Intermediate Pipelines
VM 3D2

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Pipelines

Agenda — Pipelines

- Level Set
- A Journeyman's Tool Box
- Multistream Pipelines
- Selection Stages
- Its Looking UP
- Looking through our SPEC's
- Do it in REXX
- CallPipe
- REXX/Pipelines Interfaces

Level Set: Example — Pipelines

- Problem: For SEV=4 records, Sort by Dpt and display only Nbr, SEV, and Next Information
- Input File:

```
Nbr S Last      Ans          Next          Nx  Dpt
    E Act       Code         Action        Ac  Nxt
    V Done                   To Do         ID  Act
----+-------1----+--------2--------+-------3-----+--
001 3 RECEIVED               ANSWER        KL  A32
002 3 RECEIVED               ANSWER        BR  A32
003 3 RECEIVED               ANSWER        BI  A00
004 5 ANSWERED   COLD         INT1          VM  B29
005 3 ANSWERED   DUP          CLOSE         CO  B26
006 3 OPENED                 RECEIVE       BI  A00
007 4 REROUTED               RECEIVE       PE  B18
008 3 OPENED                 RECEIVE       BI  A00
009 4 RECEIVED               ANSWER        BE  B18
010 3 ANSWERED   COLD         SSV           DE  A31
011 4 CLOSED     CNEW         NONE
012 4 CLOSED     CNEW         NONE
013 3 OPENED                 RECEIVE       CP  A64
014 4 RECEIVED               ANSWER        NE  B18
015 1 OPENED                 RECEIVE       CP  A64
016 3 RECEIVED               ANSWER        XX  A31
```

Level Set: Example.... Pipelines

Level Set: Example..... Pipelines

- **Pipe Command:**

```
Pipe   < INPUT FILE A| drop 4| locate 5.1 /4/
|   sort 34-36 | specs 1.3 1 5.1 nw 22.16 nw
|   > OUTPUT FILE A
```

- **Pipe Command in REXX EXEC:**

```
/* TEST1 EXEC                                          */
'Pipe ( endchar ?)',
   '   < INPUT FILE A',           /*Read   */
   '|  drop 4',                  /* Select */
   '|  locate 5.1 /4/',          /*Select */
   '|  sort 34-36',              /*Sort   */
   '|  specs 1.3 1 5.1 NextWord 22.16 nw',
   '|  > OUTPUT FILE A'        /*Write    */
Exit
```

- **Output:**

011 4 NONE
012 4 NONE
007 4 RECEIVE PE B18
009 4 ANSWER BE B18

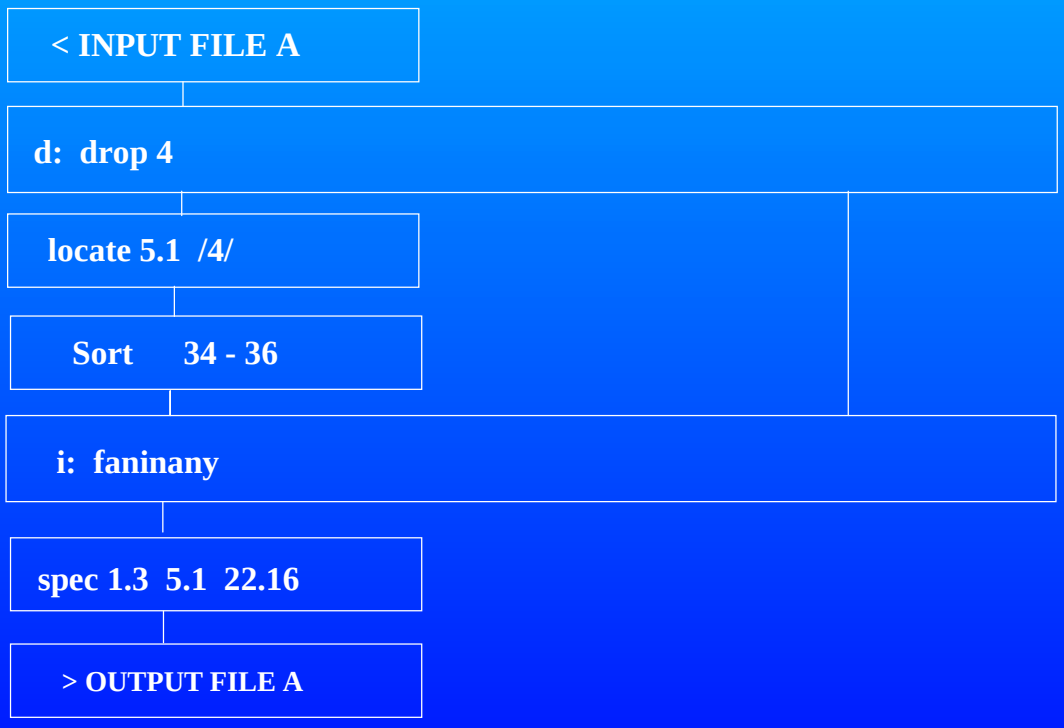
The Tool Box — Pipelines

- How to get HELP
  - HELP - From CMS Pipeline Reference
  - AHELP - Author's help
    - To use:

      pipe (a) help menu
      pipe (a) help locate
      help pipe menu
      help pipe locate
      help pipe

  - CMS Pipelines User's Guide - SC24-5777
  - CMS Pipelines Reference - SC24-5778
  - CMS Pipelines Author's Edition- SL26-0018
  - Quick Reference - SX24-5290

Multistream Pipelines — Pipelines



Multisteam Pipelines .... Pipelines

- RPTHDG EXEC

```
/* RPTHDG EXEC    4/24/92                    */
 'Pipe ( endchar ?)',
   '    < INPUT FILE A',       /* Read       */
   '|d:drop 4',                /* Select     */
   '|   locate 5.1 /4/',
   '|   sort 34-36',           /* Sort,Pick */
   '|i:faninany',
   '|   spec 1.3 1 5.1 NextWord 22.16 nw',
   '|   > OUTPUT FILE A ',     /* Write      */
   '?d:',                     /* Keep Hdg   */
   '|i:'
  Exit
```

- Output data for RPTHDG EXEC -OUTPUT FILE A

```
Nbr S Next    Nx Dpt
  E Action   Ac Nxt
  V To Do    ID Act
--- + ---+----3----+-
011 4 NONE
012 4 NONE
007 4 RECEIVE  PE B18
009 4 ANSWER   BE B18
014 4 ANSWER   NE B18
```

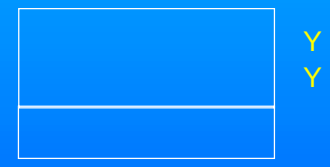
Selection Stages Pipelines

- Flow Diagram

- Divides one stream into two streams
- Does NOT delay the record
- Stage ends when all output streams are disconnected

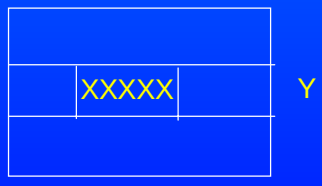
Selection Stages

Pipelines

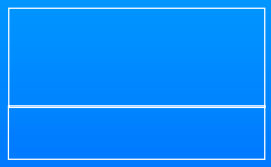


TAKE 2

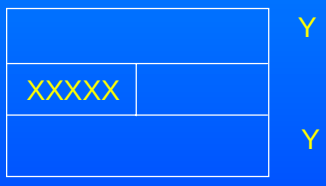
FIND
STRFIND



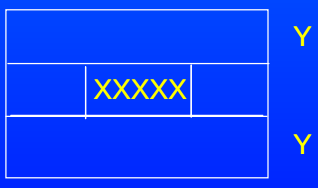
LOCATE, ALL, or PICK



DROP 2



NFIND
STRNFIND



NLOCATE

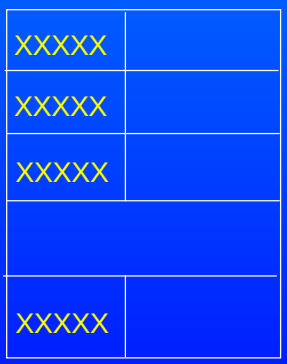
Y - record selected

Selection Stages ...

Pipelines

TO LABEL
STRTOLABEL
TOTARGET

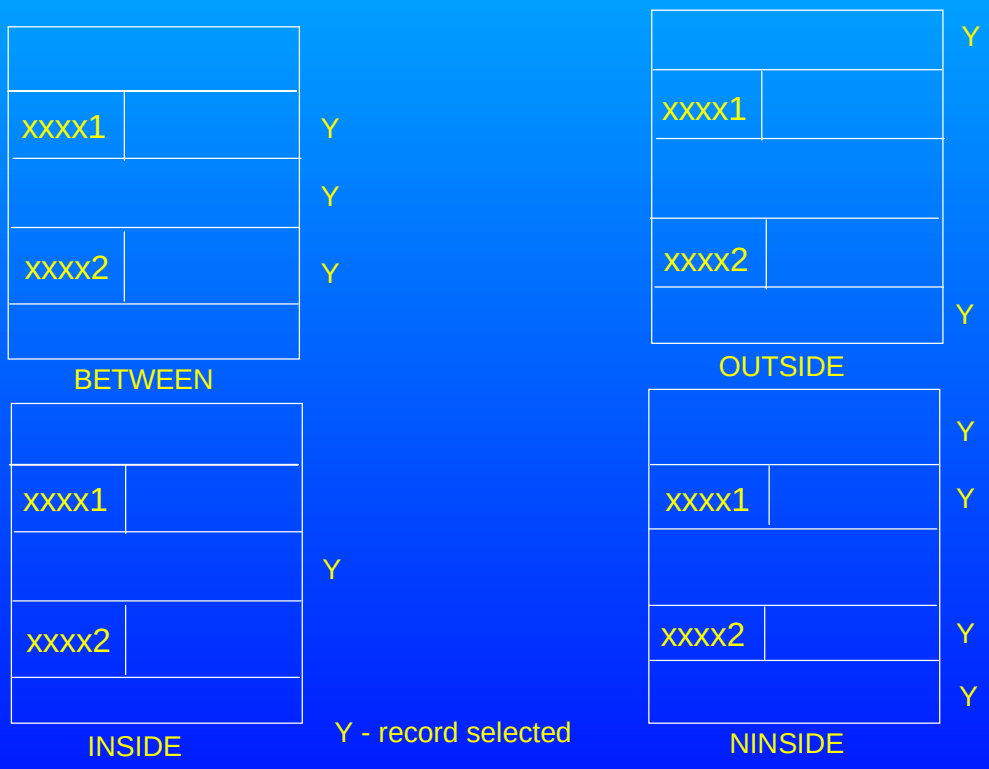
FRLABEL
STRFRLABEL
FRTARGET
FROM TARGET



WHILELABEL and STRWHILELABEL

Y - record selected

Selection Stages ... Pipelines



Selection Stages Pipelines

- Selection Stage prefixes
  - NOT
    - Reverses output streams of a stage

```
Pipe   < MATH FILE
   |   not all (/1/ ! /56/) & x4b
   |   console
234 - 567
345 * 675.
```

    - CASEI
      - Allows a selection stage to function without regard to case (CASE Insensitive)

```
pipe    literal a b c A B C
   |     split
   |     casei locate /a/
   |     console
a
A
```

Selection Stages ... Pipelines

- Selection Stage prefixes
  - ZONE
    - Allows a selection to use a range of columns

```
pipe    literal  a b c  A B C
        | zone 3.1 between /b/  2
        | console
a b c  A B C
```

  - REVERSE
    - Reverses the contents of the record

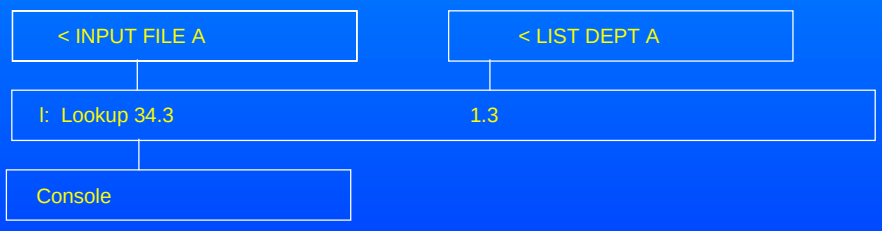
```
pipe    literal 123 abc
        | reverse
        | strfind  /cba/       /* find  'abc'    */
        | reverse
        | console
123 abc
```

Using Lookup Pipelines

- Get Depts to match from a file
- Input data for LOOKUP EXEC -LIST DEPT A

```
A32
A31
```

- Lookup with Detail and Master



- Output

```
001 3 RECEIVED            ANSWER    KL    A32
A32 Process
002 3 RECEIVED            ANSWER    BR    A32
A32 Process
010 3 ANSWERED COLD       SSV       DE    A31
A31 Design
016 3 RECEIVED            ANSWER    XX    A31
A31 Design
```

Using Lookup .... Pipelines

- Same input file - INPUT FILE A

```
Nbr S Last      Ans    Next     Nx Dpt
    E Act       Code   Action   Ac Nxt
    V Done             To Do    ID Act
----+----1----+----2----+----3----+--
001 3 RECEIVED        ANSWER    KL A32
002 3 RECEIVED        ANSWER    BR A32
003 3 RECEIVED        ANSWER    BI A00
004 5 ANSWERED COLD   INT1      VM B29
005 3 ANSWERED DUP    CLOSE     CO B26
006 3 OPENED          RECEIVE   BI A00
007 4 REROUTED        RECEIVE   PE B18
008 3 OPENED          RECEIVE   BI A00
009 4 RECEIVED        ANSWER    BE B18
010 3 ANSWERED COLD   SSV       DE A31
011 4 CLOSED   CNEW   NONE
012 4 CLOSED   CNEW   NONE
013 3 OPENED          RECEIVE   CP A64
014 4 RECEIVED        ANSWER    NE B18
015 1 OPENED          RECEIVE   CP 464
016 3 RECEIVED        ANSWER    XX A31
```

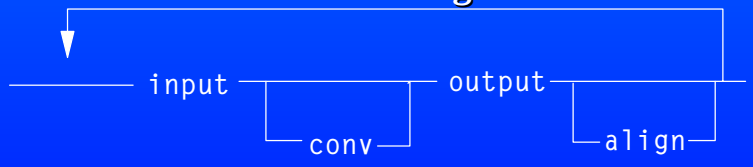
Using Lookup Pipelines

- LookUp EXEC

```
/* Lookup Example                                        */
'Pipe ( end ?)',
  '    < INPUT FILE',                        /* Read List */
  '|l:lookup 34.3 1.3',
  '|   console',                             /* Write     */
  '?   < LIST DEPT',                  /* Get Dept List    */
  '|l:'                          /* 2nd I/P of Lookup     */
Exit
```

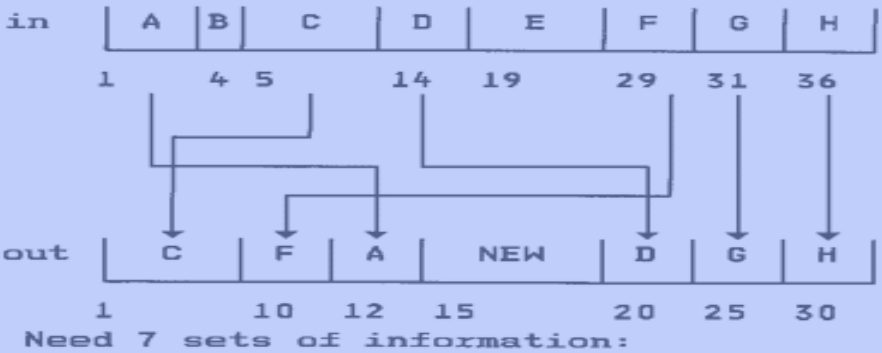
SPECs Pipelines

- SPECS constructs output records field by field
- Output fields can come from one or more input records, literal values, record number or time of day clock
- SPECS
  - Rearranges record contents
  - Converts data into different formats
  - Aligns or centers data in output field
  - Strips leading or trailing blanks
  - Pads output fields
- Basic Format of SPECS stage command



SPECs ... Pipelines

◆ For Example ...



Need 7 sets of information:

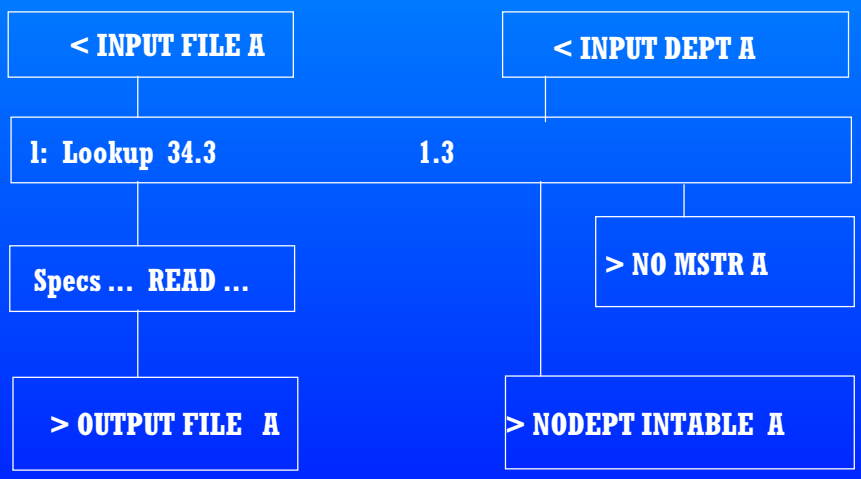
	FROM	TO	What?
SPECS	1–3	12	A
	5.9	1	C
	14–18	20	D
	/NEW/	15	
	29.2	10	F
	31.5	25	G
	36–*	30	H

SPECs Pipelines

- Additional Features of SPECs
  - ►READ
    - – Read the next record now so its data can be used
    - – Used to combine records
    - – Ex: Specs 1.3 1 5.1 NW 22.16 nw read 5-* nw
  - ►WRITE
    - – Write the built record now so another one can be built
    - – Used to create additional records
    - – Ex: Specs 1.3 1 5.1 NW write 1.3 1 22.16 nw
  - ►SELECT n
    - – Read data from STREAM n
    - – Used to combine data from multiple streams
    - – Ex: Specs 1.3 1 5.1 NW select 1 1.3 nw
  - ►WORDSEParator (WS)
    - – Specify what separates words
    - – NULL words are not counted
    - – Ex: Specs ws - w1 1 W5 nw
  - ►FIELDSEParator (FS)
    - – Specify what separates fields
    - – No default
    - – NULL fields are counted

SPECs Pipelines

- Lookup with Detail and Master



- LookUp EXEC

```
/* Lookup Example with SPECs READ                    */
'Pipe ( end ?)'.
   '    < INPUT FILE'.          /* Read              */
   '|1:lookup 34.3 1.3'.        /* Dept name         */
   '|   > lookup temp a'.       /* For Demo          */
   '|   spec 1.3 1 5.1 NextWord 22.16 nw'.
   '        read 5-* nw'. /* Combine Rods           */
   '|   > OUTPUT FILE A '.      /* Write             */
   '?   < INPUT DEPT'.
   '|1:'.              /* 2nd I/O of Lookup         */
   '|   > NODEPT INTABLE A'.
   '?1:'.             /* 3rd O/P of Lookup         */
   '|   > NO MSTR A'
Exit
```


- Output data for LOOKUP EXEC - OUTPUT FILE A

```
001  3  ANSWER    KL  A32  Process
002  3  ANSWER    BR  A32  Process
003  3  ANSWER    BI  A00  Code
004  5  INT1      VM  B29  Test
005  3  CLOSE     CO  B26  Finance
006  3  RECEIVE   BI  A00  Code
007  4  RECEIVE   PE  B18  Code
008  3  RECEIVE   BI  A00  Code
009  4  ANSWER    BE  B18  Code
010  3  SSV       DE  A31  Design
014  4  ANSWER    NE  B18  Code
016  3  ANSWER    XX  A31  Design
```

- Output data for LOOKUP EXEC - NO_DEPT IN_TABLE A

```
011  4  CLOSED    CNEW   NONE
012  4  CLOSED    CNEW   NONE
013  3  OPENED           RECEIVE   CP  A64
015  1  OPENED           RECEIVE   CP  A64
```

- Output data for LOOKUP EXEC - NO MSTR A

```
XXX Not Found
```

Writing Stages in REXX Pipelines

- Reading Pipeline Records
  - ►Peekto
  - ►Readto
- Writing Pipeline Records
  - ►Output
- Select - Pick and Input/Output Stream
- Maxstream - Highest stream that is hooked up
- Streamnum - What stream is selected?
- Streamstate - What is happening to my selected stream?
- Stagenum - Where is this stage in the Pipeline?
- Short - Hook my selected I/P to my selected O/P
- Message - Tell them this NEW message
- IssueMsg - Tell them this EXISTING message

Improved MsgEvery REXX Stage Pipelines

- Do MsgEvery with conditional secondary output stream
  - Write all input records the primary output stream
  - Write a message with the record count every n records
  - If the secondary output stream is connected, write the message to it, otherwise to a SAY
  - Make sure this stage is NOT first in the Pipeline

```
/* Do a MSG for every COUNT lines */
 parse arg count message       /* get args  */
'maxstream output'   /* 2 output steams?    */
 Stream Count = rc

'stagenum'  /* What Stage are we?  */
 StagePosition = rc
 if (StagePosition = 1) then do
  'issuemsg 127  FPLMYM'
   say '_____________________________________'
  'message Do Not put me first'
   say '_____________________________________'
  'message FPLMYM127E Don not put me first'
   signal BigError
end
```

Improved MsgEvery REXX Stage Pipelines

```
 signal on error
'PEEKTO in_data '
 do rcd_nbr = 1 while rc = o
    'OUTPUT' in_data
     if (rcd_nbr // count = 0) then do
        if (StreamCount < 2) then do
           say message "record Number:' rcd_nbr
        end
        else do
           'select 1'
           'output' message 'Record Number: 'rcd_nbr
           'select 0'
        end
     end
   'READTO'
   'PEEKTO in_data '
end /* do while rc = 0 */

error:
   say message ' Record Number:' rcd-nbr
BigError:
   Exit RC * (RC <> 12)
```

Improved MsgEvery REXX Stage ... Pipelines

```
/* MSGEVERY — NO Secondary Stream  */
say '====== No Secondary Stream ============='
'Pipe'.
   '    < INPUT FILE'.
   '|   msgevery 3 This is an Example'.
   '|   > OUTPUT FILE A'
say '====== Has Secondary Stream ============'
/* MSGEVERY with Secondary Stream  */
'Pipe (endchar ?)'.
   '    < INPUT FILE'.
   '|m:msgevery 3 This is an Example'.
   '|   > OUTPUT FILE A'.
   '?m:'.
   '|   console'
say '====== First In Pipeline — Message ===='
/* MSGEVERY — as First Stage  */
'Pipe'.
   '    msgevery 3 This is an Example'.
   '|   > OUTPUT FILE A'
```

Improved MsgEvery REXX Stage..... Pipelines

- **MSGEVERY Console Log**

```
=====No Secondary Stream ==============
THIS IS AN EXAMPLE   Record Number: 3
THIS IS AN EXAMPLE   Record Number: 6
THIS IS AN EXAMPLE   Record Number: 9
THIS IS AN EXAMPLE   Record Number: 12
THIS IS AN EXAMPLE   Record Number: 15
THIS IS AN EXAMPLE   Record Number: 18
THIS IS AN EXAMPLE   Record Number: 20
=====Has Secondary Stream ================
THIS IS AN EXAMPLE   Record Number: 3
THIS IS AN EXAMPLE   Record Number: 6
THIS IS AN EXAMPLE   Record Number: 9
THIS IS AN EXAMPLE   Record Number: 12
THIS IS AN EXAMPLE   Record Number: 15
THIS IS AN EXAMPLE   Record Number: 18
THIS IS AN EXAMPLE   Record Number: 20
```

Improved MsgEvery REXX Stage ... Pipelines

```
====== First In Pipeline — Message ====
DMSMYM2771E Stage command cannot be
      specified as the
DMSMYM2771E first stage of a pipeline
DMSPMG2653I ... Issued by stage number 1
      of pipeline number 1
DMSPMG2651I ... Running stage: msgevery 3
      This is an Example
_____________________________________
Do not put me first.
_____________________________________
FPLMYM127E Do not put me first.
DMSPMG2653I ... Issued by stage number 1
      of pipeline number 1
DMSPMG2651I ... Running stage: msgevery 3
      This is an Example
```

Example of Pipe in a Pipe Pipelines

Example of Pipe in a Pipe Pipelines

- Sortex REXX

```
/* To sort the records of a pipeline, but leaving a
specified number of records in the front of the file alone (not sorted).
SAMPLE:  SORTEX 3  1.6  11-30                    */

arg qty sort_args
'Callpipe ( endchar  ? )',
   '    *:',
   '|t:take  'qty,
   '|i:fanin',
   '|  *:',
   '?t:',
   '|  sort 'sort_args,
   '|i:'
Exit

/* To demonstrate SORTEX     */
'Pipe ( endchar ?)',
   '  < INPUT FILE',
   '| SORTEX 4 34.3 ',
   '| > OUTPUT FILE A'
Exit
```

Example of Pipe in a Pipe

Pipelines

OUTPUT FILE A:

```
Nbr S Last      Ans          Next           Nx  Dpt
    E Act       Code         Action         Ac  Nxt
    V Done                   To Do          ID  Act
----+-------1----+--------2--------+-------3-----+--
011 4 CLOSED    CNEW         NONE
012 4 CLOSED    CNEW         NONE
003 3 RECEIVED               ANSWER         BI  A00
006 3 OPENED                 RECEIVE        BI  A00
008 3 OPENED                 RECEIVE        BI  A00
010 3 ANSWERED   COLD        SSV            DE  A31
016 3 RECEIVED               ANSWER         XX  A31
001 3 RECEIVED               ANSWER         KL  A32
002 3 RECEIVED               ANSWER         BR  A32
013 3 OPENED                 RECEIVE        CP  A64
015 1 OPENED                 RECEIVE        CP  A64
007 4 REROUTED               RECEIVE        PE  B18
009 4 RECEIVED               ANSWER         BE  B18
014 4 RECEIVED               ANSWER         NE  B18
005 3 ANSWERED  DUP          CLOSE          C0  B26
004 5 ANSWERED  COLD         INTA           VM  B29
```

Obtaining REXX Variables

Pipelines

- **VAR**
  - ► **Gets/Sets a Variable**
- **STEM**
  - ► **Gets/Sets a stemmed array**
- **REXXVARS**
  - ► **Gets all variables**
- **VARLOAD**
  - ► **Sets all variables**
- **PRODUCER option**
  - ► **Obtains or sets REXX variables from the stage preceding it in the pipeline**
  - ► **Consider: pipe ONE | TWO | console**
    - – **TWO can obtain or set variables in ONE**
  - ► **The following must exist:**
    - – **Stage ONE must be blocked in output**
    - – **Stage TWO must issue the command from a CALLPIPE**

Acronyms and IBM Trade Marks — Pipelines

- **Acronyms**
  - CMS - Conversational Monitor System
  - CP - Control Program
  - IUCV - Inter-user Communication Vehicle
  - TCP - Transmission Control Protocol
- **IBM Trade Marks**
  - VM/ESA - Virtual Machine/Enterprise Systems Architecture

For More Information — Pipelines

- CMS Pipelines User's Guide - SC24-5777
- CMS Pipelines Reference - SC24-5778
- CMS Pipelines Author's Edition - SL26-0018
- Quick Reference - SX24-5290
- Development Contacts:
  - Will J. Roden, Jr.
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