Rowan Ducks

CMS-2 Source Monitor and Analyzer

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Version:	1.1
Date:	03/03/17

Sponsor:	ASRC Federal Mission Solutions
Client Representatives:	Chris Bartley, Craig Sobieralski

Document History

Version	Date	Updated By	Comments
1.1	3/3/2017	Thomas Harker	Initial CMS-2 Source Monitor and Analyzer requirements

Acronyms and Defined Terms

Acronym/ Defined Terms	Description
CMS-2	Programming language used by the US Navy
Fortran	Programming language which has fallen out of favor in technical industry
SAN	Source Analyzer: a module used to quantify elements in CMS-2 files
SM	Source Monitor: a module used to quantify changes between version-controlled CMS-2 files

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1. INTRODUCTION

1.1 Purpose

This document is the specification of requirements for the CMS-2 Source Monitor and Analyzer. The document is aimed at both the business users at ASRC-FMS and the Rowan Ducks team.

The requirements for the solution are described in the context of the business process that the solution will support. These are all known requirements for this project.

This document will be used as the basis for detailed design and testing.

1.2 Project Background

1.2.1 Project Purpose

ASRC Federal Mission Solutions currently utilizes Fortran tools to analyze changes made to their CMS-2 code-base and generate reports summarizing these changes. The Source Analyzer is responsible for generating a blanket report for the entire code base. This report contains information about individual files and their contents. The Source Monitor is responsible for documenting changes between two versions of a file. It is responsible for identifying insertions, modifications, and deletions to a file. These are requirements that must be satisfied as a contractor for the United States Defense Department. In order to improve the reusability and simplify the upkeep of these tools, ASRC-FMS would like to modernize them into a newer language. The tool currently runs in a VAX/VMS DEC Alpha environment and they would like to transfer the new tool to a UNIX/Linux environment.

1.2.2 Project Scope

The scope of this project is limited to creating new tools in Python which accomplishes the same functions as their Fortran counterparts currently in use by ASRC-FMS.

2. DETAIL FUNCTIONAL REQUIREMENTS

2.1 Source Analyzer Functional Requirements

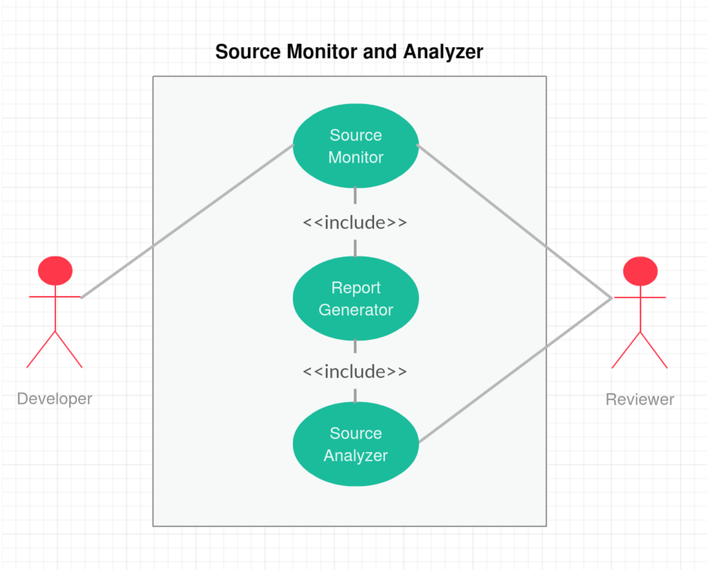
Requirement Reference #	Description	Critical
1	The Source Analyzer (SAN) shall be able to identify and count individual elements in the CMS-2 code-base.	Y
1.1	SAN shall be able to detect the total number of lines in a file.	Y
1.2	SAN shall be able to detect the number of executable statements in a file.	Y
1.2.1	SAN shall be able to identify and count the number of GOTO statements in a file	Y
1.3	SAN shall be able to detect the number of notes in a file.	Y
1.4	SAN shall be able to detect the number of comments in a file.	Y
1.4.1	SAN shall be able to detect and count single line comments in a file.	Y
1.4.2	SAN shall be able to detect and count multi-line comments in a file.	Y
1.5	SAN shall be able to detect and report the use of improper formatting in the code base.	Y
1.5.1	SAN shall be able to detect and count instances of files with incorrect extensions.	Y
1.5.2	SAN shall detect and count instances of the key phrase "END-SYSTEM" being misplaced. This phrase is only allowed at the end of a block of CMS-2 Direct	Y
1.5.3	SAN shall detect and count instances of multiple components being in the same file	Y
1.5.4	SAN shall detect and count instances of component name and filename mismatch	Y
2	The Source Analyzer shall be able to identify and count elements of both High Level CMS-2 (Appendix 4-3) and CMS-2 Direct (Appendix 4-4)	Y
2.1	The detected elements shall include lines, comments, multi-line comments, notes, multi-line notes, data statements, executable statements, and multi-line statements.	Y
3	The Source Analyzer shall generate a report providing a summary of all changes made to the CMS-2 code-base.	Y
3.1	The report generated by the Source Analyzer should use an identical format to the current report in use by ASRC-FMS. (See Appendix 4-1)	N

3.2	The report generated by the Source Analyzer shall report the number of occurrences of files with incorrect extensions and component name / file mismatches.	Y
3.3	The report shall list all files with procedures longer than 250 lines.	Y
3.4	The report shall contain the Source Analyzer starting time, completion time, and runtime duration.	Y

2.2 Source Monitor Functional Requirements

Requirement Reference #	**Description**	**Critical**
4	The Source Monitor (SM) shall be able to detect and count additions, revisions, and deletions between two versions of a file.	Y
4.1	The Source Monitor shall be able to identify changes between either two High Level CMS-2 files (Appendix 4-3) or two CMS-2 Direct files (Appendix 4-4)	Y
4.2	The detected changes shall include lines, comments, multi-line comments, notes, multi-line notes, data statements, executable statements, and multi-line statements.	Y
4.3	SM shall generate a report that indicates the file and line number of all additions, modifications and deletions in its input.	Y
4.4	The report generated by the SM shall use an identical format to the current report in use by ASRC-FMS (See Appendix 4-2).	N

2.3 Use Case Model



2.3.1 Actors

Developer: A software developer at ASRC-FMS. These individuals will only interact with the Source Monitor in their daily routine.

Reviewer: A more senior employee from management at ASRC-FMS. These individuals will interact with both the Source Monitor and Source Analyzer to perform their oversight tasks.

2.3.2 Use Cases

1.1 Code Check-in
When a developer checks in a version-controlled CMS-2 file into an ASRC-FMS code repository, the Source Monitor will analyze the checked-in files for additions, modifications, and deletions. After analysis is complete, a report is generated summarizing this information and is presented to the developer.

1.2 Review A Check-in:
When a reviewer wishes to view the changes made to the code-base in a recent check-in he/she can run the Source Monitor, using the files of interest as input, to generate a new report so that they can review any changes.

1.3 Software Release Cycle
When new software is ready to be released, the reviewer can run the Source Analyzer over the entire code base to identify and count particular elements of interest. After the analysis is complete, a report is generated summarizing the information of interest and is presented to the reviewer.

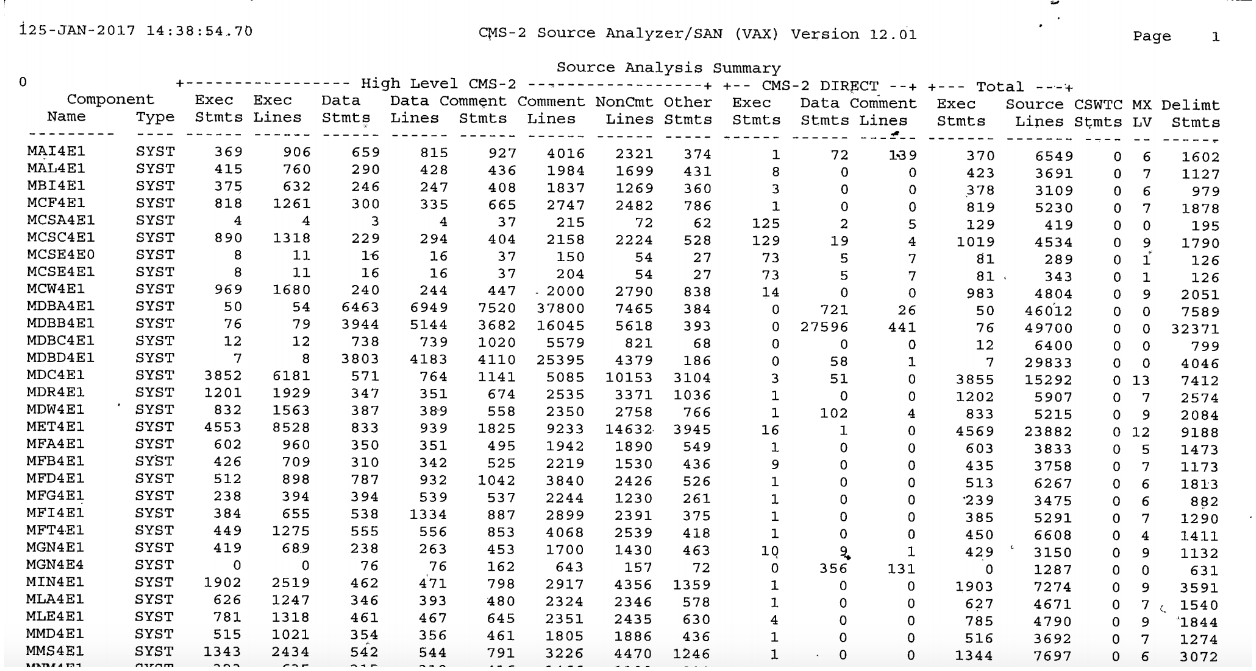
3. DETAIL NON-FUNCTIONAL REQUIREMENTS

3.1 Non-Functional Requirements

Requirement Reference #	Description	Critical
5	The product shall be created without the inclusion of any proprietary software or third party tools which are not freely available.	Y
6	The product shall be created using Python and run on a UNIX/Linux environment.	Y
6.1	The product shall run from a command line interface.	Y
7	The design of the Source Monitor and Analyzer should be extensible.	N
7.1	The product design should allow ASRC-FMS to extend functionality to the analysis of other programming languages.	N
7.2	The product should be easily compatible with the addition of a graphical user interface.	N
7.3	The design of the product should allow for easy adaptation and revision of the SAN and SM report format.	N
8	The performance of the Source Monitor and Analyzer shall not impede the workflow of developers at ASRC-FMS.	Y
8.1	The runtime of the Source Monitor/Analyzer should require less than 5 seconds if the input is less than 5 files.	N
8.2	The runtime of the Source Monitor/Analyzer should require less than 4 hours if the input is the full CMS-2 code base.	N
9	The Source Monitor shall be triggered to run automatically when a file is checked in to the code repository. Its input shall be these newly checked-in files.	Y

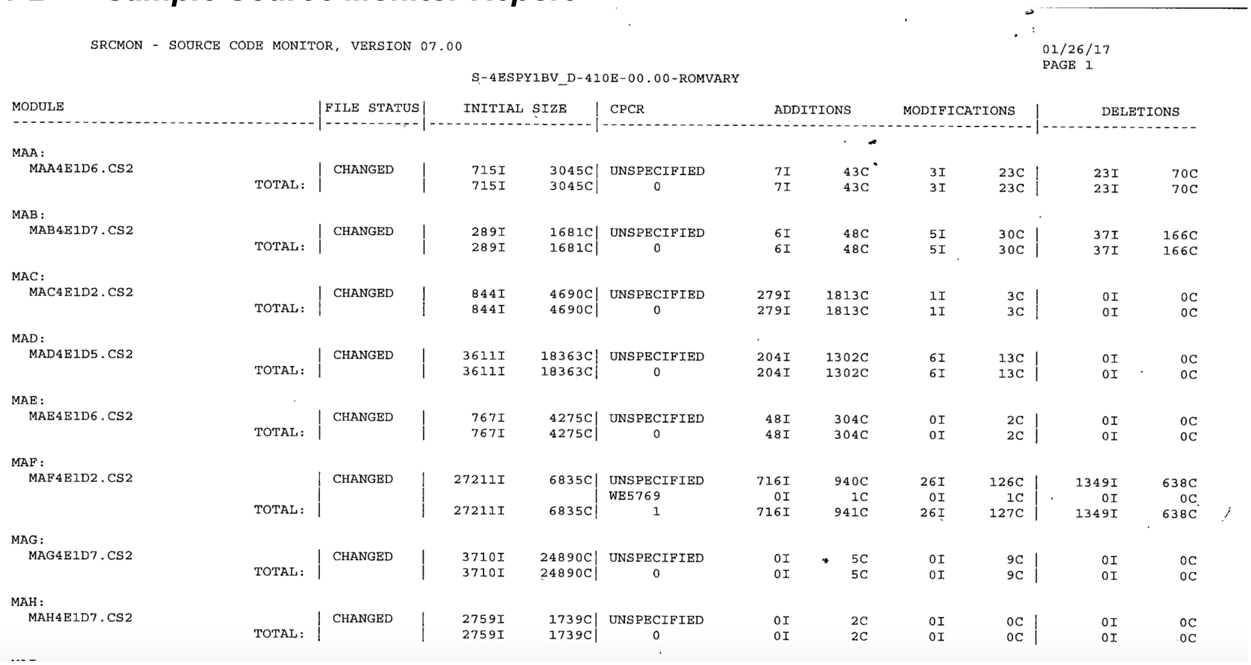
4. APPENDIX - RELATED MATERIAL

4-1 Sample Source Analyzer Report



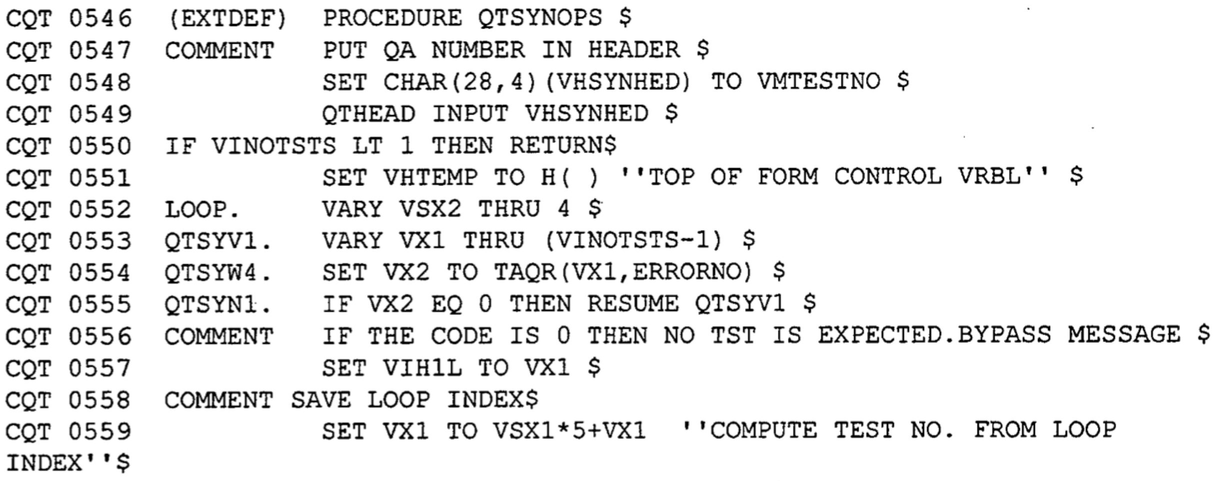
```
125-JAN-2017 14:38:54.70                         CMS-2 Source Analyzer/SAN (VAX) Version 12.01                        Page    1

                                                       Source Analysis Summary
0               +----------------- High Level CMS-2 ------------------+ +-- CMS-2 DIRECT --+ +--- Total ---+
   Component    Exec  Exec   Data   Data Comment Comment NonCmt Other  Exec   Data Comment  Exec  Source CSWTC MX Delimt
  Name    Type  Stmts Lines  Stmts  Lines  Stmts  Lines   Lines Stmts  Stmts  Stmts Lines   Stmts  Lines Stmts LV  Stmts
 --------- ---- ------ ------ ------ ------ ------ ------ ------ -----  ------ ------ ------ ------- ------- ---- -- ------
 MAI4E1   SYST    369    906    659    815    927   4016   2321   374      1     72    139     370    6549    0  6   1602
 MAL4E1   SYST    415    760    290    428    436   1984   1699   431      8      0      0     423    3691    0  7   1127
 MBI4E1   SYST    375    632    246    247    408   1837   1269   360      3      0      0     378    3109    0  6    979
 MCF4E1   SYST    818   1261    300    335    665   2747   2482   786      1      0      0     819    5230    0  7   1878
 MCSA4E1  SYST      4      4      3      4     37    215     72    62    125      2      5     129     419    0  0    195
 MCSC4E1  SYST    890   1318    229    294    404   2158   2224   528    129     19      4    1019    4534    0  9   1790
 MCSE4E0  SYST      8     11     16     16     37    150     54    27     73      5      7      81     289    0  1    126
 MCSE4E1  SYST      8     11     16     16     37    204     54    27     73      5      7      81     343    0  1    126
 MCW4E1   SYST    969   1680    240    244    447   2000   2790   838     14      0      0     983    4804    0  9   2051
 MDBA4E1  SYST     50     54   6463   6949   7520  37800   7465   384      0    721     26      50   46012    0  0   7589
 MDBB4E1  SYST     76     79   3944   5144   3682  16045   5618   393      0  27596    441      76   49700    0  0  32371
 MDBC4E1  SYST     12     12    738    739   1020   5579    821    68      0      0      0      12    6400    0  0    799
 MDBD4E1  SYST      7      8   3803   4183   4110  25395   4379   186      0     58      1       7   29833    0  0   4046
 MDC4E1   SYST   3852   6181    571    764   1141   5085  10153  3104      3     51      0    3855   15292    0 13   7412
 MDR4E1   SYST   1201   1929    347    351    674   2535   3371  1036      1      0      0    1202    5907    0  7   2574
 MDW4E1   SYST    832   1563    387    389    558   2350   2758   766      1    102      4     833    5215    0  9   2084
 MET4E1   SYST   4553   8528    833    939   1825   9233  14632  3945     16      1      0    4569   23882    0 12   9188
 MFA4E1   SYST    602    960    350    351    495   1942   1890   549      1      0      0     603    3833    0  5   1473
 MFB4E1   SYST    426    709    310    342    525   2219   1530   436      9      0      0     435    3758    0  7   1173
 MFD4E1   SYST    512    898    787    932   1042   3840   2426   526      1      0      0     513    6267    0  6   1813
 MFG4E1   SYST    238    394    394    539    537   2244   1230   261      1      0      0     239    3475    0  6    882
 MFI4E1   SYST    384    655    538   1334    887   2899   2391   375      1      0      0     385    5291    0  7   1290
 MFT4E1   SYST    449   1275    555    556    853   4068   2539   418      1      0      0     450    6608    0  4   1411
 MGN4E1   SYST    419    689    238    263    453   1700   1430   463     10      9      1     429    3150    0  9   1132
 MGN4E4   SYST      0      0     76     76    162    643    157    72      0    356    131       0    1287    0  0    631
 MIN4E1   SYST   1902   2519    462    471    798   2917   4356  1359      1      0      0    1903    7274    0  9   3591
 MLA4E1   SYST    626   1247    346    393    480   2324   2346   578      1      0      0     627    4671    0  7   1540
 MLE4E1   SYST    781   1318    461    467    645   2351   2435   630      4      0      0     785    4790    0  9   1844
 MMD4E1   SYST    515   1021    354    356    461   1805   1886   436      1      0      0     516    3692    0  7   1274
 MMS4E1   SYST   1343   2434    542    544    791   3226   4470  1246      1      0      0    1344    7697    0  6   3072
```

4-2 Sample Source Monitor Report



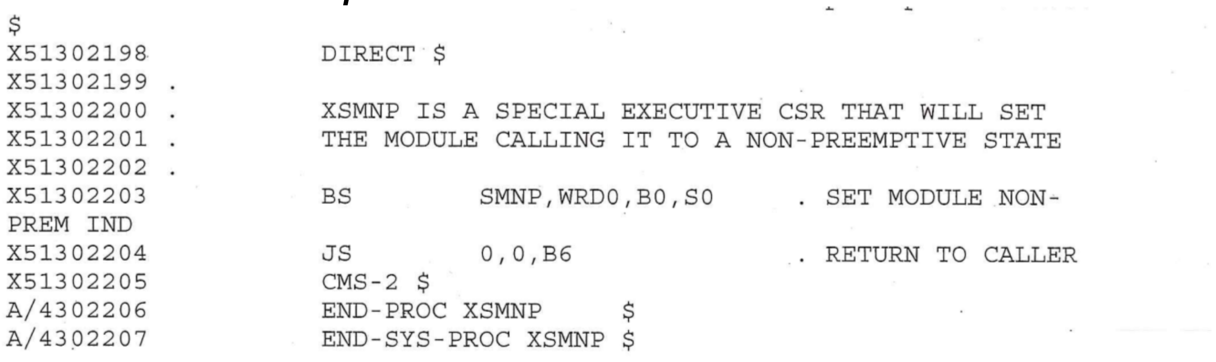
```
        SRCMON - SOURCE CODE MONITOR, VERSION 07.00                                                            01/26/17
                                                                                                               PAGE 1
                                                 S-4ESPY1BV_D-410E-00.00-ROMVARY

MODULE                             |FILE STATUS|   INITIAL SIZE   | CPCR          ADDITIONS      MODIFICATIONS    |     DELETIONS
-----------------------------------|-----------|------------------|-----------------------------------------------|-----------------

MAA:
  MAA4E1D6.CS2                     | CHANGED   |   715I     3045C| UNSPECIFIED    7I      43C      3I      23C |    23I     70C
                            TOTAL: |           |   715I     3045C|      0         7I      43C      3I      23C |    23I     70C

MAB:
  MAB4E1D7.CS2                     | CHANGED   |   289I     1681C| UNSPECIFIED    6I      48C      5I      30C |    37I    166C
                            TOTAL: |           |   289I     1681C|      0         6I      48C      5I      30C |    37I    166C

MAC:
  MAC4E1D2.CS2                     | CHANGED   |   844I     4690C| UNSPECIFIED  279I    1813C      1I       3C |     0I      0C
                            TOTAL: |           |   844I     4690C|      0       279I    1813C      1I       3C |     0I      0C

MAD:
  MAD4E1D5.CS2                     | CHANGED   |  3611I    18363C| UNSPECIFIED  204I    1302C      6I      13C |     0I      0C
                            TOTAL: |           |  3611I    18363C|      0       204I    1302C      6I      13C |     0I      0C

MAE:
  MAE4E1D6.CS2                     | CHANGED   |   767I     4275C| UNSPECIFIED   48I     304C      0I       2C |     0I      0C
                            TOTAL: |           |   767I     4275C|      0        48I     304C      0I       2C |     0I      0C

MAF:
  MAF4E1D2.CS2                     | CHANGED   | 27211I     6835C| UNSPECIFIED  716I     940C     26I     126C |  1349I    638C
                                   |           |                 | WE5769         0I       1C      0I       1C |     0I      0C
                            TOTAL: |           | 27211I     6835C|      1       716I     941C     26I     127C |  1349I    638C

MAG:
  MAG4E1D7.CS2                     | CHANGED   |  3710I    24890C| UNSPECIFIED    0I       5C      0I       9C |     0I      0C
                            TOTAL: |           |  3710I    24890C|      0         0I       5C      0I       9C |     0I      0C

MAH:
  MAH4E1D7.CS2                     | CHANGED   |  2759I     1739C| UNSPECIFIED    0I       2C      0I       0C |     0I      0C
                            TOTAL: |           |  2759I     1739C|      0         0I       2C      0I       0C |     0I      0C
```

4-3 High Level CMS-2 Sample



```
CQT 0546  (EXTDEF)  PROCEDURE QTSYNOPS $
CQT 0547  COMMENT   PUT QA NUMBER IN HEADER $
CQT 0548            SET CHAR(28,4)(VHSYNHED) TO VMTESTNO $
CQT 0549            QTHEAD INPUT VHSYNHED $
CQT 0550  IF VINOTSTS LT 1 THEN RETURN$
CQT 0551            SET VHTEMP TO H( ) ''TOP OF FORM CONTROL VRBL'' $
CQT 0552  LOOP.     VARY VSX2 THRU 4 $
CQT 0553  QTSYV1.   VARY VX1 THRU (VINOTSTS-1) $
CQT 0554  QTSYW4.   SET VX2 TO TAQR(VX1,ERRORNO) $
CQT 0555  QTSYN1.   IF VX2 EQ 0 THEN RESUME QTSYV1 $
CQT 0556  COMMENT   IF THE CODE IS 0 THEN NO TST IS EXPECTED.BYPASS MESSAGE $
CQT 0557            SET VIH1L TO VX1 $
CQT 0558  COMMENT SAVE LOOP INDEX$
CQT 0559            SET VX1 TO VSX1*5+VX1  ''COMPUTE TEST NO. FROM LOOP
INDEX''$
```

4-4 Direct CMS-2 Sample



```
$
X51302198          DIRECT $
X51302199 .
X51302200 .        XSMNP IS A SPECIAL EXECUTIVE CSR THAT WILL SET
X51302201 .        THE MODULE CALLING IT TO A NON-PREEMPTIVE STATE
X51302202 .
X51302203          BS        SMNP,WRD0,B0,S0      . SET MODULE NON-
PREM IND
X51302204          JS        0,0,B6               . RETURN TO CALLER
X51302205          CMS-2 $
A/4302206          END-PROC XSMNP     $
A/4302207          END-SYS-PROC XSMNP $
```