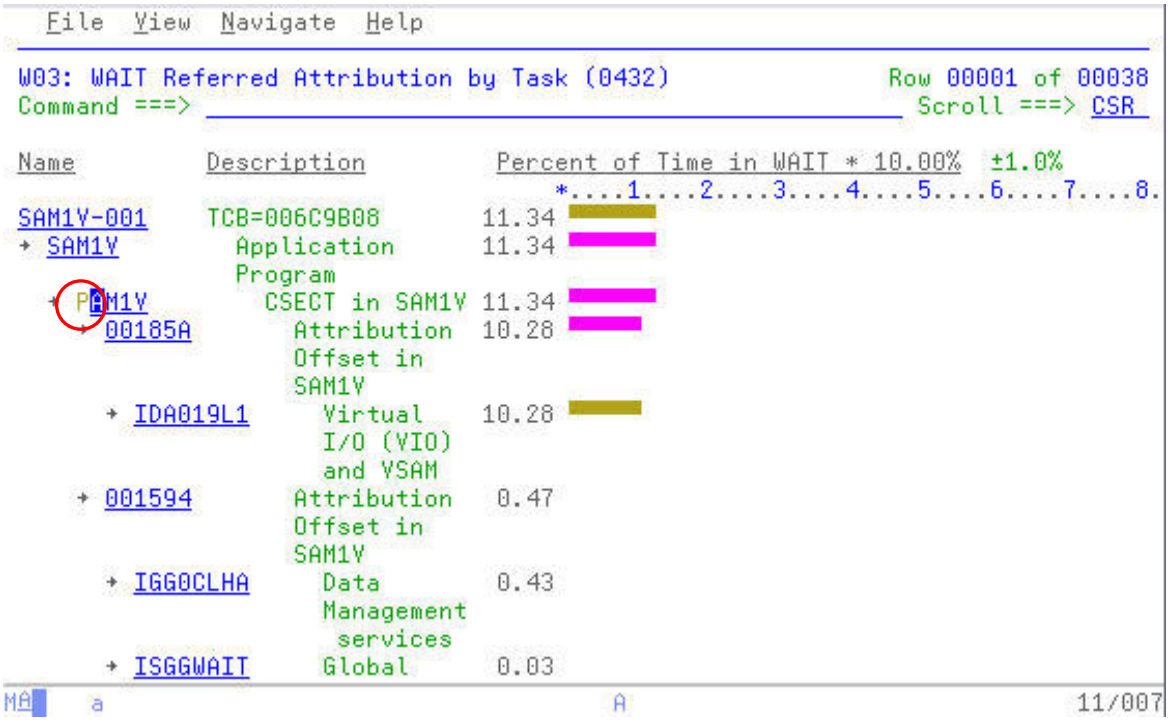
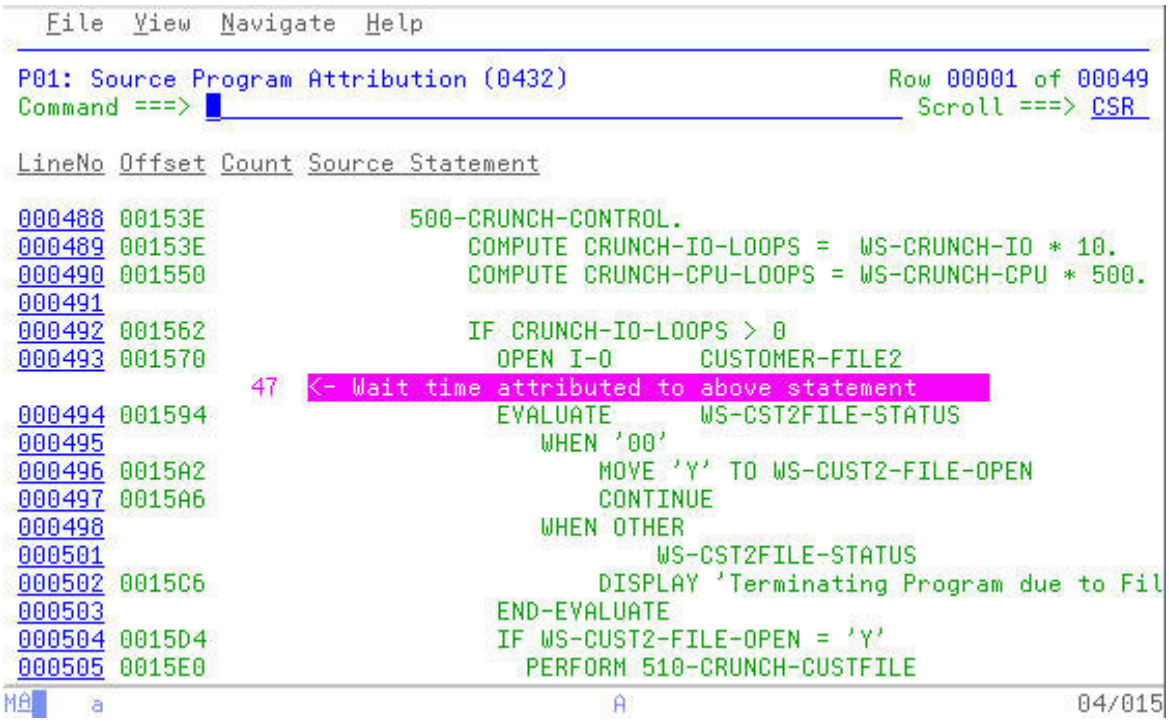


42. The resulting screen shows the source listing positioned at the first line containing an APA observation count. From here you could scroll up and scroll down to review the listing and specific offset(s) in question.



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43. End your Application Performance Analyzer session by exiting the product by pressing "**PF3**".

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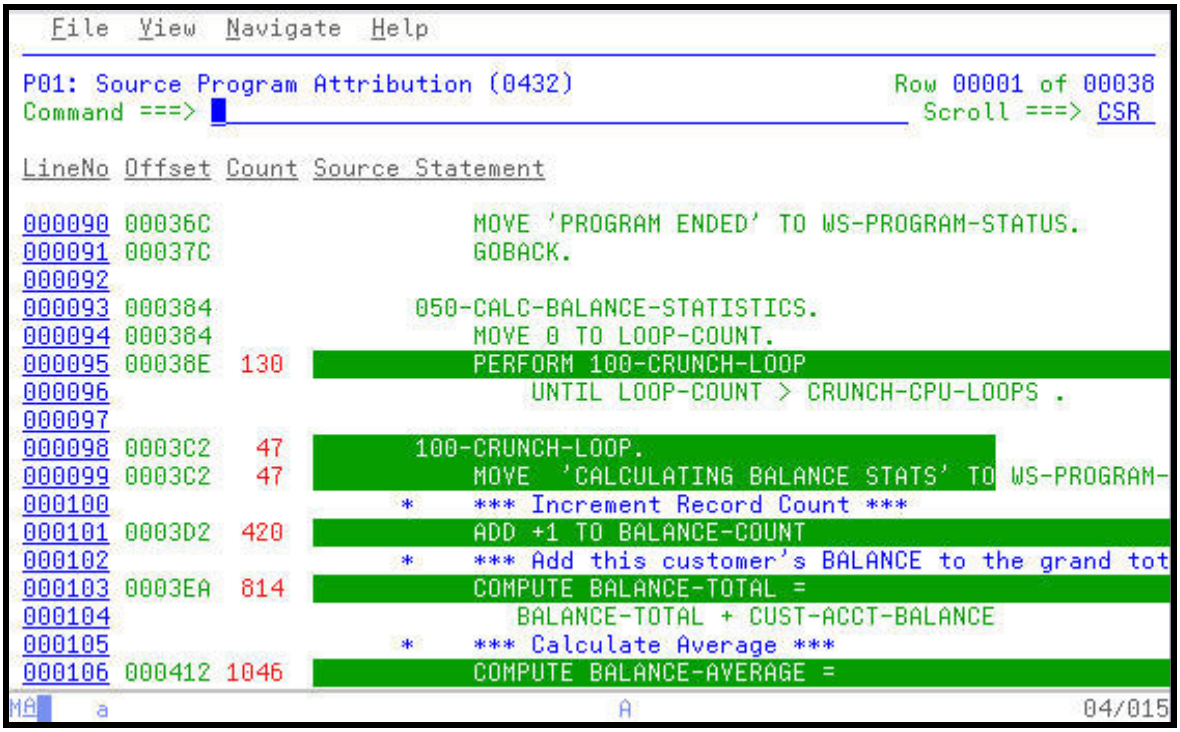
Answers for Lab Exercise 4

In this section you will find the answers to some of the basic questions posed during the course of the previous exercise. You may also see some additional commands that were discussed but not demonstrated during the course of Exercise 4.

1. One of the steps in the previous exercise asked the following:

   Question?: From reviewing the source listing with the APA counts, what have you observed from the statements indicated as high usage/executed statements?



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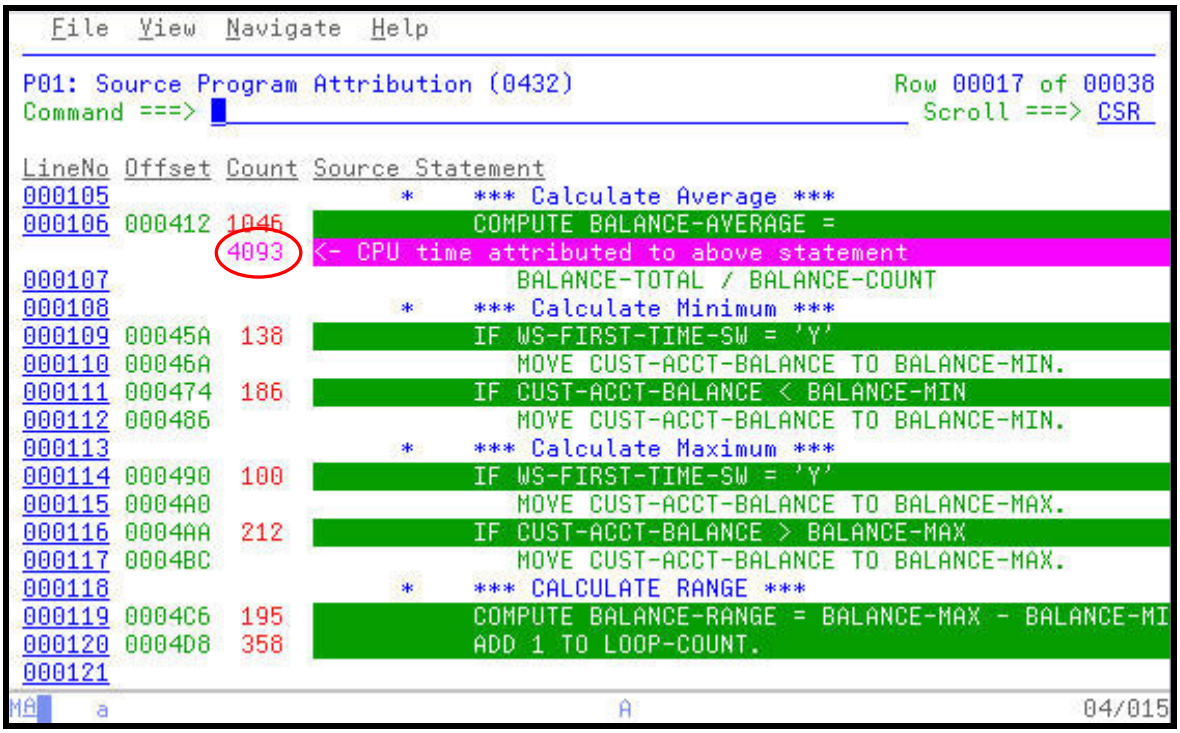

In the two previous source panels a pattern begins to emerge. Notice that many of the statements with counts are using data items beginning with the word BALANCE. The highest usage statement, which is causing some system resources to be expended uses three of these data items BALANCE-AVERAGE, BALANCE-TOTAL, and BALANCE-COUNT.

Using ISPF FIND commands it would be prudent to look at how these data items are defined to the application. In the panel below we can see that each variable is defined as a decimal numeric in using a print format. However our application is using these three variables to perform arithmetic functions. Each time the statement is encountered the system will internally convert these variables into a COMP-3 format for processing. Hence, the system resources being expended on behalf of the COMPUTE statements. More efficient processing would take place if these were defined as COMP-3 data items instead of forcing the system to convert these each time for processing.

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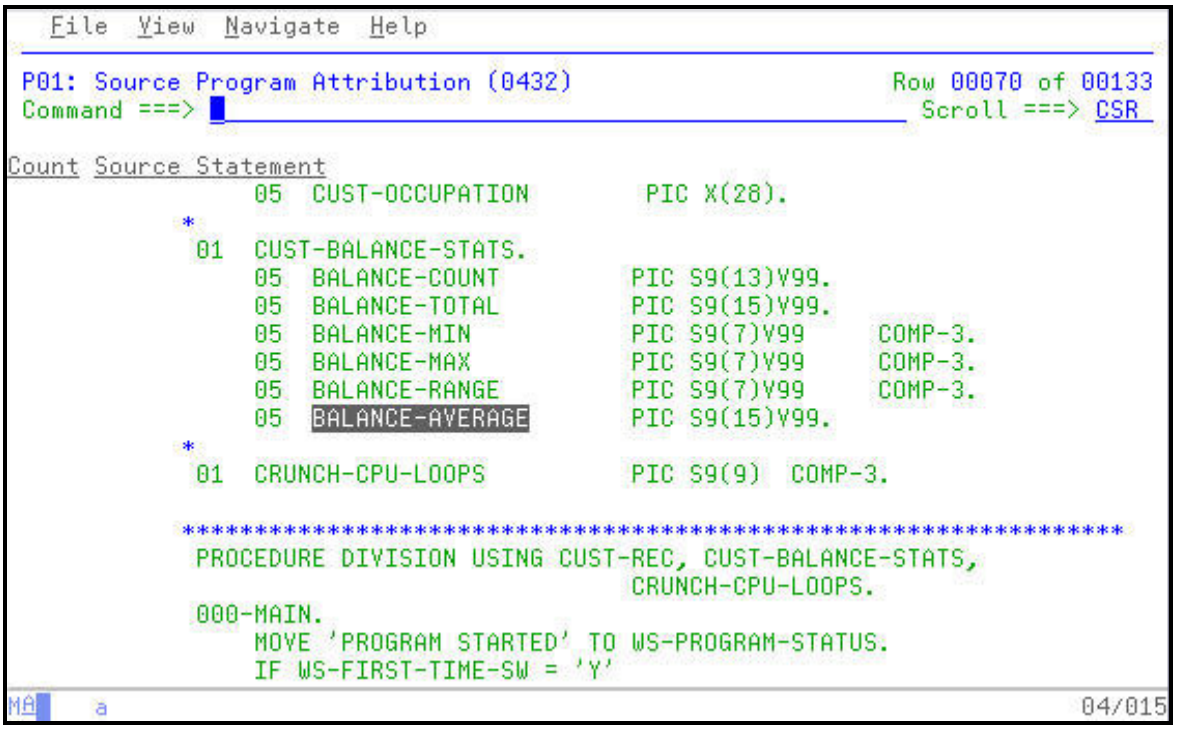

2. In the previous exercise one of the steps posed the following questions using the W01 WAIT Time by Task/Category report.

   Question?: What is occurring in the application that is causing a majority of the 10.47% WAIT? What DD statement is being observed by APA? What is the module name? Is there a specific location in the module where this condition is occurring?

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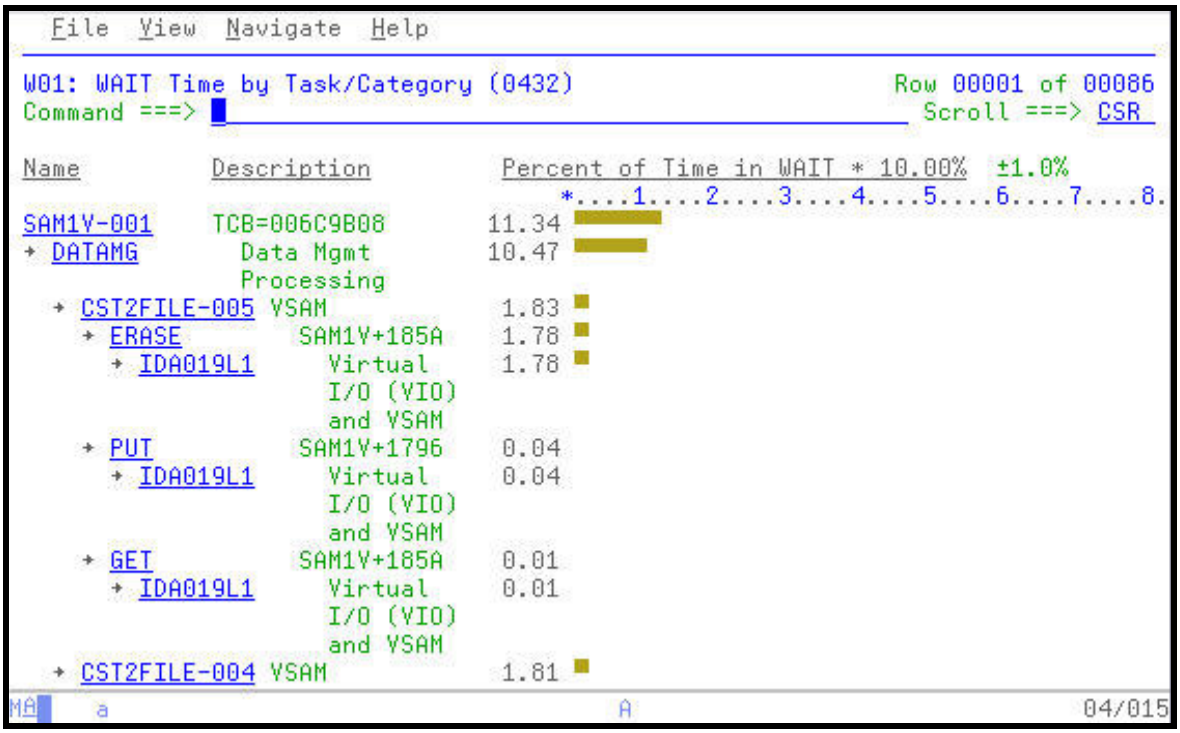

Each of the questions can be answered from the W01 report, although other reports might present this same information more readily. You become familiar with the various reports as you use and apply APA.

What is occurring in the application that is causing a majority of the 10.47% WAIT? Using "PF7" and "PF8" to scroll up and down in the W01 report shows that the ERASE function, when totaled, makes up a majority of the 10.47% being consumed by the application in WAITS.

What DD statement is being observed by APA? The DD statement is the CUST2FILE DD.

What is the module name? In case where the ERASE function is consuming resource, APA is pointing to the SAM1V Load Module and the SAM1V CSECT.

Is there a specific location in the module where this condition is occurring? Each the ERASE function is observed it points to a single location in the SAM1V CSECT, offset 185A.

3. Instead of using the "**PF7**" and "**PF8**" keys to scroll up and down through the listing, the SETUP command could be used to customize you ISPF view of the list and consolidate the listing. In the display below note that each line which contains an APA count is preceded and proceeded by 4 or 5 lines of additional source code.

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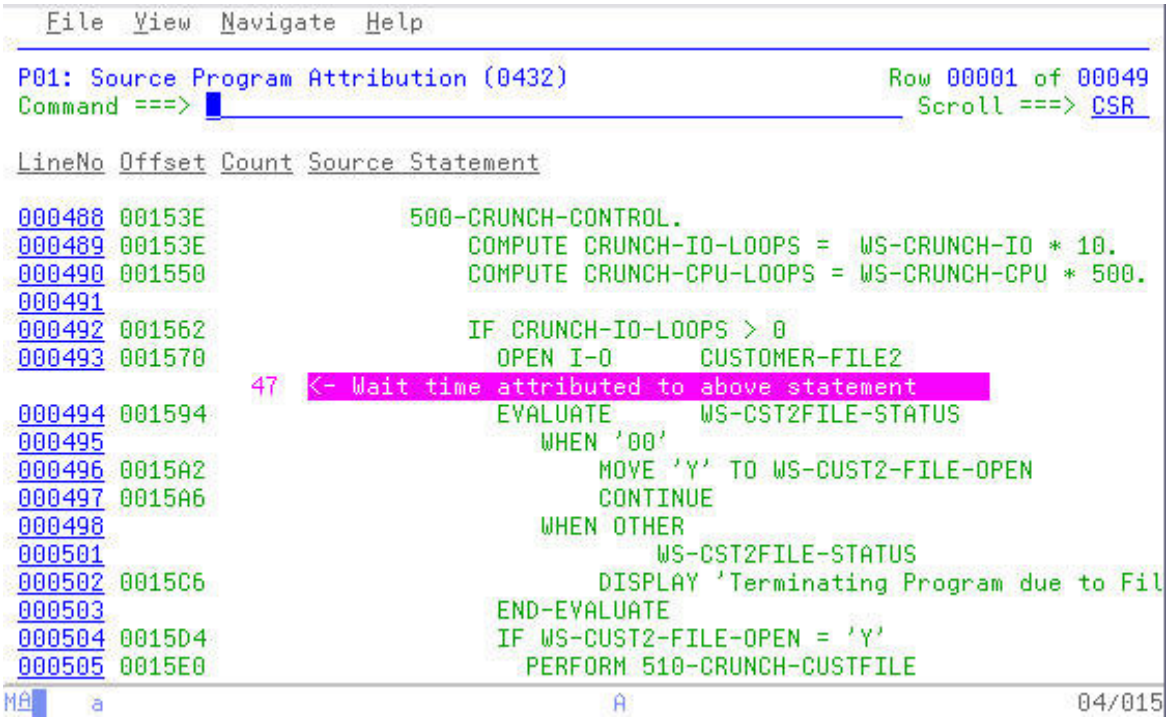
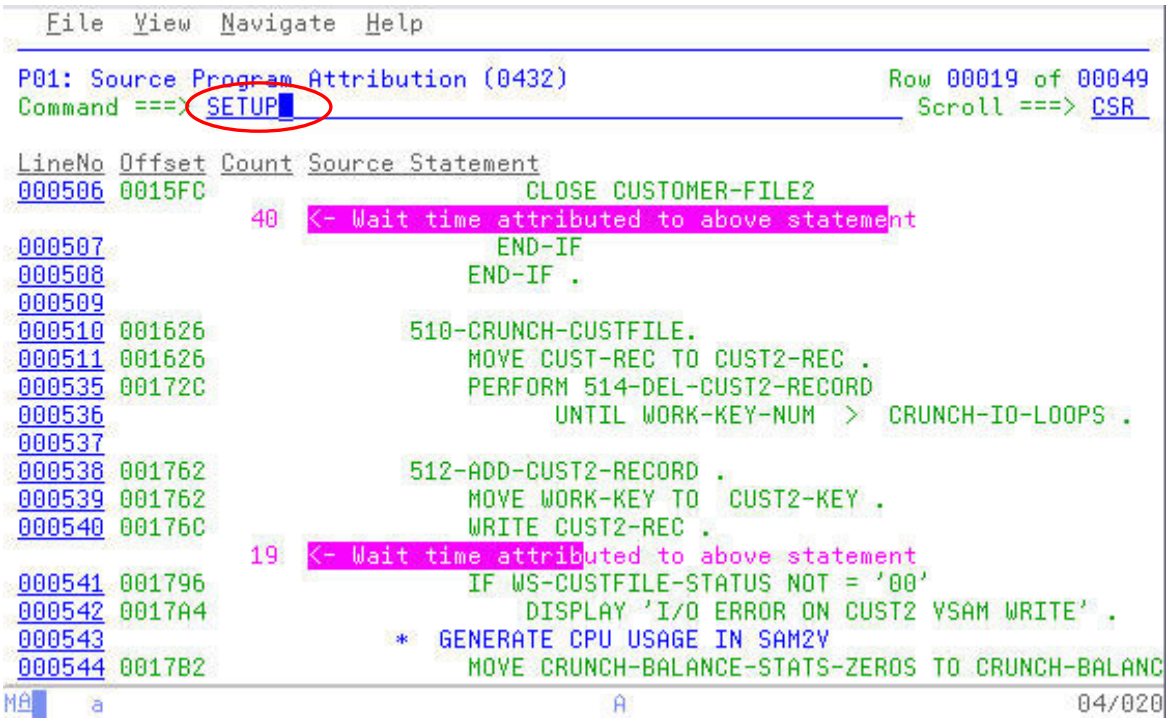


4. These lines can be reduced or even eliminated by customizing the view of the listing.

   Type "**SETUP**" on command line, followed by **ENTER**.



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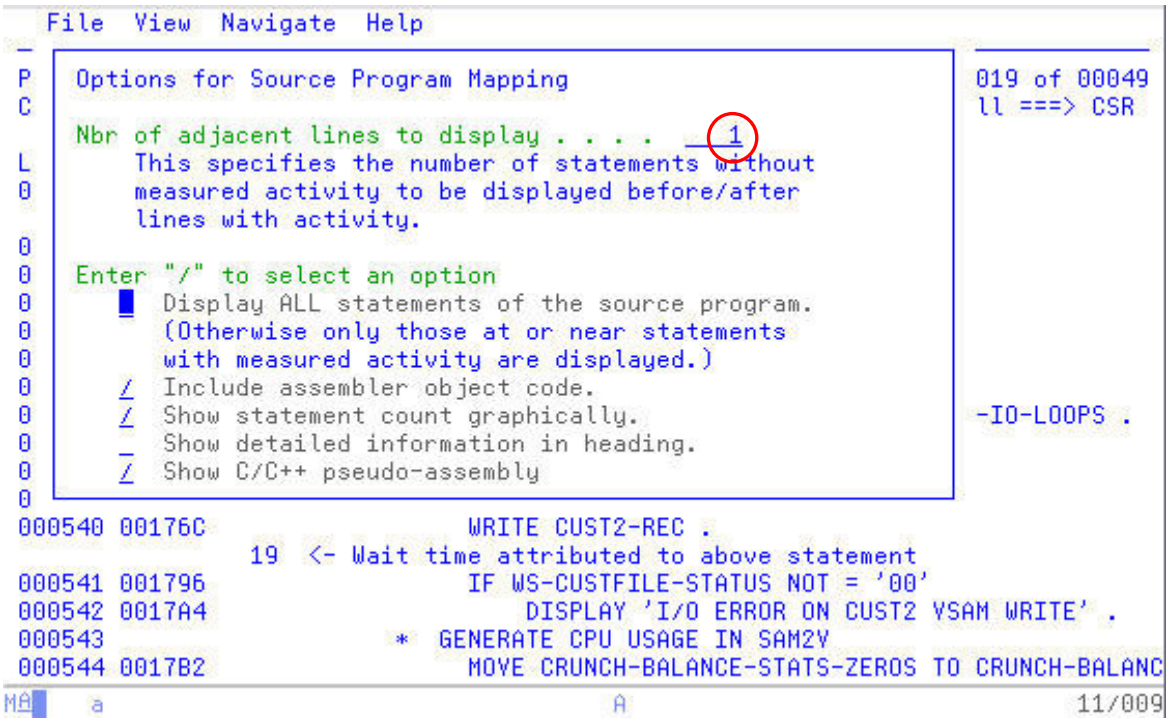
5. The report customization panel for the Source Program Mapping report is displayed. The first entry on this pop-up panel allows you to customize the "Nbr of adjacent lines to display" before and after a line containing an APA count.

   Other options on this panel allow to display the source listing in its entirety or to remove columns of information from the report display.

   Type "**1**" in the "Nbr of adjacent lines to display" prompt, followed by **ENTER**.



6. The resulting display consolidates the lines containing APA counts while still providing one line to context around each count line.

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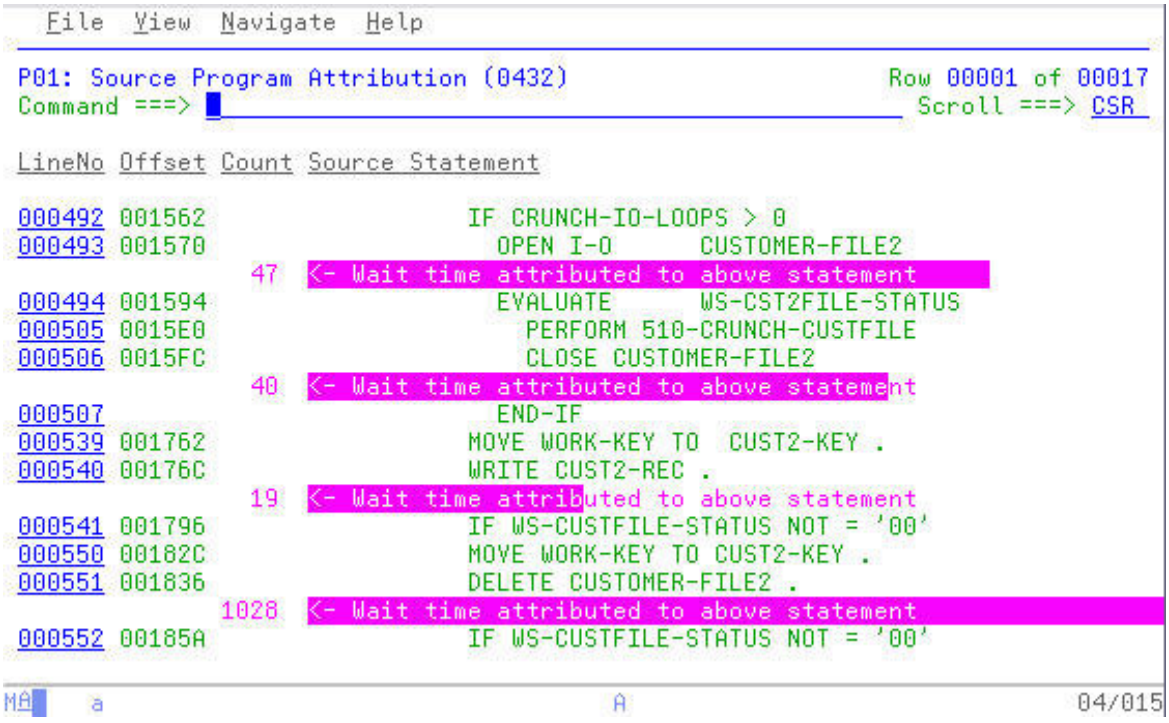

Notice that the offset mentioned with the ERASE function, 185A is shows at Statements 551 and 552.

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