



This is the tutorial for IBM Debug Tool for z/OS[®], one of the IBM zSeries[®] problem determination tools.

Using Debug Tool's terminal interface



- Full-screen windows and navigation
- Using the debugger
 - Stepping through statements and running the program
 - Program statement breakpoints
 - Monitoring variables
 - Displaying variables in the log
 - Making breakpoints conditional
 - Variable change breakpoints
 - Program entry and exit breakpoints
 - Jumping to a statement
 - Ending the debugging session

This section introduces you to Debug Tool's 3270 terminal interface, also known as the full screen interface”.

You will learn about the windows displayed in the Debug Tool 3270 interface, and how to navigate them. In the next sections you will see the commands that you need to know to perform most of the common debugging tasks.

The header and the monitor window



HEADER

- Shows language, and the current program and location

MONITOR WINDOW

- Monitor program variables
- Overtyping a value to change it
- The auto monitor displays variables in the current statement

```
COBOL  LOCATION: SAM1 :> 315.1
Command ==>                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----1-----2-----3-----4-----
0001  1 CUST-ID                               '13002'
0002  RPT-CUST-ID                             '13002'
0003  ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004  02 CUST-NAME                             'Turner, Paige'
0005  02 RPT-CUST-NAME                         'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5--- LINE: 312 OF 467
312          CALL 'SAM2' USING CUST-REC,
313          CUSTOMER-BALANCE-STATS
314          MOVE CUST-ID          TO RPT-CUST-ID
315          MOVE CUST-NAME        TO RPT-CUST-NAME
316          MOVE CUST-OCCUPATION  TO RPT-CUST-OCCUPATION
317          MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE
318          MOVE CUST-ORDERS-YTD  TO RPT-CUST-ORDERS-YTD
LOG 0-----1-----2-----3-----4-----5----- LINE: 63 OF 66
0063 GO ;
0064 STEP ;
0065 LIST ( CUST-OCCUPATION ) ;
0066 CUST-OCCUPATION = 'Author'
PF 1:?      2:STEP  3:QUIT  4:LIST  5:FIND  6:AT/CLEAR
PF 7:UP     8:DOWN  9:GO   10:ZOOM 11:ZOOM LOG 12:RETRIEVE
```

3

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When the debugger starts, there are three windows and a header displayed. The header is at the top of the screen, that shows the name of the program currently running and the current statement number in the program. Just below the header is the monitor window. You can use the monitor to watch variable values. There are commands you can use to add variables to the monitor, as you will see. Once you put a variable in the monitor, you can watch it change as the program runs. You can also turn on a function called the auto monitor. When the auto monitor is on, variables referenced by the current statement are shown automatically. If a variable is in the monitor window, you can change its value by overtyping it.

The source window



SOURCE WINDOW

- Displays program source
- The next statement that will run is highlighted
- Breakpoints are shown as highlighted line numbers
- The frequency counter is activated with the command: **SET FREQ ON**

```
COBOL  LOCATION: SAM1 :> 315.1
Command ==>                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----+-----1-----2-----3-----4-----
0001  1 CUST-ID                               '13002'
0002  RPT-CUST-ID                             '13002'
0003  ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004  02 CUST-NAME                             'Turner, Paige'
0005  02 RPT-CUST-NAME                         'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5--- LINE: 312 OF 467
312          CALL 'SAM2' USING CUST-REC,
313          CUSTOMER-BALANCE-STATS
314          MOVE CUST-ID TO RPT-CUST-ID
315          MOVE CUST-NAME TO RPT-CUST-NAME
316          MOVE CUST-OCCUPATION TO RPT-CUST-OCCUPATION
317          MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE
318          MOVE CUST-ORDERS-YTD TO RPT-CUST-ORDERS-YTD
LOG 0-----1-----2-----3-----4-----5----- LINE: 63 OF 66
0063 GO ;
0064 STEP ;
0065 LIST ( CUST-OCCUPATION ) ;
0066 CUST-OCCUPATION = 'Author'
PF 1:?          2:STEP      3:QUIT      4:LIST      5:FIND      6:AT/CLEAR
PF 7:UP         8:DOWN     9:GO       10:ZOOM     11:ZOOM LOG 12:RETRIEVE
```

4

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The source window is in the middle of the screen, and it displays program source statements. Notice that one of the statements is highlighted in red. That is the current statement, which is the next statement that will run. The area to the left of the program statements is called the prefix area, and you can enter line commands there. You can use line commands to perform tasks such as setting breakpoints. In this example, there is a breakpoint set at statement 314. Statement breakpoints are shown with their line numbers highlighted. Also notice the statement frequency counts which are shown to the right of the statements. You can turn on the frequency counter with the command “set frequency on”.

The log window



```
COBOL  LOCATION: SAM1 :> 315.1
Command ==>                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----+-----1-----2-----3-----4-----
0001  1 CUST-ID           '13002'
0002  RPT-CUST-ID        '13002'
0003  ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004  02 CUST-NAME       'Turner, Paige'
0005  02 RPT-CUST-NAME   'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5--- LINE: 312 OF 467
312          CALL 'SAM2' USING CUST-REC,
313          CUSTOMER-BALANCE-STATS
314          MOVE CUST-ID          TO RPT-CUST-ID
315          MOVE CUST-NAME        TO RPT-CUST-NAME
316          MOVE CUST-OCCUPATION  TO RPT-CUST-OCCUPATION
317          MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE
318          MOVE CUST-ORDERS-YTD  TO RPT-CUST-ORDERS-YTD
LOG 0-----1-----2-----3-----4-----5----- LINE: 63 OF 66
0063 GO ;
0064 STEP ;
0065 LIST ( CUST-OCCUPATION ) ;
0066 CUST-OCCUPATION = 'Author'
PF 1:?      2:STEP  3:QUIT  4:LIST  5:FIND  6:AT/CLEAR
PF 7:UP     8:DOWN  9:GO   10:ZOOM 11:ZOOM LOG 12:RETRIEVE
```

LOG WINDOW

- Commands and messages are logged
- The log can optionally be written to a file

5

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The log window is at the bottom of the screen. Commands and actions that you enter are logged in the log window. As a result, Debug Tool automatically keeps an ongoing script of your session. You can even optionally save your log into a file. In addition to commands and actions, you can also display items in the log such as program variable values, program statements, and settings.

Scrolling in a window



SCROLLING

- Use the scroll keys (F7 and F8 by default) to scroll up and down in a window
- Optionally specify the number of lines to scroll on the command line

```
COBOL  LOCATION: SAM1 :> 315.1
Command ==>                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----1-----2-----3-----4-----
0001  1 CUST-ID                               '13002'
0002  RPT-CUST-ID                             '13002'
0003  ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004  02 CUST-NAME                             'Turner, Paige'
0005  02 RPT-CUST-NAME                         'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5--- LINE: 312 OF 467
312          CALL 'SAM2' USING CUST-REC,
313          CUSTOMER-BALANCE-STATS
314          MOVE CUST-ID          TO RPT-CUST-ID
315          MOVE CUST-NAME        TO RPT-CUST-NAME
316          MOVE CUST-OCCUPATION  TO RPT-CUST-OCCUPATION
317          MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE
318          MOVE CUST-ORDERS-YTD  TO RPT-CUST-ORDERS-YTD
LOG 0-----1-----2-----3-----4-----5----- LINE: 63 OF 66
0063 GO ;
0064 STEP ;
0065 LIST ( CUST-OCCUPATION ) ;
0066 CUST-OCCUPATION = 'Author'
PF 1: ?          2: STEP          3: QUIT          4: LIST          5: FIN
PF 7: UP         8: DOWN         9: GO           10: ZOOM         11: ZOO

```

6

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Notice that the F7 and F8 keys are set to up and down by default. You can use these keys to scroll up and down in any of the windows. By default, if you leave your cursor on the command line, the source window scrolls. In this example, F8 is pressed.

Scrolling in a window



SCROLLING

- F8 was used to scroll down in the Source Window
- The SOURCE window scrolls by default
- To scroll the log or monitor, place the cursor anywhere in the window, then press a scroll key
- Use a **QUALIFY RESET** command to reposition to the current statement in the source

```
COBOL LOCATION: SAM1 :> 315.1
Command ==> |
Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----1-----2-----3-----4-----
0001 1 CUST-ID '13002'
0002 RPT-CUST-ID '13002'
0003 ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004 02 CUST-NAME 'Turner, Paige'
0005 02 RPT-CUST-NAME 'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5- LINE: 319 OF 467
319 WRITE REPORT-RECORD FROM RPT-DETAIL AFTER 1 21
320 ADD +1 TO NUM-DETAIL-LINES 21
321 END-IF ..
322 IF CUST-RECORD-TYPE = 'P' 73
323 * SUBROUTINE SAM3 WILL COLLECT PRODUCT STATISTICS ..
324 CALL 'SAM3' USING CUST-REC, 52
325 PRODUCT-STATS ..
LOG 0-----1-----2-----3-----4-----5- LINE: 63 OF 66
0063 GO ;
0064 STEP ;
0065 LIST ( CUST-OCCUPATION ) ;
0066 CUST-OCCUPATION = 'Author
PF 1: ? 2: STEP 3: QUIT 4: LIST 5: FIND 6: AT/CLEAR
PF 7: UP 8: DOWN 9: GO 10: ZOOM 11: ZOOM LOG 12: RETRIEVE
```

7

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And the source window was scrolled down. If you put your cursor in one of the other windows before you press F7 or F8, the window selected by the cursor will scroll instead.


Zoom a window to show it full-screen



ZOOM

- Zoom in on any window by placing the cursor in the window and using a ZOOM command or function key
- The SOURCE window will zoom by default
- F10 and F11 are ZOOM commands

```
COBOL  LOCATION: SAM1 :> 315.1
Command ==> ZOOM                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----1-----2-----3-----4-----
0001  1 CUST-ID                                '13002'
0002  RPT-CUST-ID                              '13002'
0003  ***** AUTOMONITOR SAM1 ::> SAM1 :> 315.1 *****
0004  02 CUST-NAME                             'Turner, Paige'
0005  02 RPT-CUST-NAME                         'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5----- LINE: 319 OF 467
319      WRITE REPORT-RECORD FROM RPT-DETAIL AFTER 1      21
320      ADD +1 TO NUM-DETAIL-LINES                        21
321      END-IF
322      IF CUST-RECORD-TYPE = 'P'                        73
323      * SUBROUTINE SAM3 WILL COLLECT PRODUCT STATISTICS ..
324      CALL 'SAM3' USING CUST-REC,                      52
325      PRODUCT-STATS                                   ..
LOG 0-----1-----2-----3-----4-----5----- LINE: 63 OF 66
0063  GO ;
0064  STEP ;
0065  LIST ( CUST-OCCUPATION ) ;
0066  CUST-OCCUPATION = 'Author'
PF 1: ?      2: STEP      3: QUIT      4: LIST      5: FIND
PF 7: UP      8: DOWN     9: GO      10: ZOOM     11: ZOOM LOG
```



8

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You can also zoom in and out of any window. To zoom to a window, type the zoom command, then place the cursor in the window you want to zoom, then press Enter. If you leave the cursor on the command line, the source window is zoomed. Also notice that a couple of function keys, F10 and F11, are set to the zoom and zoom log commands. In this example, the zoom command is typed on the command line, and enter is pressed.

After zooming the source window



ZOOM

- Use a ZOOM command (or function key) to zoom back out

```
COBOL  LOCATION: SAM1 :> 315.1
Command ==> |
Scroll ==> PAGE
SOURCE: SAM1 +----1-----2-----3-----4-----5--- LINE: 319 OF 467
319      WRITE REPORT-RECORD FROM RPT-DETAIL AFTER 1      21
320      ADD +1 TO NUM-DETAIL-LINES                        21
321      END-IF
322      IF CUST-RECORD-TYPE = 'P'                          73
323      *  SUBROUTINE SAM3 WILL COLLECT PRODUCT STATISTICS ..
324      CALL 'SAM3' USING CUST-REC,                       52
325          PRODUCT-STATS                                ..
326      ADD +1 TO NUM-PRODUCT-RECS                        52
327      END-IF
328      END-IF .
329
330      300-PROCESS-TOTALS-TRAN.
331      ADD +1 TO NUM-TOTALS-REQUESTS .                    00
332      ADD +1 TO NUM-TRANSACTIONS.                       00
333      WRITE REPORT-RECORD FROM RPT-SPACES AFTER 1.      00
334      WRITE REPORT-RECORD FROM RPT-TOTALS-HDR1.         00
335      WRITE REPORT-RECORD FROM RPT-TOTALS-HDR2.         00
336      IF NUM-PRINT-COMPLETED > 0                      00
337      MOVE SPACES TO RPT-TOTALS-DETAIL                  00
PF 1: ?      2: STEP      3: QUIT      4: LIST      5: FIND      6: AT/CLEAR
PF 7: UP     8: DOWN     9: GO      10: ZOOM     11: ZOOM LOG  12: RETRIEVE
```

9

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That zoomed in on the source window. Zooming on a window means expanding that window to the full screen, which can make it easier to work with. To zoom back out, just use the Zoom command again, or the Zoom key, F10. When you zoom out, you will see all three windows again.

Resize windows with the SIZE command



To resize windows

- Type SIZE on the command line, and
- place the cursor where you want the border

```
COBOL LOCATION SAM1 :> 315.1
Command = => SIZE                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----1-----2-----3-----4-----
0001 1 CUST-ID                                '13002'
0002 RPT-CUST-ID                              '13002'
0003 ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004 02 CUST-NAME                             'Turner, Paige'
0005 02 RPT-CUST-NAME                         'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5--- LINE: 312 OF 467
312 CALL 'SAM2' USING CUST-REC,                22
313 CUSTOMER-BALANCE-STATS                    22
314 MOVE CUST-ID TO RPT-CUST-ID                21
315 MOVE CUST-NAME TO RPT-CUST-NAME            21
316 MOVE CUST-OCCUPATION TO RPT-CUST-OCCUPATION 21
317 MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE 21
318 MOVE CUST-ORDERS-YTD TO RPT-CUST-ORDERS-YTD 21
LOG 0-----1-----2-----3-----4-----5----- LINE: 63 OF 66
0063 GO ;>
0064 STEP ; |
0065 LIST ( CUST-OCCUPATION ) ;
0066 CUST-OCCUPATION = 'Author'
PF 1: ?      2: STEP    3: QUIT    4: LIST    5: FIND    6: EAR
PF 7: UP     8: DOWN   9: GO     10: ZOOM   11: ZOOM   12: EVE
```

10

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You can also change the sizes of the windows, by moving the border lines. First, type "size" on the command line, then place your cursor where you want the border to be. The current border line nearest the cursor, in this example the one between the source and log windows, will be the one that moves. Press Enter.

Resize windows with the SIZE command



- The border nearest to the cursor snapped to the cursor

```
COBOL  LOCATION: SAM1 :> 315.1
Command ==>                               Scroll ==> PAGE
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 1 OF 8
-----+-----1-----2-----3-----4-----
0001  1 CUST-ID                '13002'
0002  RPT-CUST-ID              '13002'
0003  ***** AUTOMONITOR SAM1 :> SAM1 :> 315.1 *****
0004  02 CUST-NAME              'Turner, Paige'
0005  02 RPT-CUST-NAME         'Ness, Luke'
SOURCE: SAM1 +-----1-----2-----3-----4-----5--- LINE: 312 OF 467
312          CALL 'SAM2' USING CUST-REC,                22
313          CUSTOMER-BALANCE-STATS                    ..
314          MOVE CUST-ID          TO RPT-CUST-ID        22
315          MOVE CUST-NAME        TO RPT-CUST-NAME      21
316          MOVE CUST-OCCUPATION  TO RPT-CUST-OCCUPATION 21
317          MOVE CUST-ACCT-BALANCE TO RPT-CUST-ACCT-BALANCE 21
318          MOVE CUST-ORDERS-YTD  TO RPT-CUST-ORDERS-YTD 21
319          WRITE REPORT-RECORD FROM RPT-DETAIL AFTER 1 21
320          ADD +1 TO NUM-DETAIL-LINES                  21
LOG 0-----+-----1-----2-----3-----4-----5----- LINE: 66 OF 67
0066 CUST-OCCUPATION = 'Author'
0067 SIZE ;
PF 1: ?      2: STEP    3: QUIT    4: LIST    5: FIND    6: AT/CLEAR
PF 7: UP     8: DOWN   9: GO     10: ZOOM   11: ZOOM LOG 12: RETRIEVE
```

11

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And the border line was snapped to the cursor, which in this case changed the sizes of the source and log windows..

When a debugging session starts



- The program has not started yet
- STEP or GO will start the program
- If you specified a Preferences file or Command file, they have already run
- At this point you can:
 - Set breakpoints
 - Monitor variables
 - Run the program

```
COBOL  LOCATION: SAM1 initialization
Command ==> |
MONITOR +-----1-----2-----3-----4-----5-----6- LINE: 0 OF 0
***** TOP OF MONITOR *****
***** BOTTOM OF MONITOR *****
Note: variable values will not display until
the program has initialized

SOURCE: SAM1 +-----1-----2-----3-----4-----5----- LINE: 1 OF 467
1 *****
2 x PROGRAM: SAM1
3 x Sample prog
4 x
5 x AUTHOR : Doug Stout
6 x IBM PD TOOLS
7 x
LOG 0-----1-----2-----3-----4-----5----- LINE: 33 OF 36
0009 in this Debug Tool session.
0010
0011 EQA1872E An error occurred while opening file: INSPREF. The file may not
0012 exist, or is not accessible.
PF 1:? 2:STEP 3:QUIT 4:LIST 5:FIND 6:AT/CLEAR
PF 7:UP 8:DOWN 9:GO 10:ZOOM 11:ZOOM LOG 12:RETRIEVE
```

Note: Warnings about opening the Preferences (INSPREF) and Log (INSPLOG) files are normal

This is an example of a Debug Tool session when it first starts. In most cases, Debug Tool will pause the application before the initialization of the main program. The main program has not yet started. Be aware that variables do not exist until the program initializes. Program initialization will occur automatically as soon as you run or step into the program. At this point, you can set breakpoints, add variables to the monitor window, change your Debug Tool settings, step, and run the program.

That is the end of this section, which described the windows in the 3270 interface and how to navigate them. Continue with the next section to learn about the basic debugging commands.

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