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z/OS I/O Discovery and Auto Configuration (zDAC) 2.1 Update

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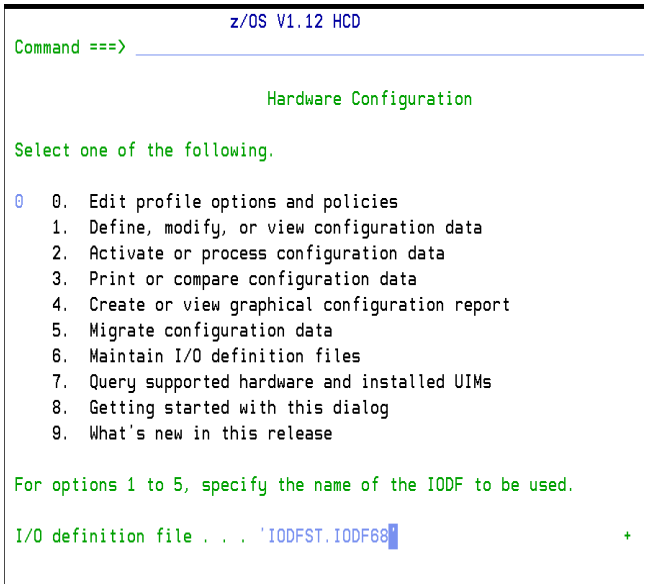
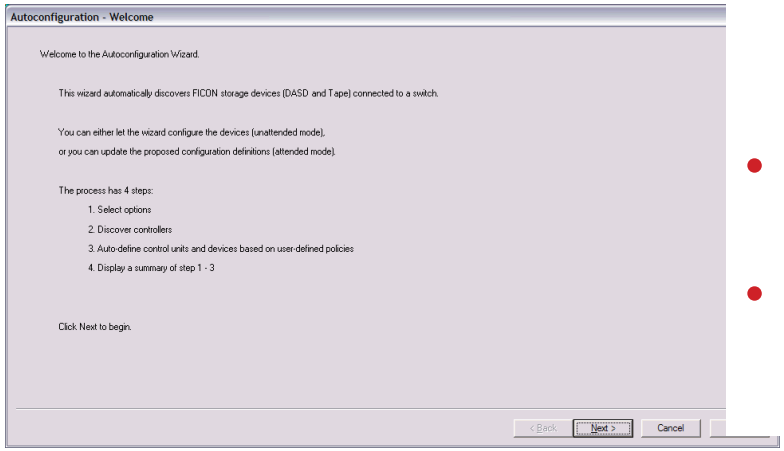
SHARE in Boston

Agenda

- Discovery and Autoconfiguration Overview
  - What is zDAC?
  - zDAC goals and considerations
  - Autoconfiguration policy options
  - How zDAC works
- New features in z/OS 2.1
- Demo
- Q&A

What is Discovery and Autoconfiguration (zDAC)?



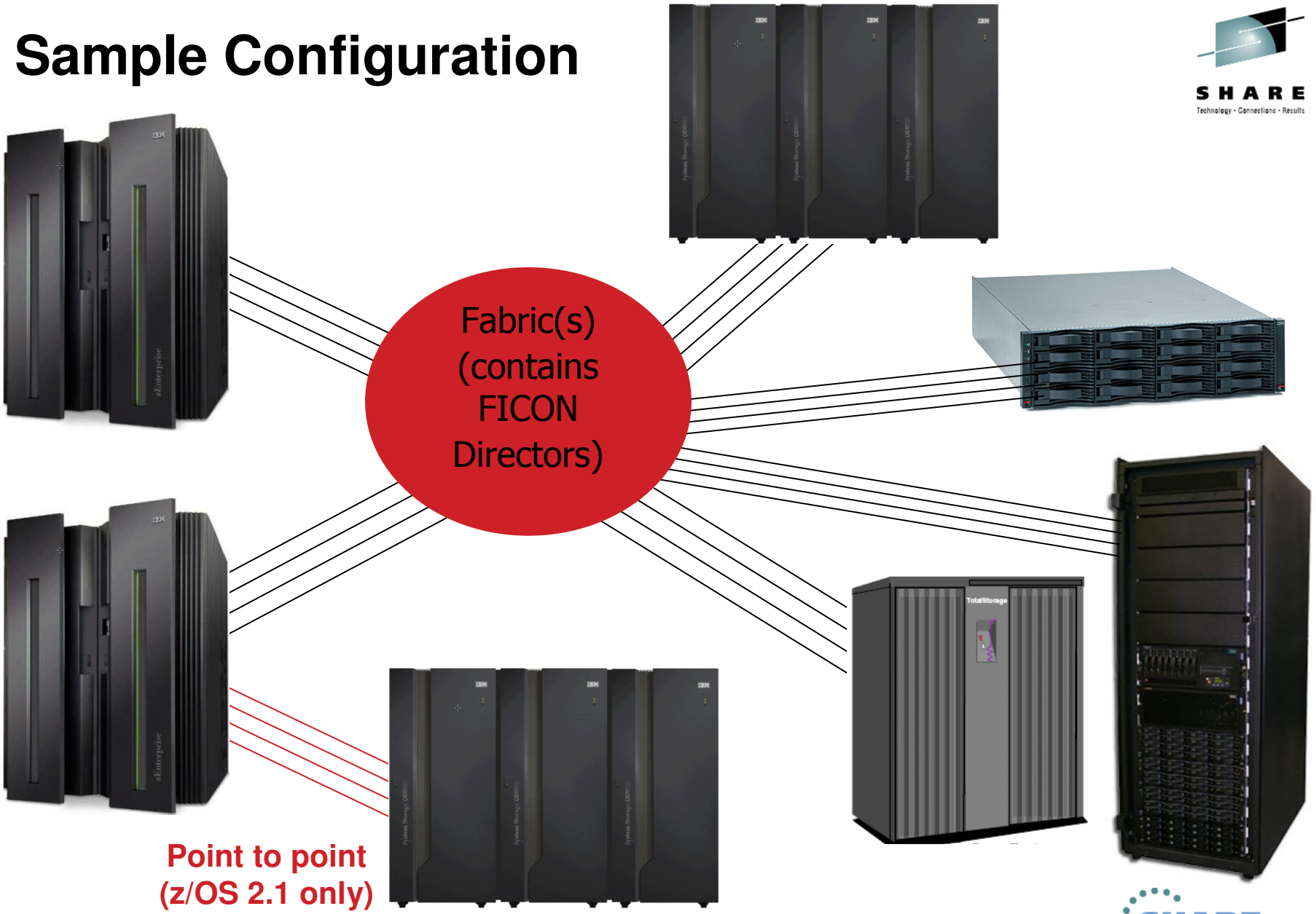


- New feature of z196 (and z114)
  - Invoked as a new option Hardware Configuration Dialog (HCD) and Hardware Configuration Manager (HCM)
- Provides capability to discovery attached disk and tape controllers in FICON switch fabrics (2.1 supports point to point)
- Detects
  - New controllers (storage subsystems)
  - New control units on existing controllers
  - New devices on existing control units
- Proposes control unit and device numbering
- Proposes paths for all discovery systems to newly discovered control units

zDAC Goals

- Reduce complexity and skill required to configure devices
- Reduce the time it takes to make I/O configuration changes
- Ensure the defined configuration aligns with reality
- Ensure that high availability expectations are met in the configuration
- Support older as well as newer controllers

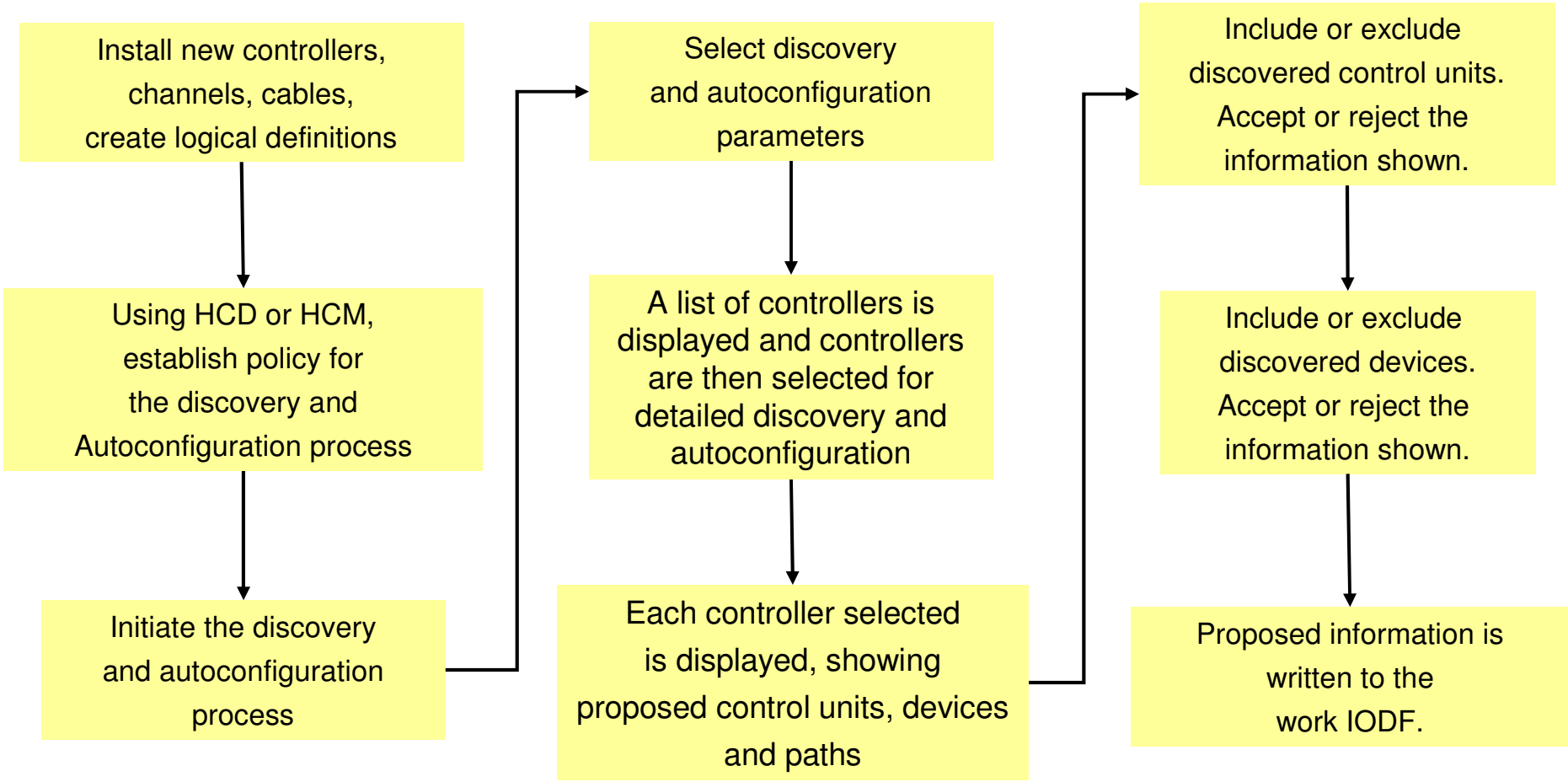
Sample Configuration



Some Things to Consider…

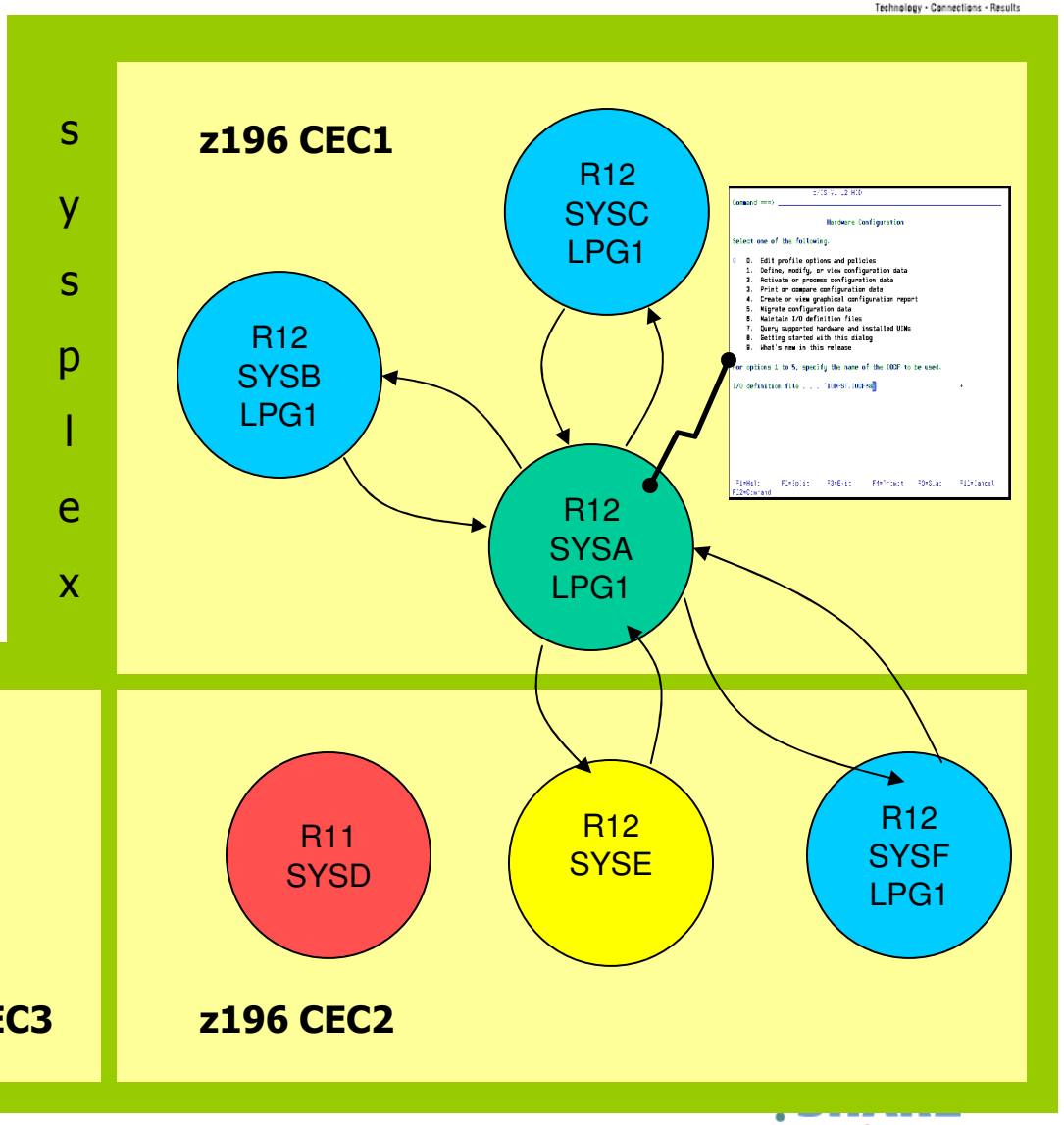
- Physical planning is still up to you
- Logical definitions on the controller are still up to you
- What z/OS images should be allowed to use the new devices?
- How should new devices be numbered?
- How many paths to new control units should be configured?

Discovery and Autoconfiguration Steps



Controlling Discovery Scope

- AUTO_SUG_LPGROUP
- Specify LPARs that will participate in the discovery attempt
- Specify LPGROUP in policy
- Isolate scope to those systems and processors that have the capability to perform the function.
- Isolate scope to those systems to have access to discovered items



Controlling Control Unit & Device Numbering

- AUTO_MATCH_CU_DEVNUM
  - YES - CU Number matches 1st base
  - NO – Does not have to match the 1st base
- AUTO_SS_ALTERNATE
  - Controls where aliases are placed
- AUTO_SS_DEVNUM_SCHEME
  - Identifies how devices are to be numbered
    - PAIRING (default)
    - CONSECUTIVE
    - DENSE
    - **NONE (z/OS 2.1)**
- AUTO_SUG_CU_RANGE
- AUTO_SUG_DEV_RANGE

Add 2 new control units, each with 64 bases and 64 aliases

PAIRING Example

CUNUM=2000, BASES=02000-0203F, ALIASES=120C0-120FF

CUNUM=2080, BASES=02080-020BF, ALIASES=12040-1207F

CONSECUTIVE Example

CUNUM=2000, BASES=02000-0203F, ALIASES=12040-1207F

CUNUM=2100, BASES=02100-0213F, ALIASES=12140-1217F

DENSE Example

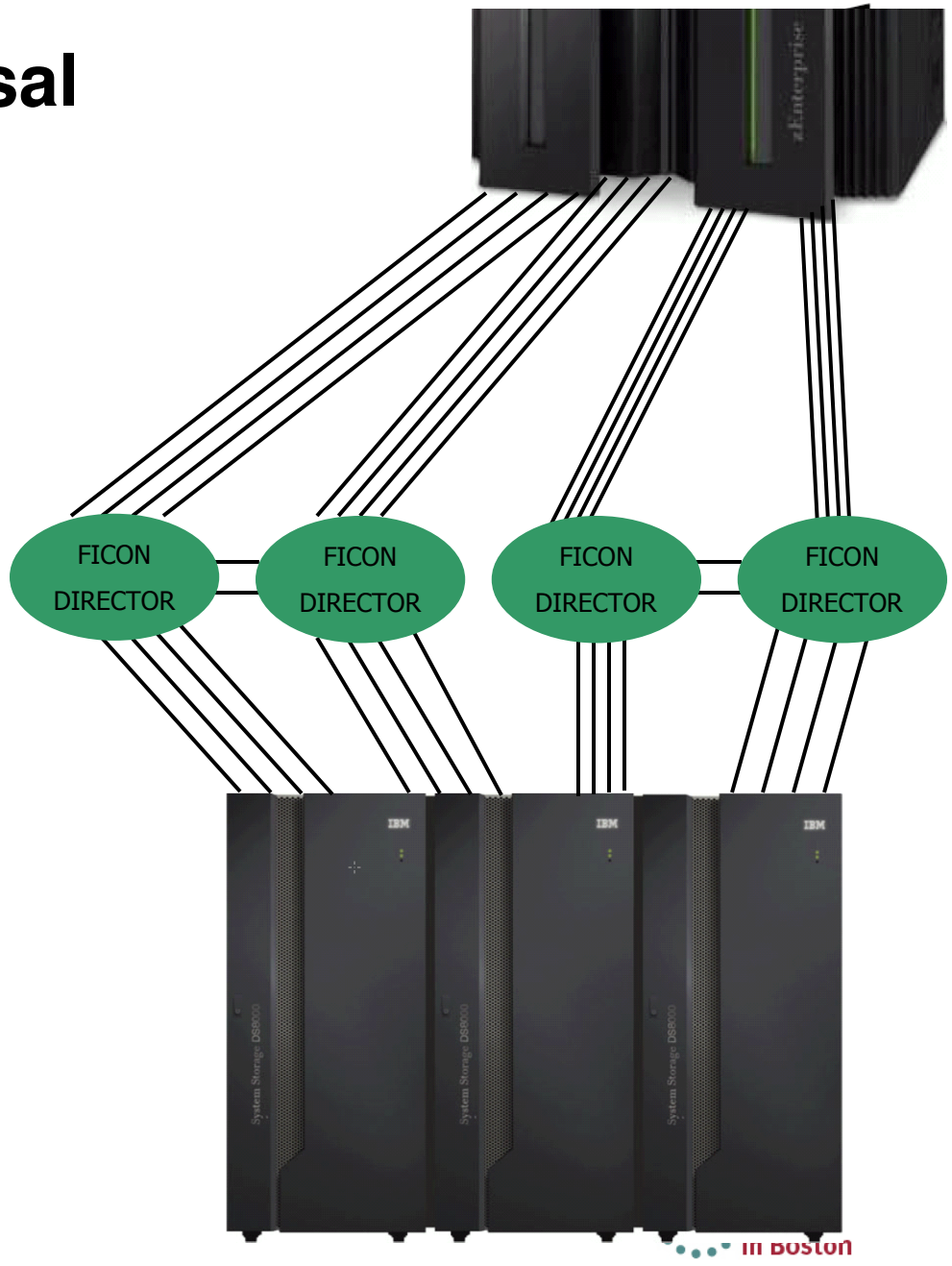
CUNUM=2000, BASES=02000-0203F, ALIASES=12000-1203F

CUNUM=2100, BASES=02100-0213F, ALIASES=12100-1213F

Controlling Path Proposal

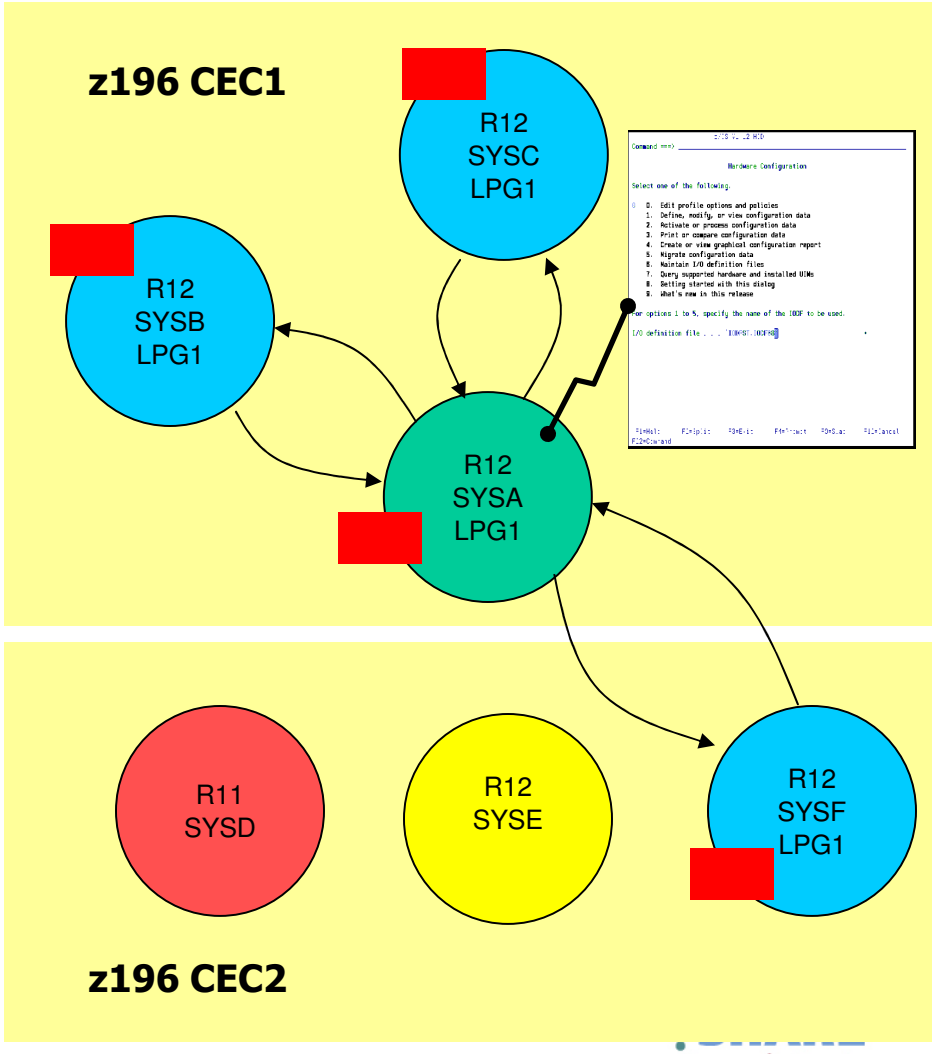
- AUTO_SUG_STAT_CHPIDS
  - 1 – 8, indicating the number of static paths that should be proposed for new control units
- AUTO_SUG_DYN_CHPIDS
  - 0-7, indicating the number of dynamic paths that should be proposed for new control units
- AUTO_SUG_STAT_CHPIDS + AUTO_SUG_DYN_CHPIDS <= 8
- Cascaded Switches Are OK

More on Path Proposal Processing Later…



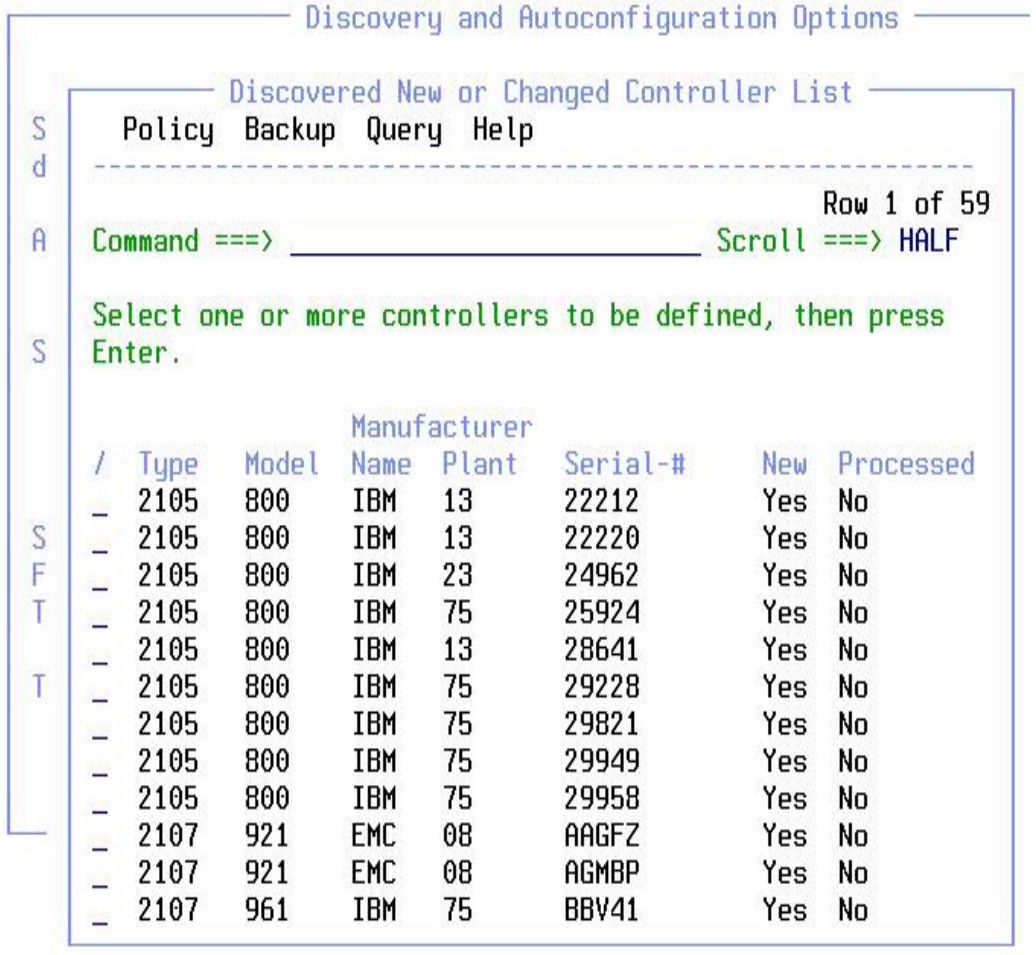
How Discovery Works – Fabric Discovery

- Discovery is initiated using HCD or HCM
- Through policy, the scope of the discovery is defined
- Discovery devices are added to the target systems using dynamic I/O configuration changes
- To explore the connected fabrics, the devices are connected to channels using dynamic I/O configuration changes and I/O commands are performed to determine what is “out there.”
- Discovered information is compared against the target IODF to determine what is new
- Information is organized and a list of discovered controllers is displayed to the user



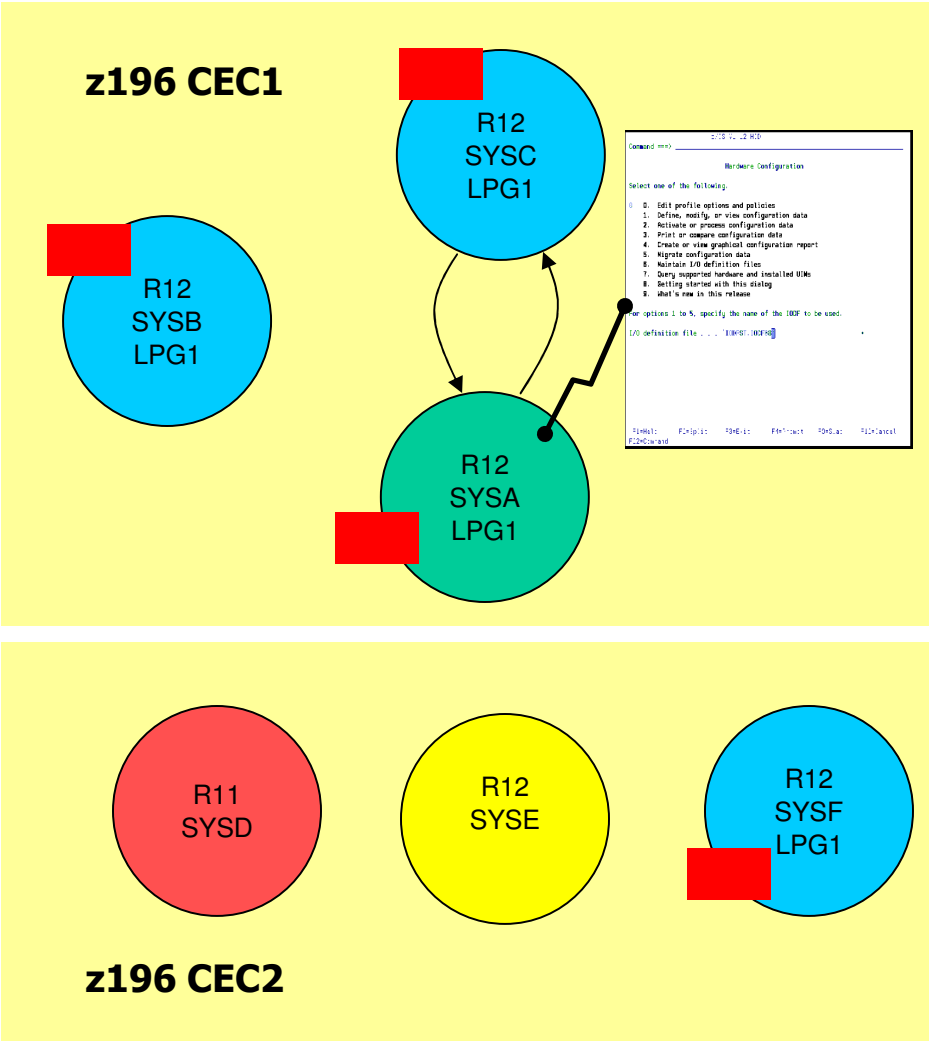
How Discovery Works – Fabric Discovery…

- The controller list has a line for each discovered controller
- Information displayed is read from each controller
- New: Yes or No – set based on whether the controller has any control unit definitions within the discovery scope
- One or more controllers can be selected for Controller Discovery



How Discovery Works – Controller Discovery

- To explore the controller, the devices on a *single* system are connected to channels using dynamic I/O configuration changes and I/O commands are performed to determine what is "on there."
- Most I/O commands used have existed for a long time
- Discovered information is compared against the target IODF to determine what is new
- Paths are proposed for new control units
- New control units and devices are displayed to the user



How Discovery Works – Controller Discovery…

Proposed Control Unit List

Row 1 of 96

Command ===> _____ Scroll ===> HALF

Control unit type . . : 2107-961 Serial number : ZA591

Proposed switch.ports :

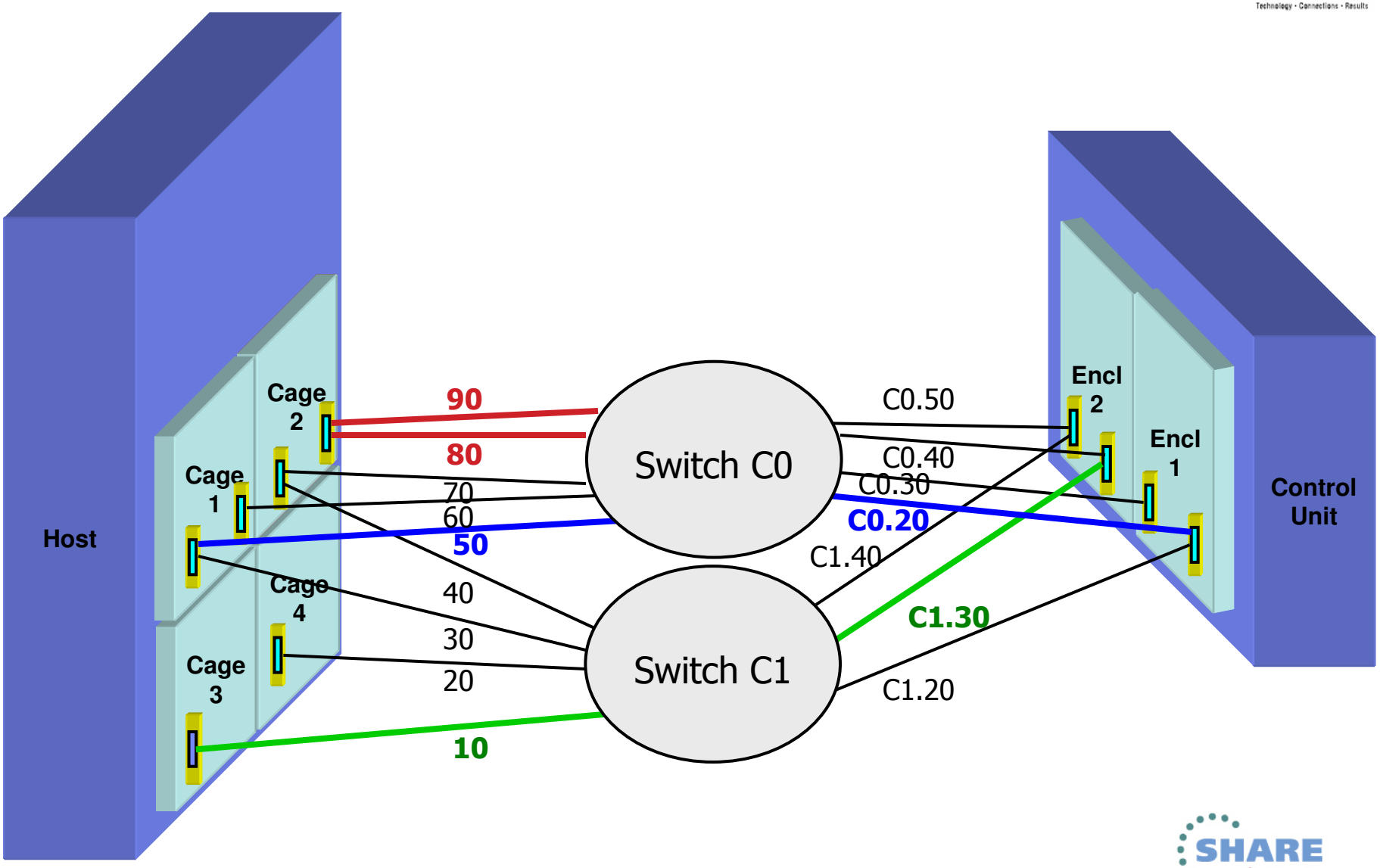
To accept the proposed values, press Enter. To modify them, edit the fields, or select one or more control units to change, exclude or include the corresponding definitions, then press Enter.

/	CU ADD	CU number+	# of devices	LPAR Access+	New	Description	I
_	00	0300	256	P87R7D	Yes		Y
_	01	0400	256	P87R7D	Yes		Y
_	02	0600	256	P87R7D	Yes		Y
_	03	0700	256	P87R7D	Yes		Y
_	04	0C00	256	P87R7D	Yes		Y
_	05	0D00	256	P87R7D	Yes		Y
_	06	0F00	256	P87R7D	Yes		Y
_	07	2100	256	P87R7D	Yes		Y

Philosophy on Path Proposal

- Policy suggests # of paths to be selected (i.e., 4 statics)
- The channels that can reach the controller are compared against each other to determine the best channels to use
  - Single points of failure (common hardware components)
    - Switch
    - Channel card
    - I/O cage
  - Current definitions (how many unit addresses and control units are currently configured to use the channel)
- Once a set of channels is selected, destination link addresses are chosen in a similar manner

Path Proposal: Avoiding Single Points of Failure



What's New in z/OS 2.1?

- Point to point connections supported
- Profile option to allow you to manually specify control unit and device numbers
- Channel path/switch inclusion/exclusion lists
- Discovery by controller serial number
- Autoconfiguration policies can be changed between two subsequent controller discoveries
- Inactive or incapable systems are ignored during discovery
- SAVE command supported on panels containing the discovered information

zDAC Support for Point to Point

- z/OS 2.1 must be used to initiate the discovery
- Only z/OS 2.1 systems in the LPAR group will return discovery information
- Point to point connections preferred over switched point to point
  - zDAC will never propose a mix of the two
- Path proposal still considers channel and control unit single points of failure

Verify a Configuration via zDAC

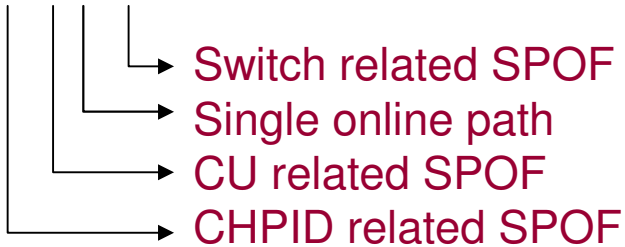
- Prior to z/OS 2.1, required Tivoli System Automation (TSA) I/O Operations (priced product)

- With z/OS 2.1, zDAC is used to discover the active configuration
  - Requires z196 / z114 or higher processor
  - Only done if TSA I/O Operations is not operational
  - System to run report must be part of local sysplex
  - Device and path status information only available if run against the local system

Single Point of Failure Info for I/O Path

- Today, for local system, STAT column contains the status of each channel path
  - Online (Blank)
  - Offline (OFFL)
  - Unknown (UNKN)
- For local system, if path online, STAT contains single point of failure information:

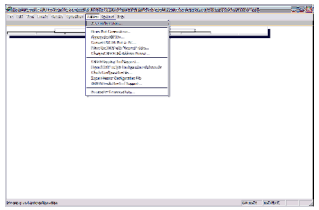
```
----I/O Path-----  ----------Sensed Data...
CHP CU   DEV       STAT CHT   CUTYPE
80  2000 2000,144  #CPS FC_S  2107-941
```

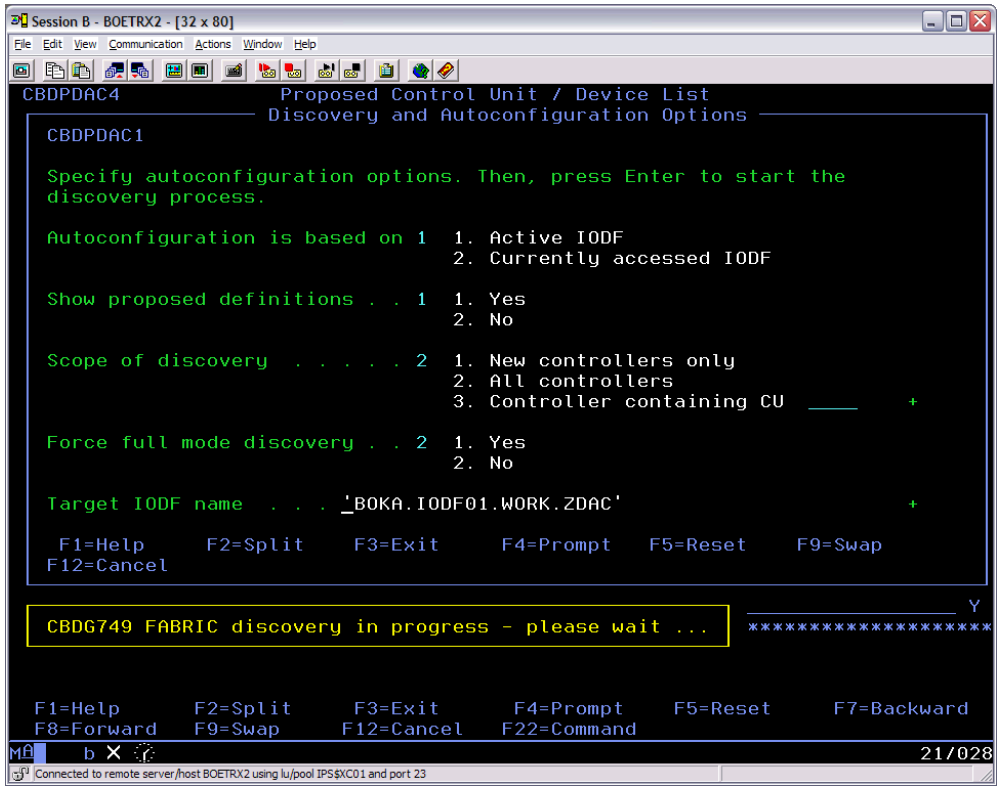


Requirements

- Systems running z/OS Version 1 Release 12 or later (native)
  - z/OS 2.1 is needed for the enhanced functions
- z196/z114 processor or higher
- LPAR authorized to make dynamic I/O configuration changes on each processor hosting a discovery system
- HCD or HCM user authorized to make dynamic I/O configuration changes (has UPDATE authority for MVS.ACTIVATE OPERCMDS resource)

Demo




Session B - BOETRX2 - [32 x 80]
File Edit View Communication Actions Window Help
CBDPDAC4 Proposed Control Unit / Device List
Discovery and Autoconfiguration Options
CBDPDAC1
Specify autoconfiguration options. Then, press Enter to start the discovery process.
Autoconfiguration is based on 1 1. Active IODF
2. Currently accessed IODF
Show proposed definitions . . 1 1. Yes
2. No
Scope of discovery . . . . . 2 1. New controllers only
2. All controllers
3. Controller containing CU ____
Force full mode discovery . . 2 1. Yes
2. No
Target IODF name . . . 'BOKA.IODF01.WORK.ZDAC'
F1=Help F2=Split F3=Exit F4=Prompt F5=Reset F9=Swap
F12=Cancel
CBDG749 FABRIC discovery in progress - please wait ...
F1=Help F2=Split F3=Exit F4=Prompt F5=Reset F7=Backward
F8=Forward F9=Swap F12=Cancel F22=Command
21/028
Connected to remote server/host BOETRX2 using lu/pool IPS$XC01 and port 23

Reference Material

- z/OS V2R1 HCD User's Guide, SC33-7988
- z/OS V2R2 and z/VM V6R1.0 HCM User's Guide, SC33-7989
- IBM zEnterprise 196 Configuration Setup, SG24-7834
- z/OS Intelligent Resource Director, SG24-5952

Thank you

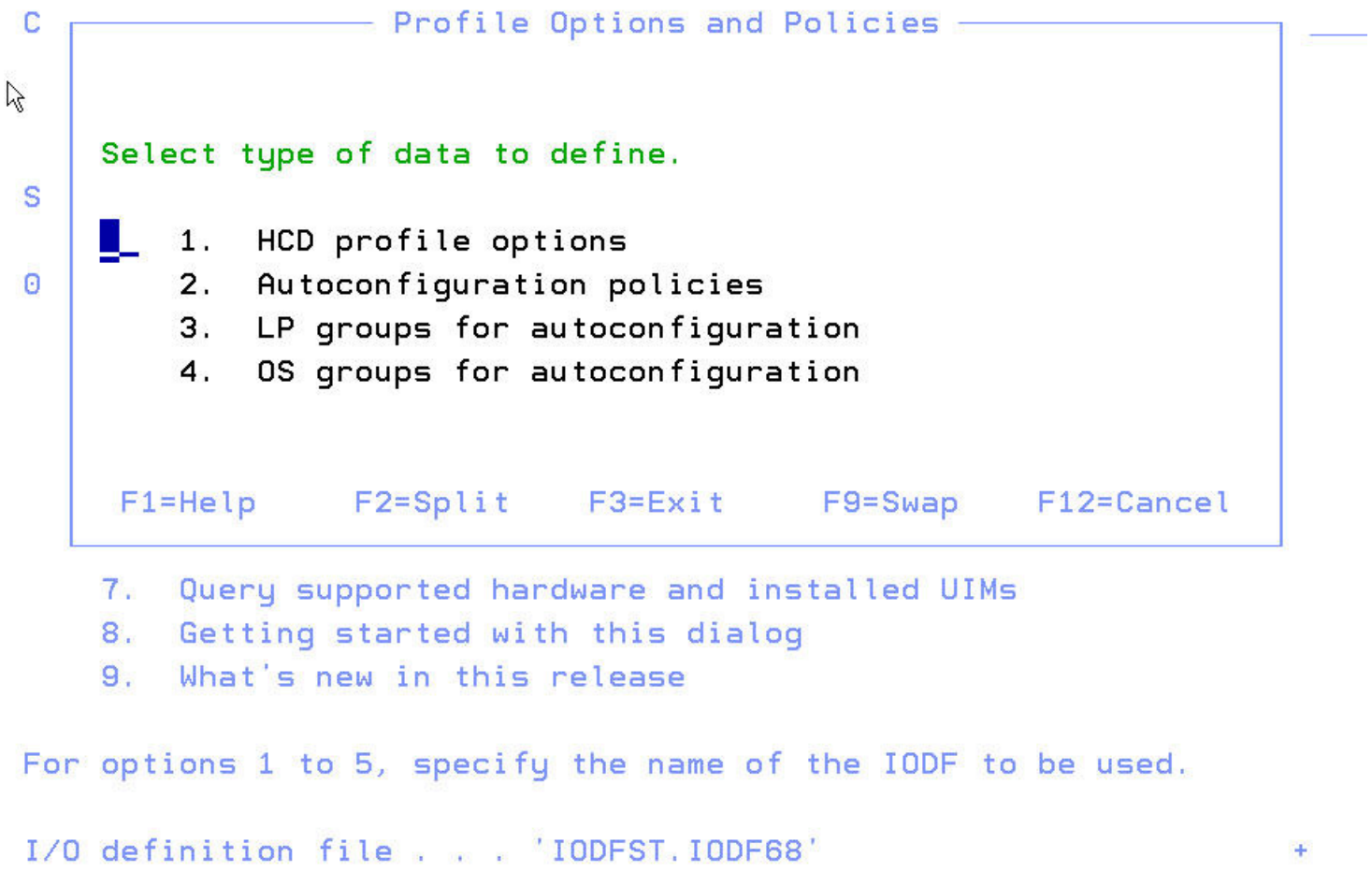
Backup Screen Shots

If demo is not available…

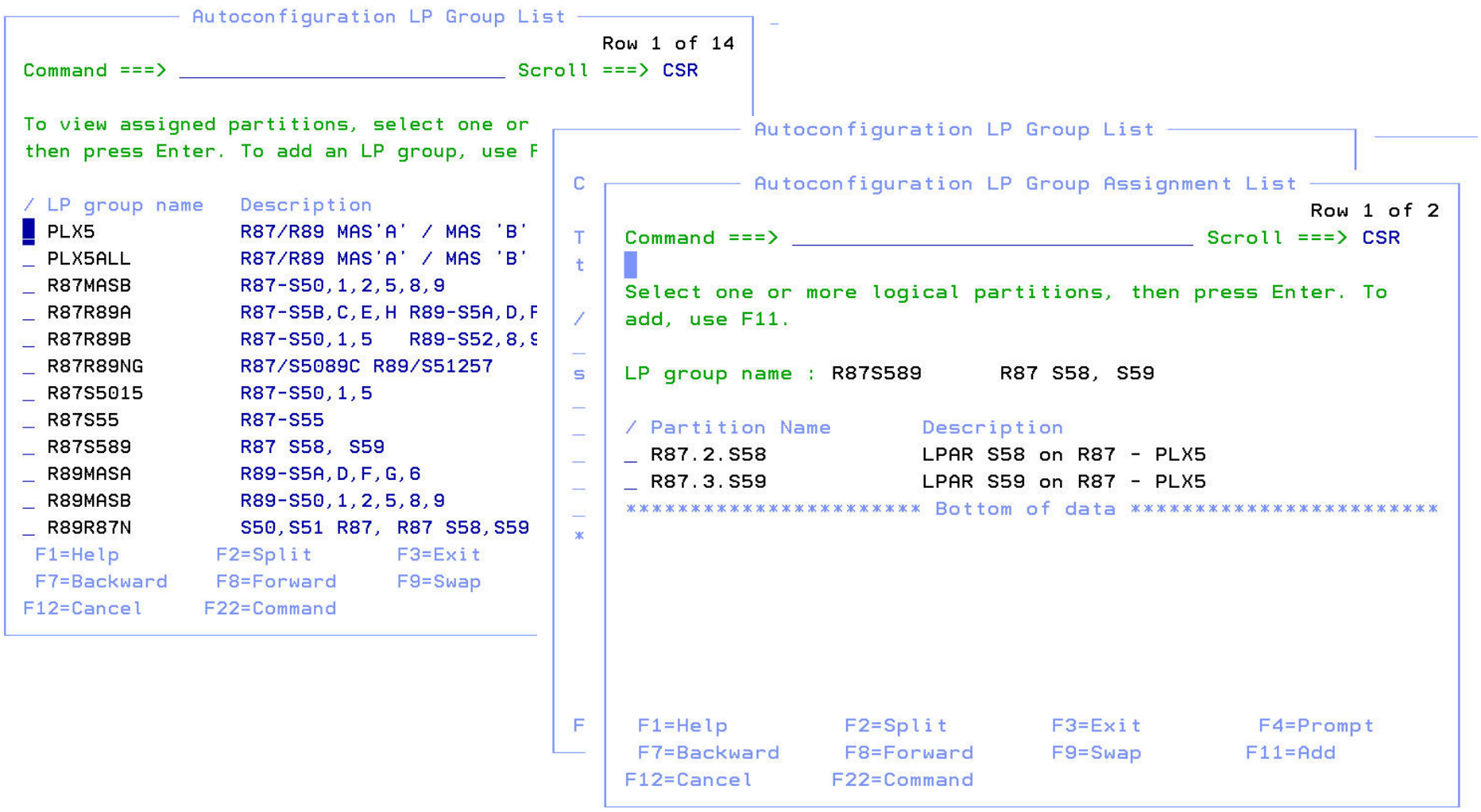
Discovering with HCD

```
Command ===> _____________________________________________________________

                                Hardware Configuration

Select one of the following.

0   0.  Edit profile options and policies
    1.  Define, modify, or view configuration data
    2.  Activate or process configuration data
    3.  Print or compare configuration data
    4.  Create or view graphical configuration report
    5.  Migrate configuration data
    6.  Maintain I/O definition files
    7.  Query supported hardware and installed UIMs
    8.  Getting started with this dialog
    9.  What's new in this release

For options 1 to 5, specify the name of the IODF to be used.

I/O definition file . . .  'IODFST.IODF68'
```

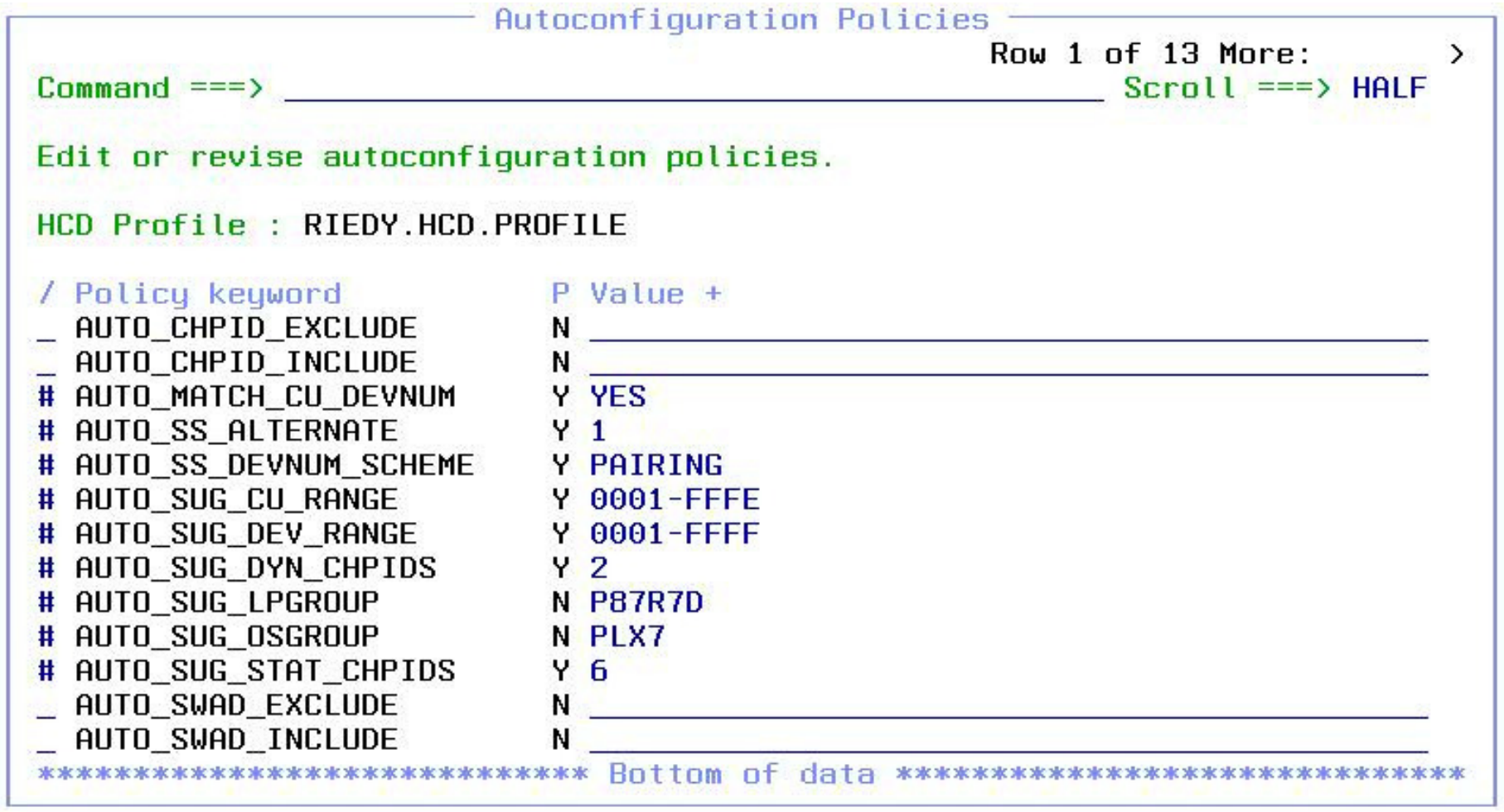
HCD Profile Options



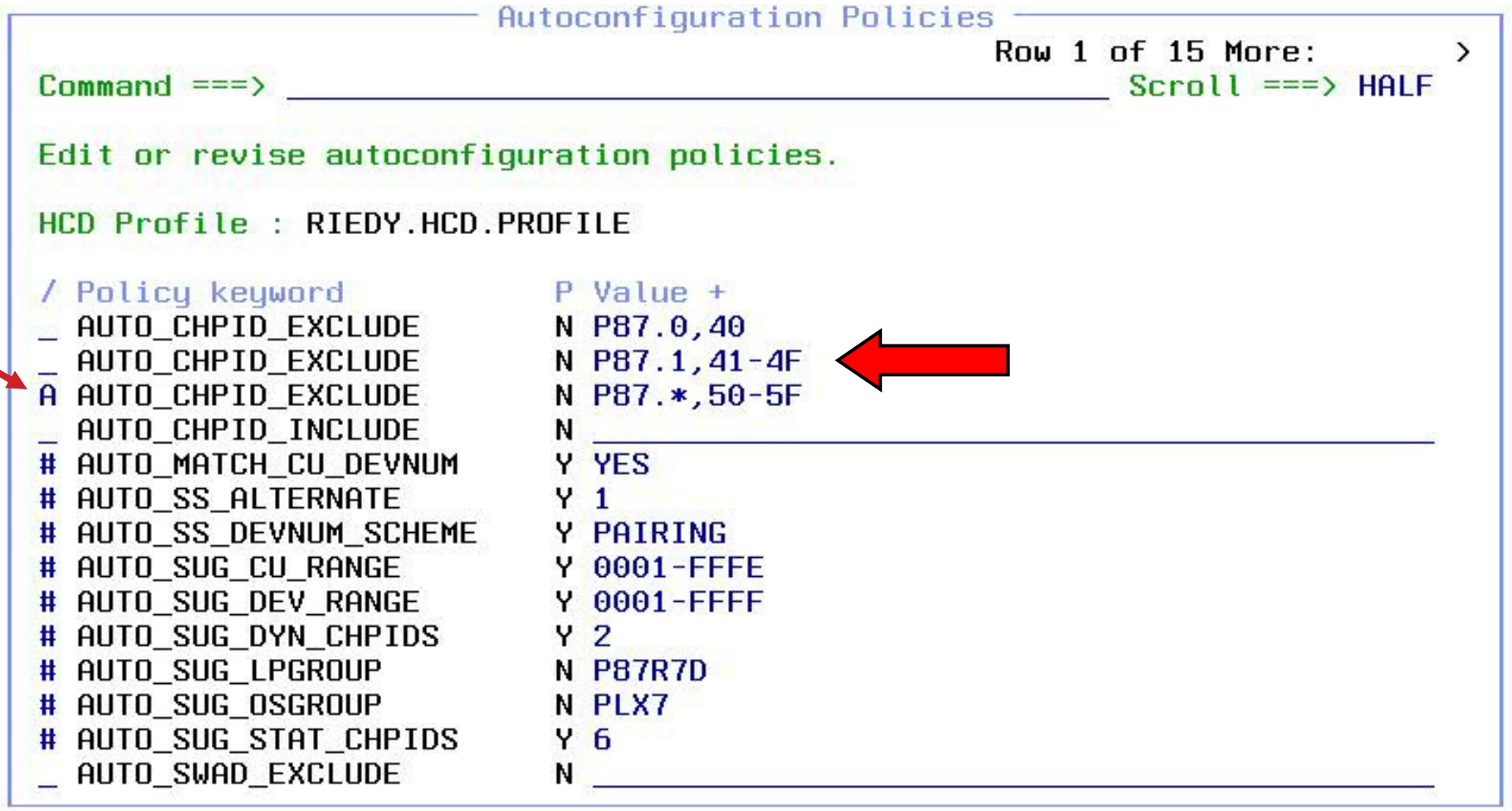
HCD LPAR Groups



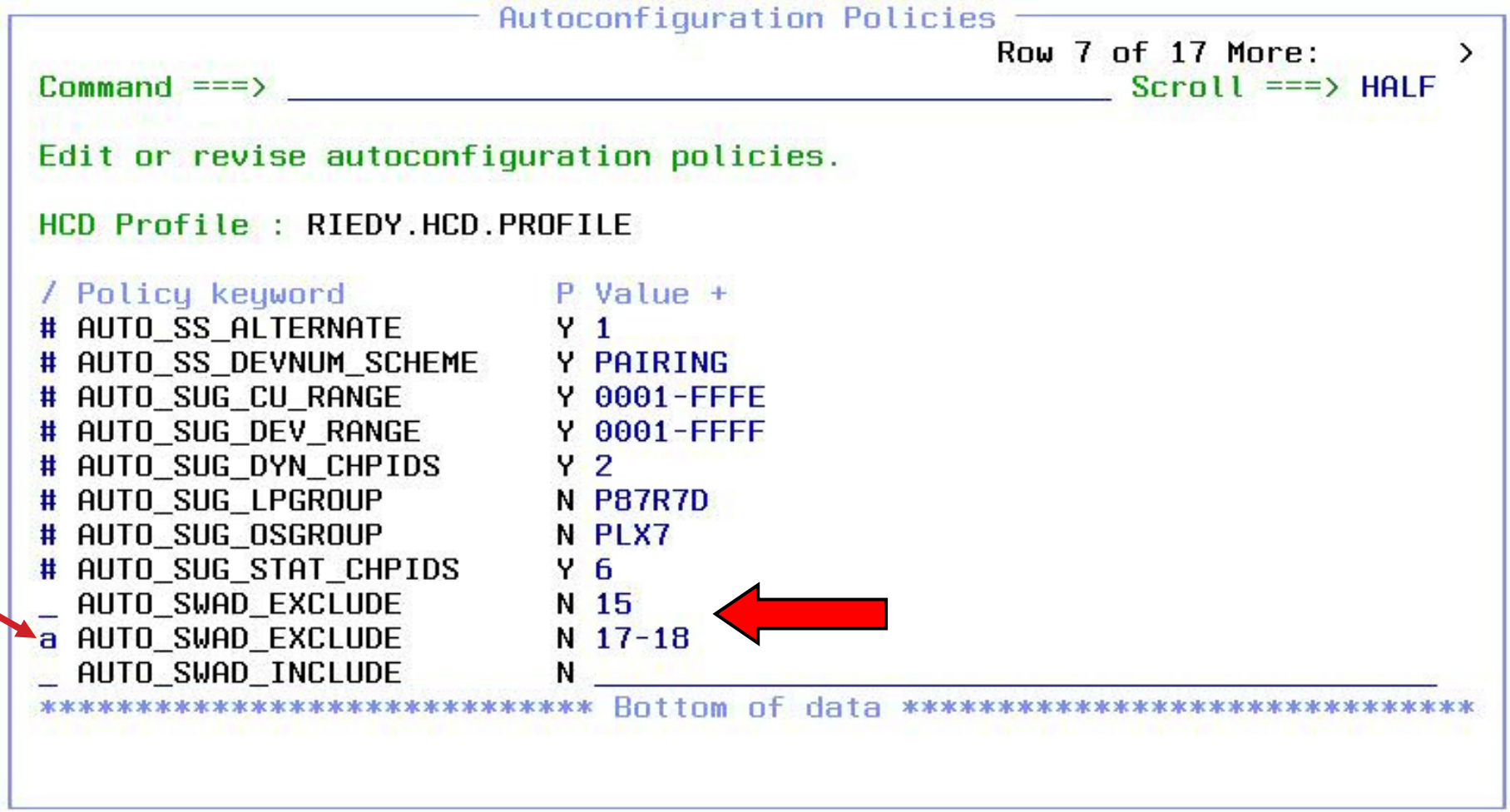
HCD Autoconfiguration Policy



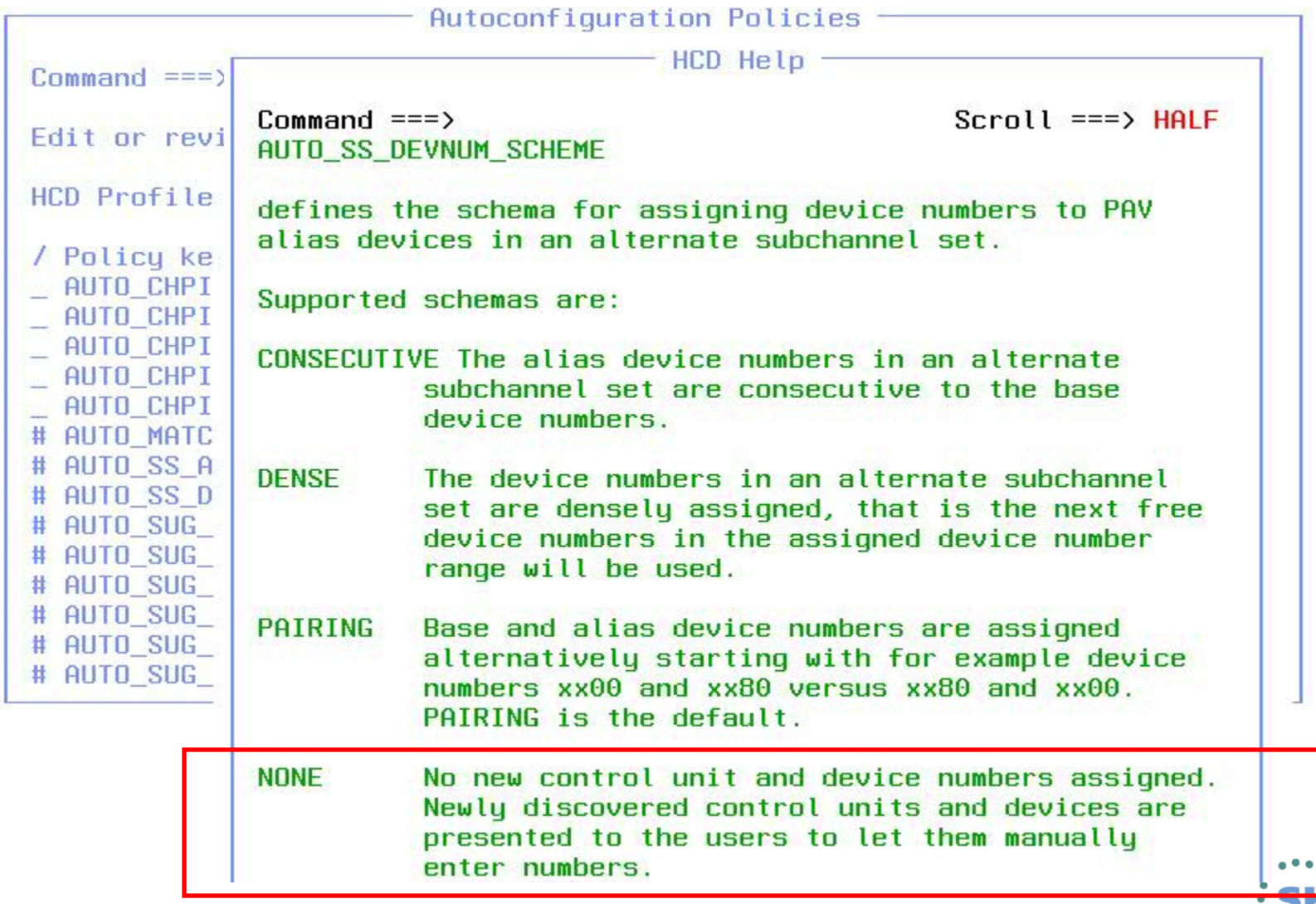
CHPID Inclusion/Exclusion List



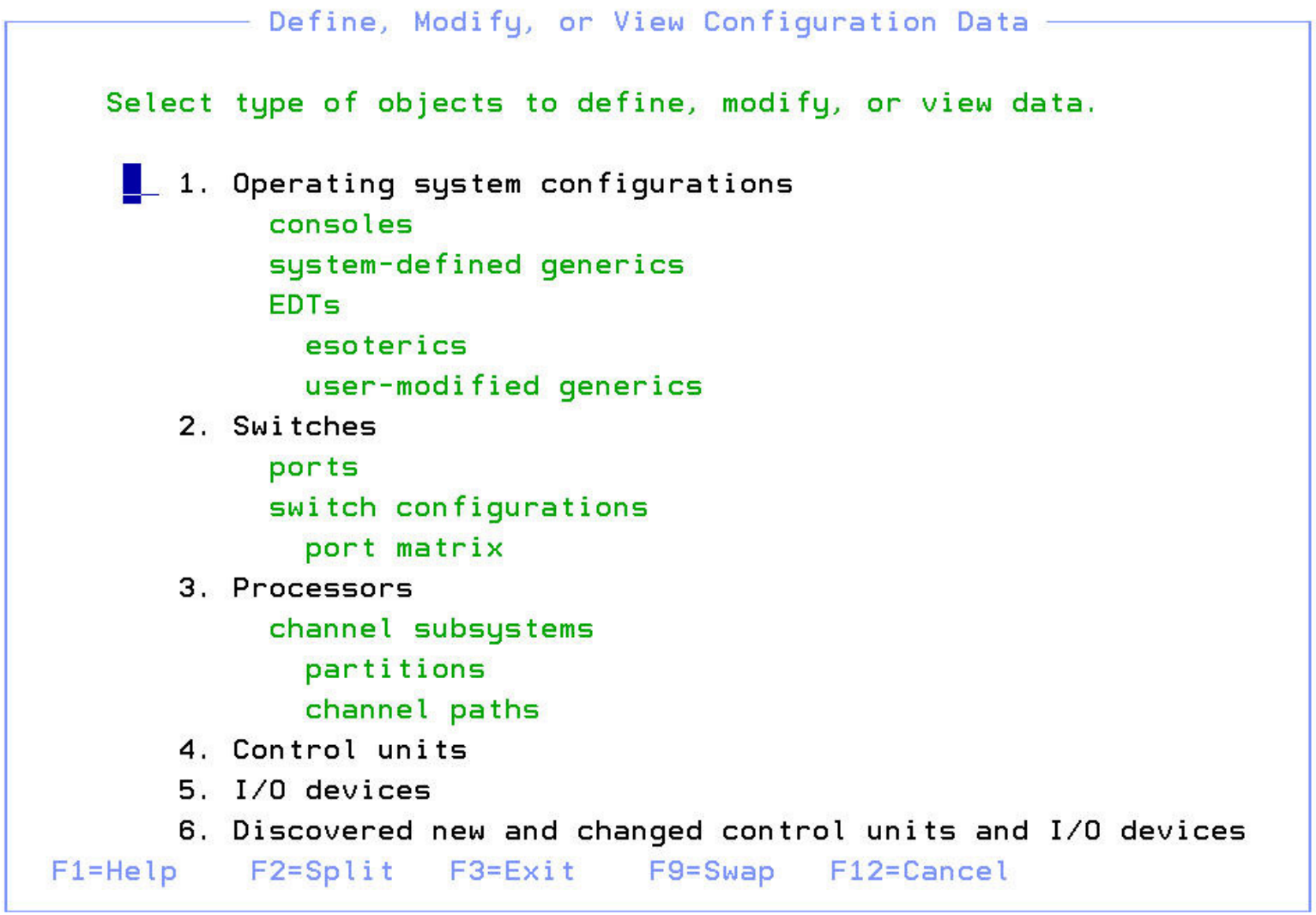
Switch Inclusion/Exclusion Lists



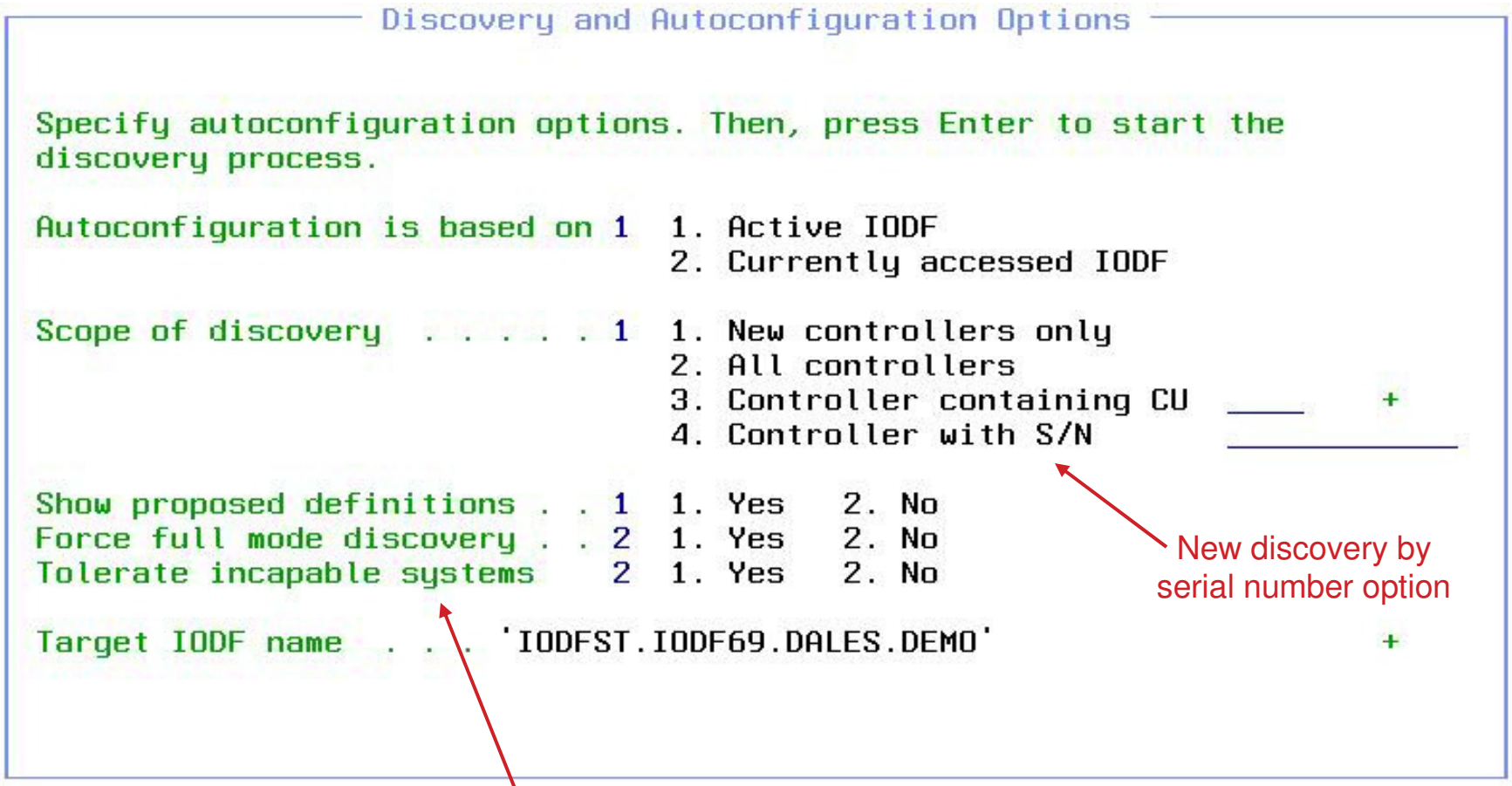
No Numbering of CUs or Devices Option



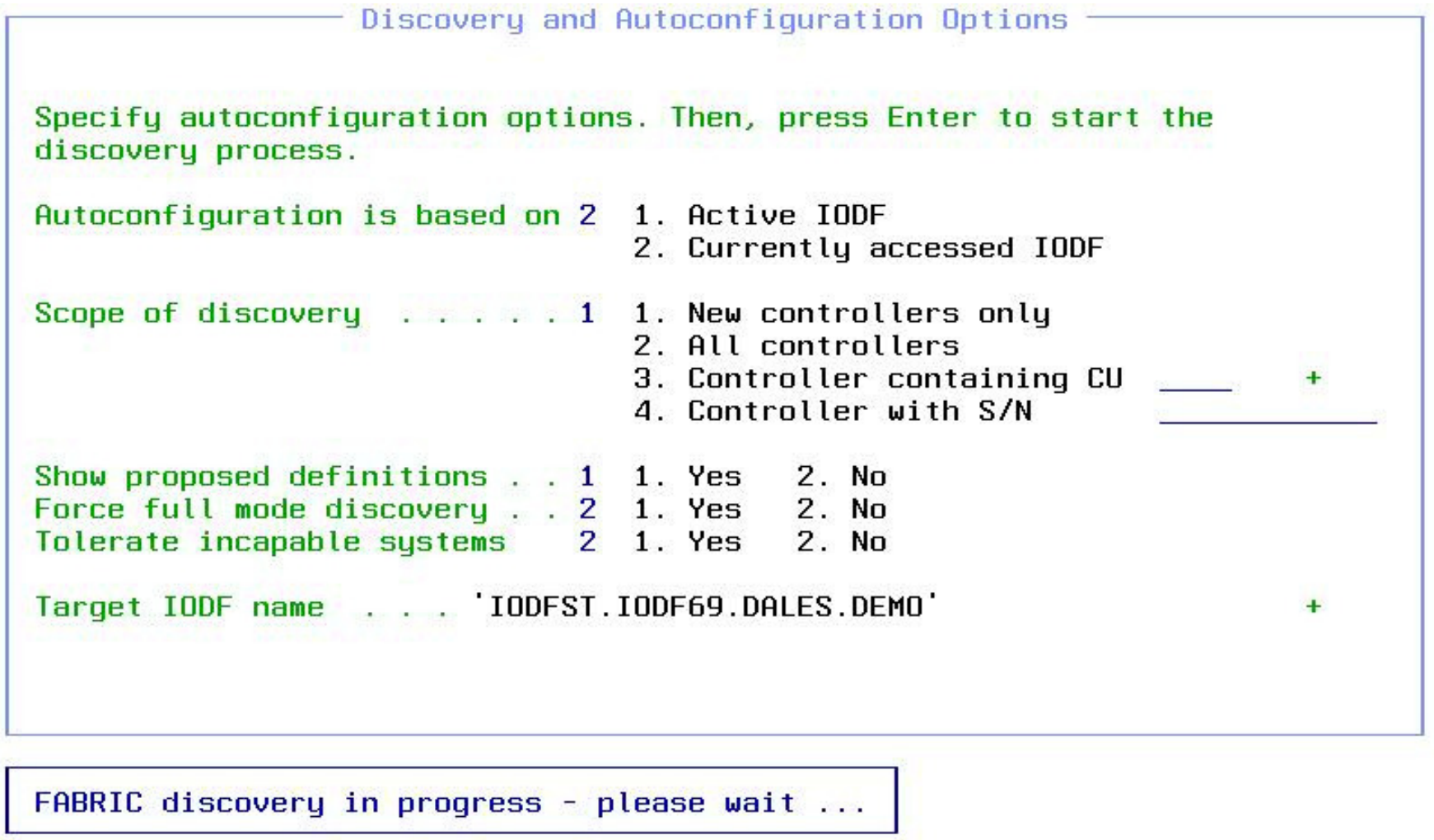
Start Discovery and AutoConfig Process



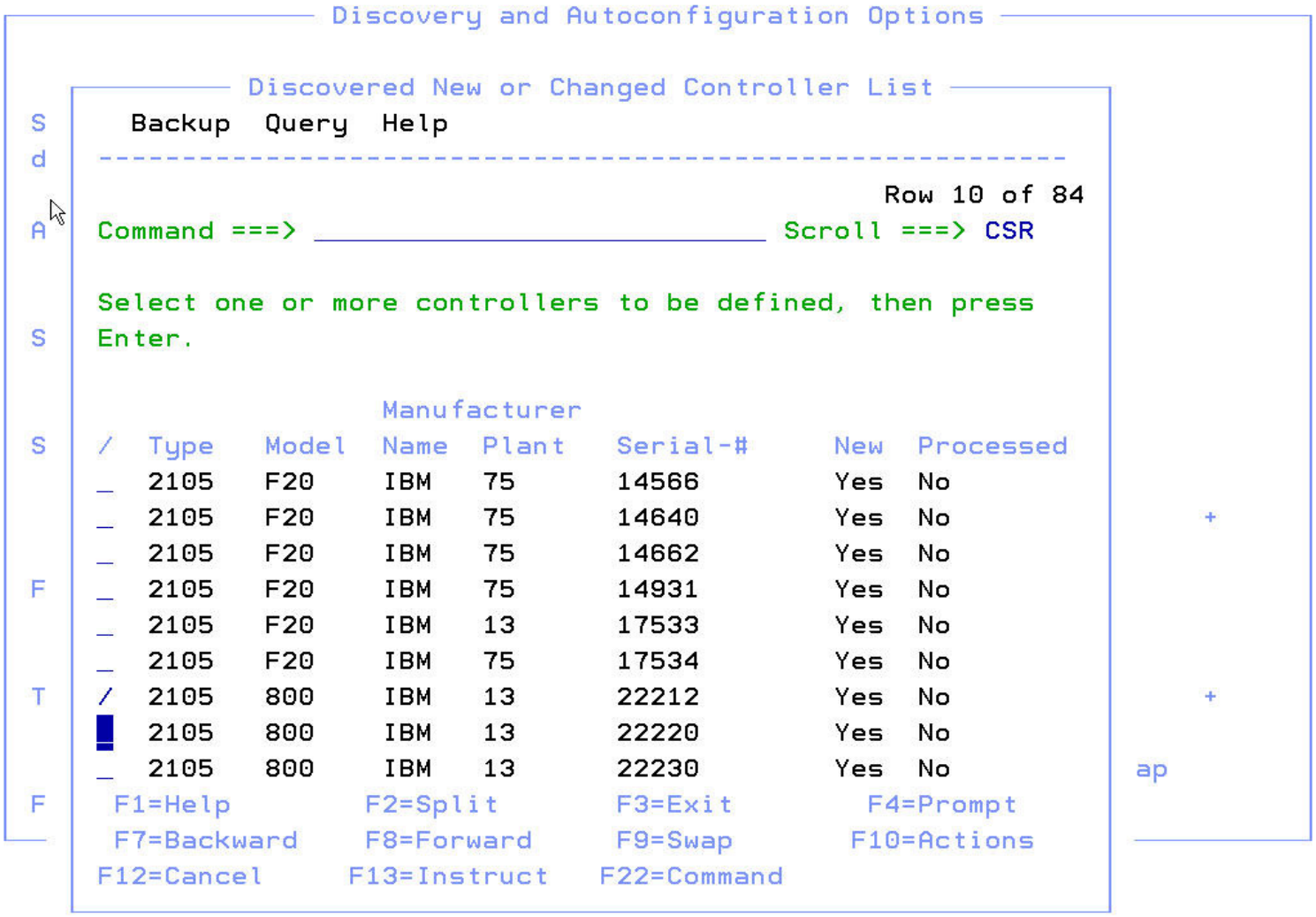
Specifying AutoConfiguration Options



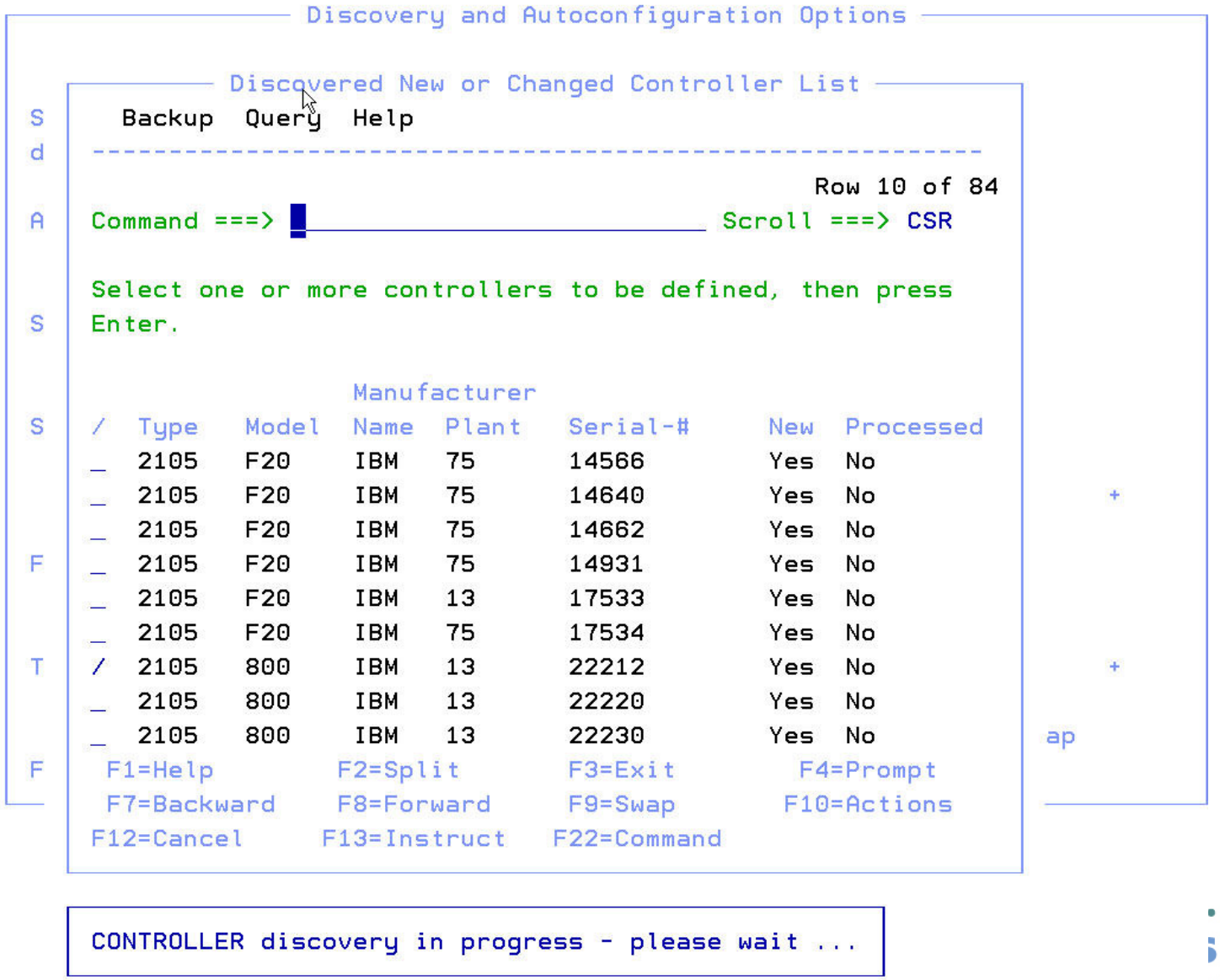
Fabric Discovery in Progress



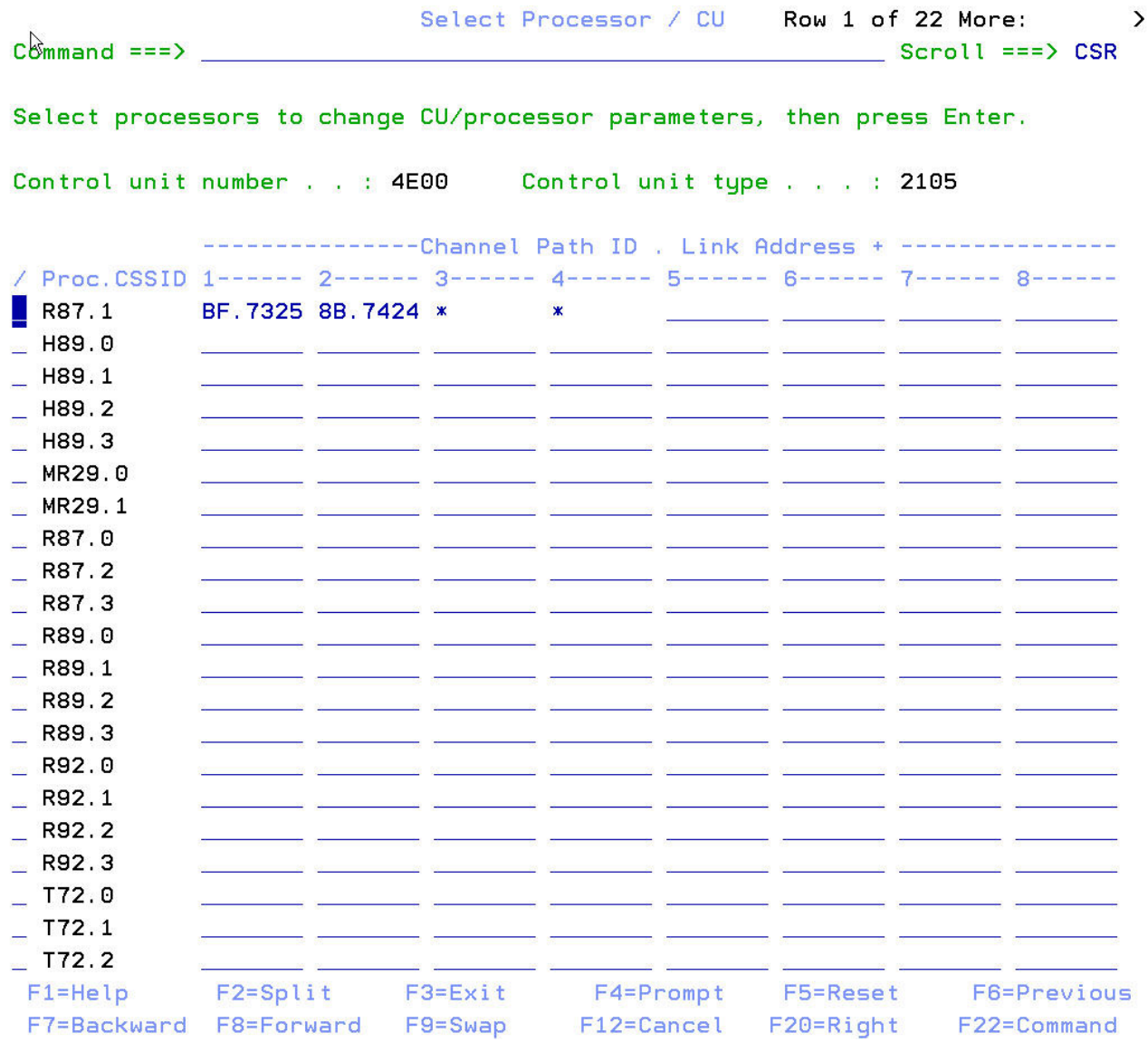
Discovered Controller List



Starting Controller Discovery



Proposed DASD Control Unit List

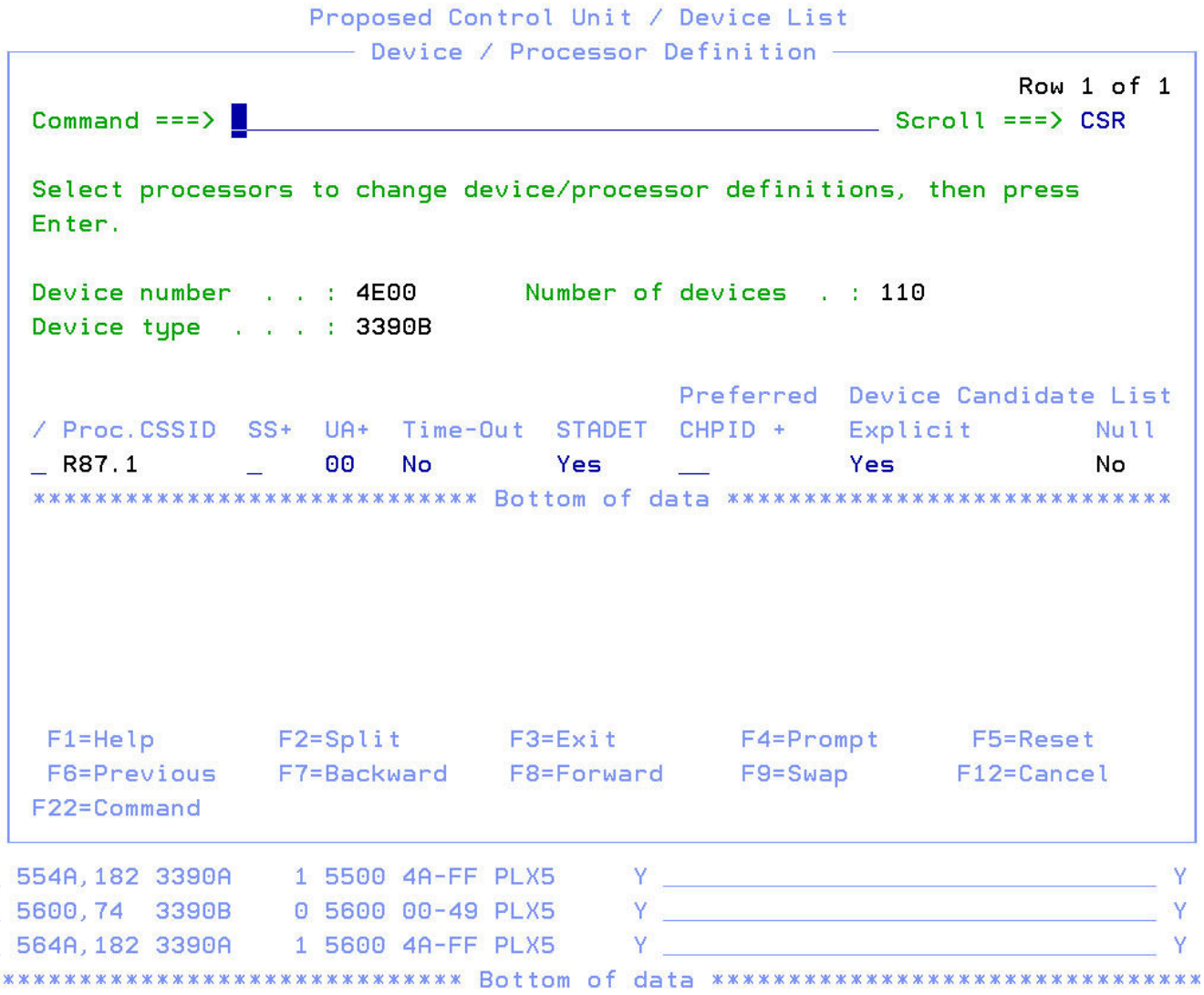


```
                          Select Processor / CU     Row 1 of 22 More:       >
Command ===> _____________________________________________ Scroll ===> CSR

Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : 4E00     Control unit type . . . : 2105

               ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ R87.1      BF.7325 8B.7424 *       *       _______ _______ _______ _______
_ H89.0      _______ _______ _______ _______ _______ _______ _______ _______
_ H89.1      _______ _______ _______ _______ _______ _______ _______ _______
_ H89.2      _______ _______ _______ _______ _______ _______ _______ _______
_ H89.3      _______ _______ _______ _______ _______ _______ _______ _______
_ MR29.0     _______ _______ _______ _______ _______ _______ _______ _______
_ MR29.1     _______ _______ _______ _______ _______ _______ _______ _______
_ R87.0      _______ _______ _______ _______ _______ _______ _______ _______
_ R87.2      _______ _______ _______ _______ _______ _______ _______ _______
_ R87.3      _______ _______ _______ _______ _______ _______ _______ _______
_ R89.0      _______ _______ _______ _______ _______ _______ _______ _______
_ R89.1      _______ _______ _______ _______ _______ _______ _______ _______
_ R89.2      _______ _______ _______ _______ _______ _______ _______ _______
_ R89.3      _______ _______ _______ _______ _______ _______ _______ _______
_ R92.0      _______ _______ _______ _______ _______ _______ _______ _______
_ R92.1      _______ _______ _______ _______ _______ _______ _______ _______
_ R92.2      _______ _______ _______ _______ _______ _______ _______ _______
_ R92.3      _______ _______ _______ _______ _______ _______ _______ _______
_ T72.0      _______ _______ _______ _______ _______ _______ _______ _______
_ T72.1      _______ _______ _______ _______ _______ _______ _______ _______
_ T72.2      _______ _______ _______ _______ _______ _______ _______ _______
 F1=Help      F2=Split     F3=Exit      F4=Prompt    F5=Reset     F6=Previous
 F7=Backward  F8=Forward   F9=Swap      F12=Cancel   F20=Right    F22=Command
```

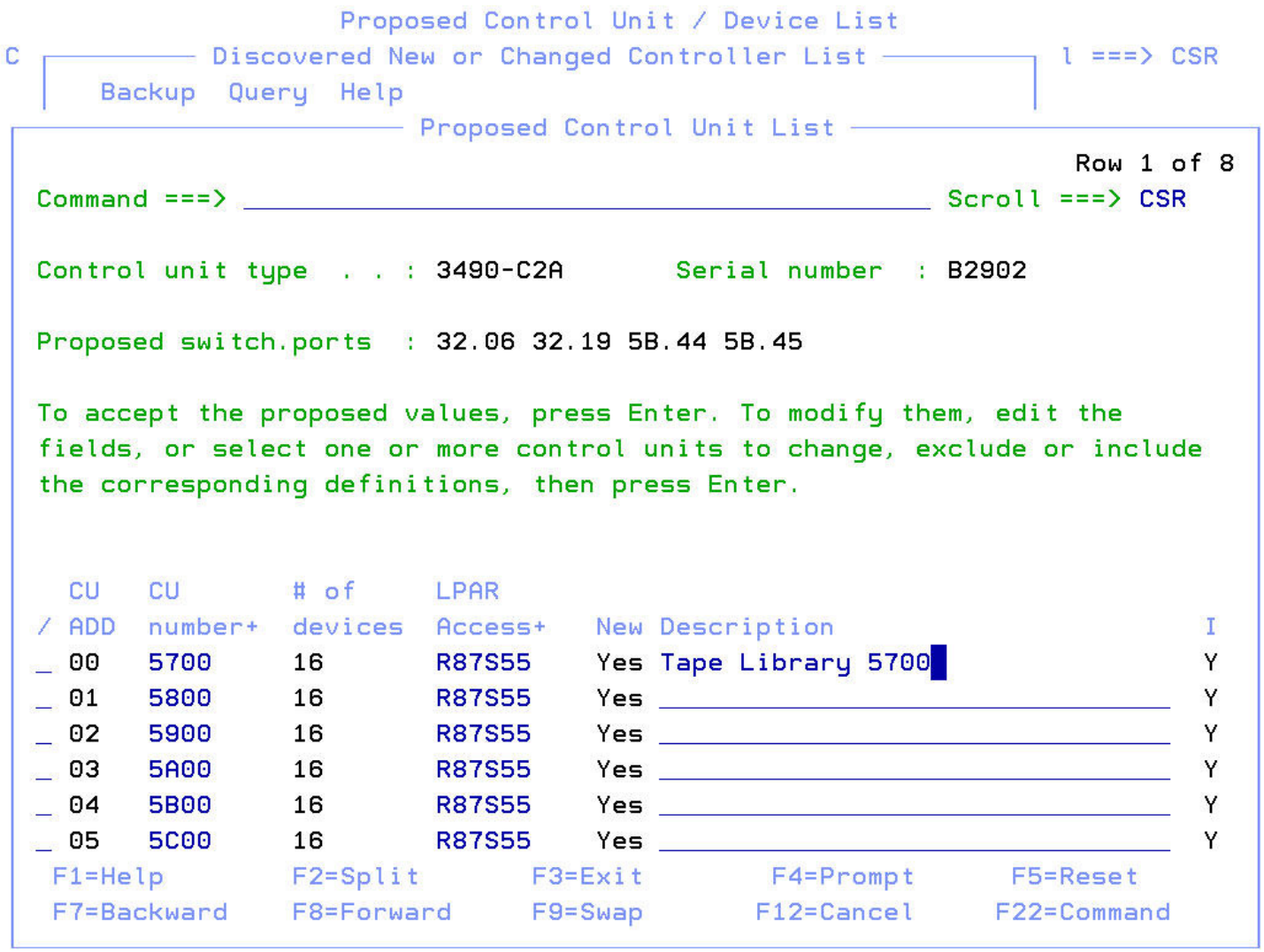
List of Proposed DASD Devices


```
                        Proposed Control Unit / Device List          Row 1 of 16
Command ===> _____________________________________________ Scroll ===> CSR

Control unit type  . . : 2105-800       Serial number  : 22212

To accept the proposed values, press Enter. To modify them, edit the
fields, or select one or more device ranges to change, exclude or include
the corresponding definitions, then press Enter.

  ------Device-----  S CU   UA    OS
/ Number   Type+     S Num  Range Access+  N Description                    I
_ 4E00,110 3390B     0 4E00 00-6D PLX5      Y _____________________________ Y
_ 4E6E,146 3390A     1 4E00 6E-FF PLX5      Y _____________________________ Y
_ 5000,51  3390B     0 5000 00-32 PLX5      Y _____________________________ Y
_ 5034,204 3390A     1 5000 34-FF PLX5      Y _____________________________ Y
_ 5100,110 3390B     0 5100 00-6D PLX5      Y _____________________________ Y
_ 516E,146 3390A     1 5100 6E-FF PLX5      Y _____________________________ Y
_ 5200,51  3390B     0 5200 00-32 PLX5      Y _____________________________ Y
_ 5234,204 3390A     1 5200 34-FF PLX5      Y _____________________________ Y
_ 5300,110 3390B     0 5300 00-6D PLX5      Y _____________________________ Y
_ 536E,146 3390A     1 5300 6E-FF PLX5      Y _____________________________ Y
_ 5400,53  3390B     0 5400 00-34 PLX5      Y _____________________________ Y
_ 5447,185 3390A     1 5400 47-FF PLX5      Y _____________________________ Y
_ 5500,74  3390B     0 5500 00-49 PLX5      Y _____________________________ Y
_ 554A,182 3390A     1 5500 4A-FF PLX5      Y _____________________________ Y
_ 5600,74  3390B     0 5600 00-49 PLX5      Y _____________________________ Y
_ 564A,182 3390A     1 5600 4A-FF PLX5      Y _____________________________ Y
****************************** Bottom of data ********************************
```

Displaying a Specific DASD Device



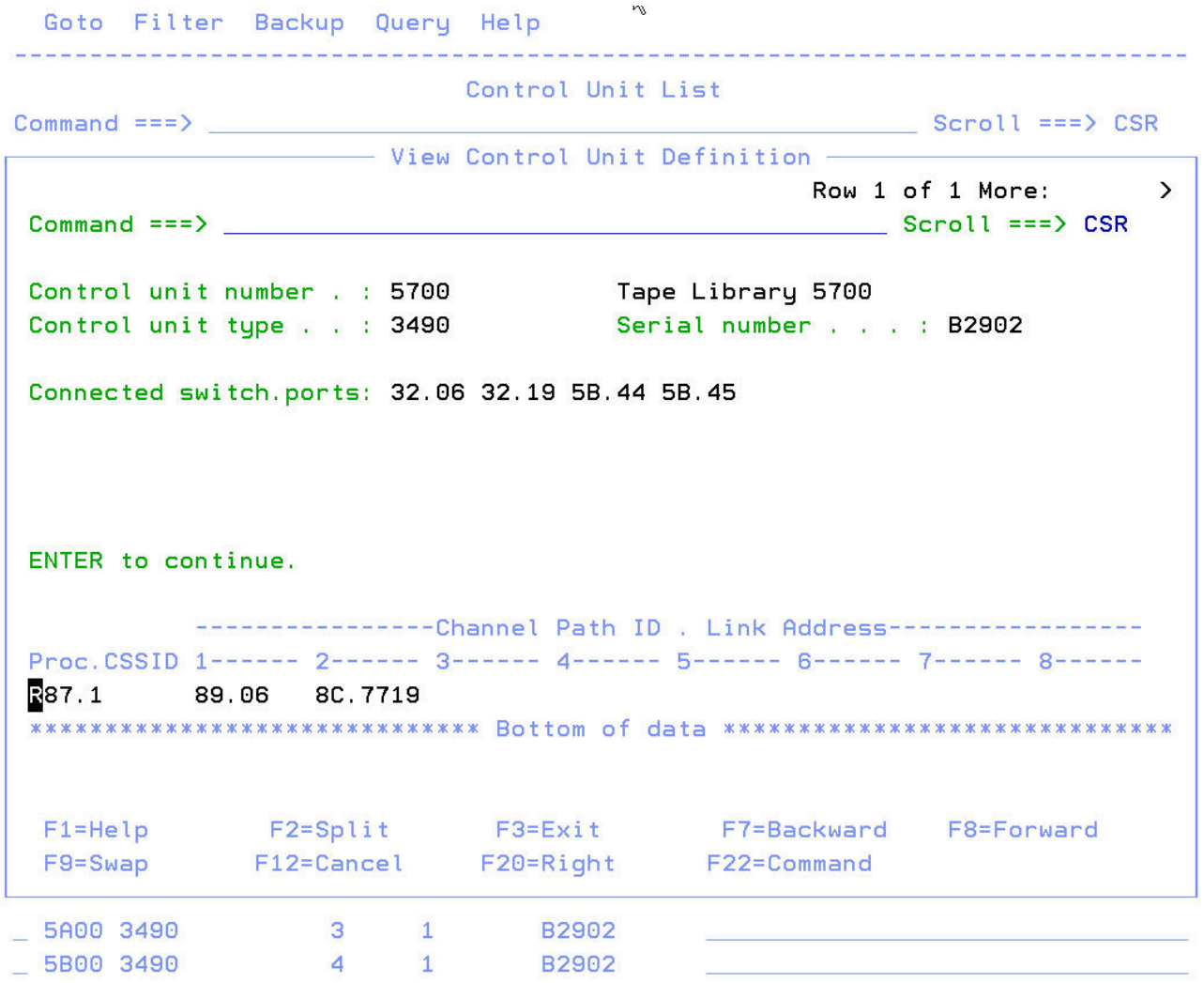
Tape Library Example



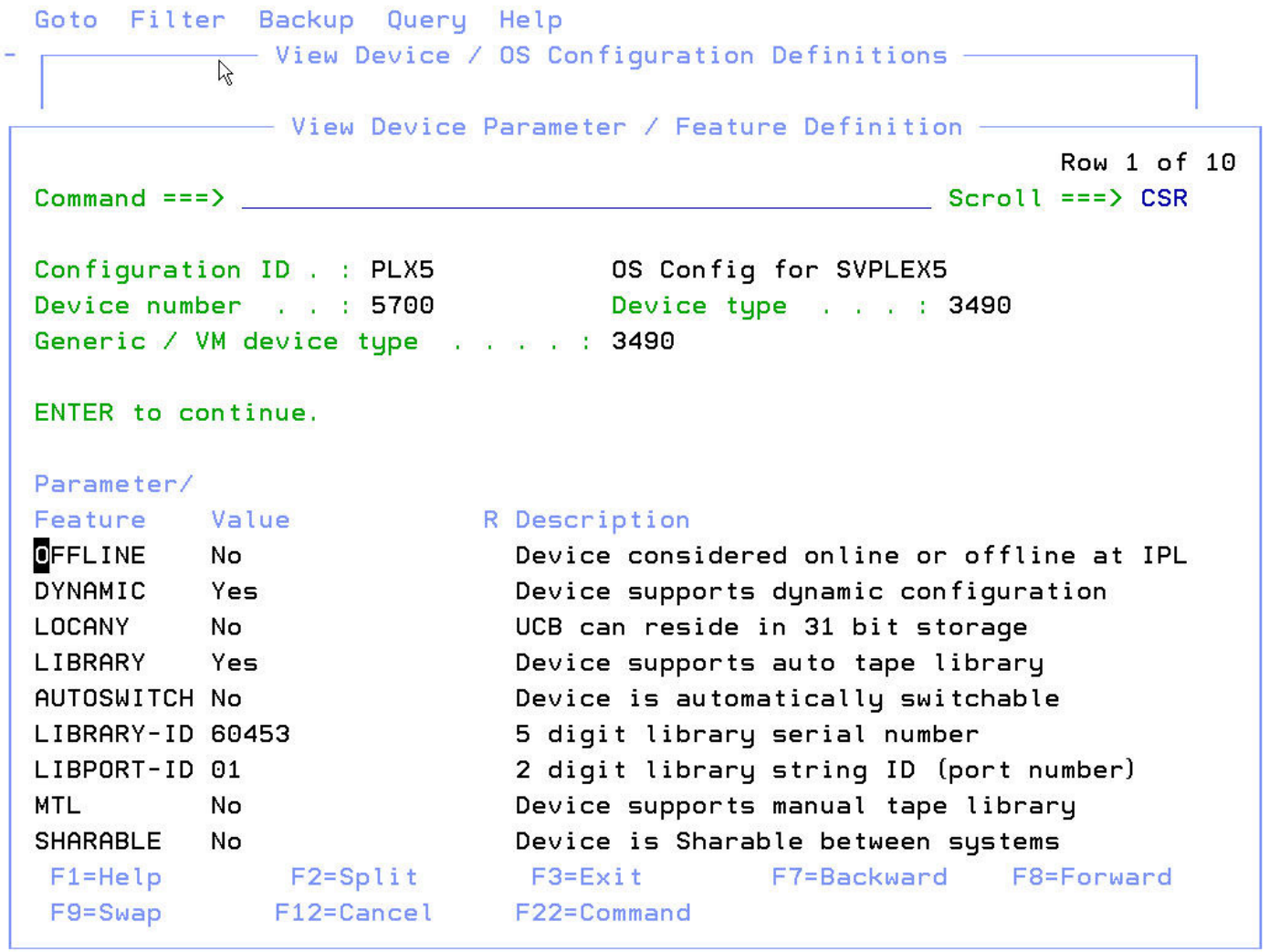
List of Proposed Tape Devices


```
                        Proposed Control Unit / Device List          Row 1 of 8
Command ===> ____________________________________________ Scroll ===> CSR

Control unit type  . . : 3490-C2A       Serial number  : B2902

To accept the proposed values, press Enter. To modify them, edit the
fields, or select one or more device ranges to change, exclude or include
the corresponding definitions, then press Enter.

   ------Device-----  S CU   UA    OS
/  Number   Type+     S Num  Range Access+  N Description                    I
_  5700,16   3490      0 5700 00-0F PLX5     Y ____________________________ Y
_  5800,16   3490      0 5800 00-0F PLX5     Y ____________________________ Y
_  5900,16   3490      0 5900 00-0F PLX5     Y ____________________________ Y
_  5A00,16   3490      0 5A00 00-0F PLX5     Y ____________________________ Y
_  5B00,16   3490      0 5B00 00-0F PLX5     Y ____________________________ Y
_  5C00,16   3490      0 5C00 00-0F PLX5     Y ____________________________ Y
_  5D00,16   3490      0 5D00 00-0F PLX5     Y ____________________________ Y
_  5E00,16   3490      0 5E00 00-0F PLX5     Y ____________________________ Y
****************************** Bottom of data ********************************
```

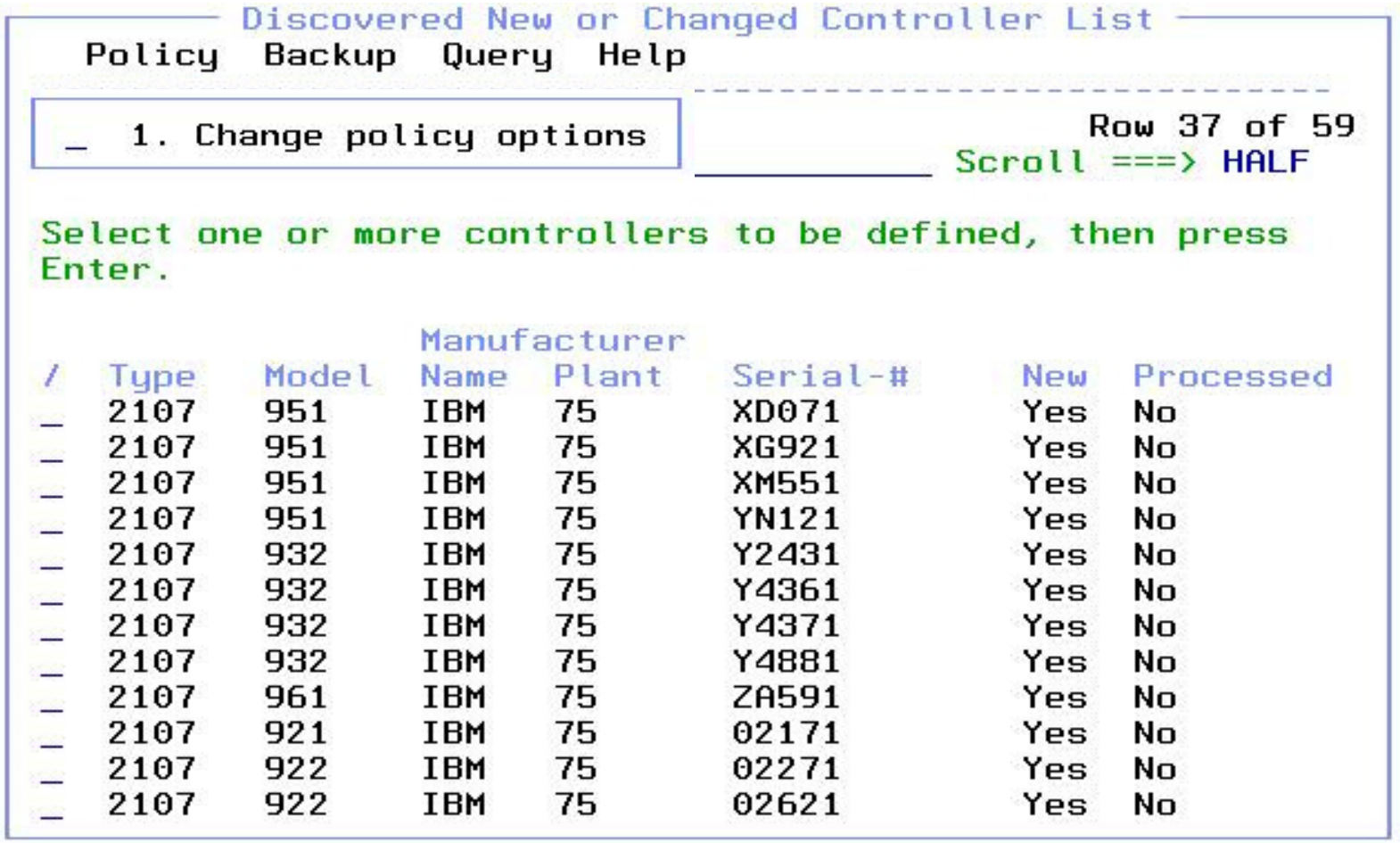
Proposed Tape Control Unit List



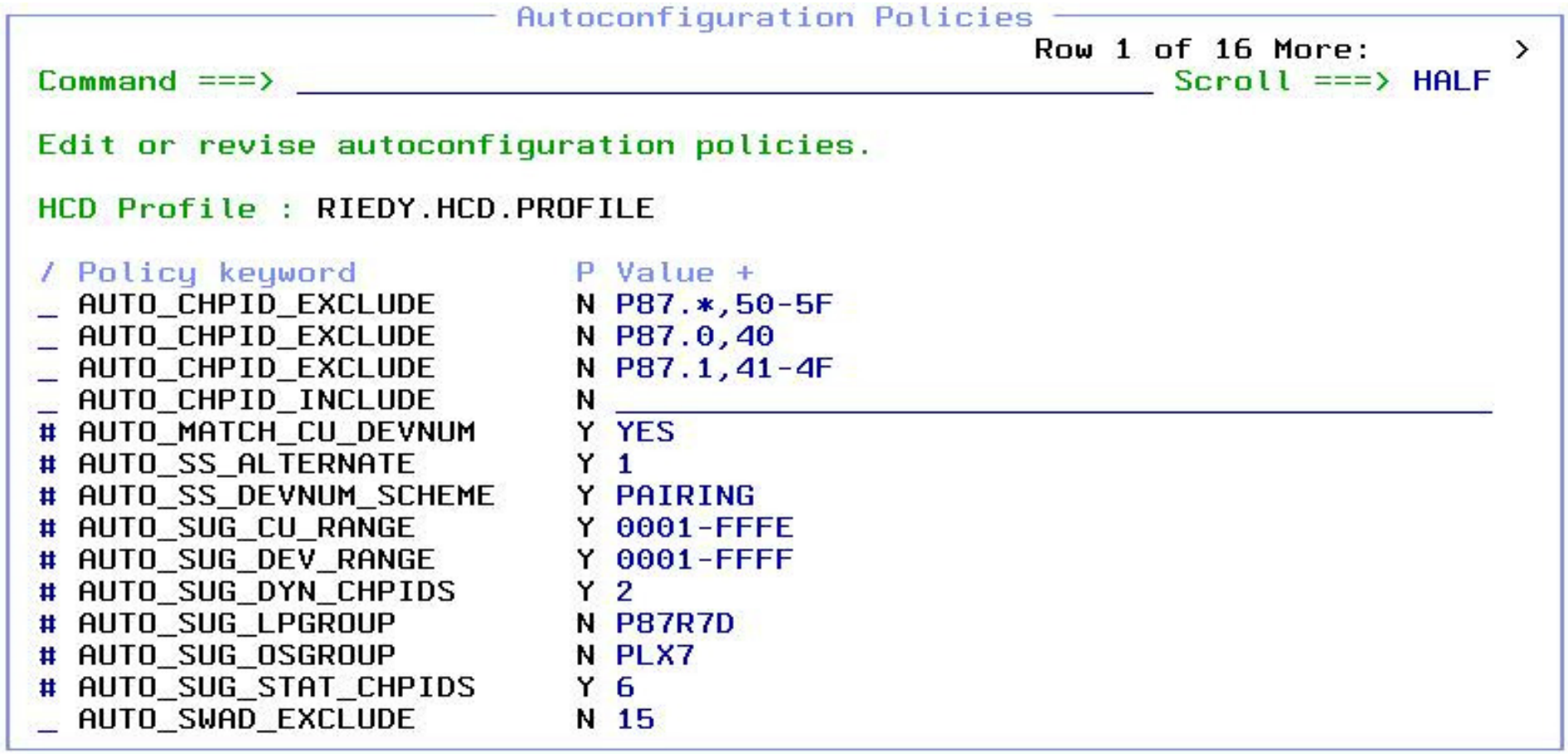
Displaying a Specific Tape Device



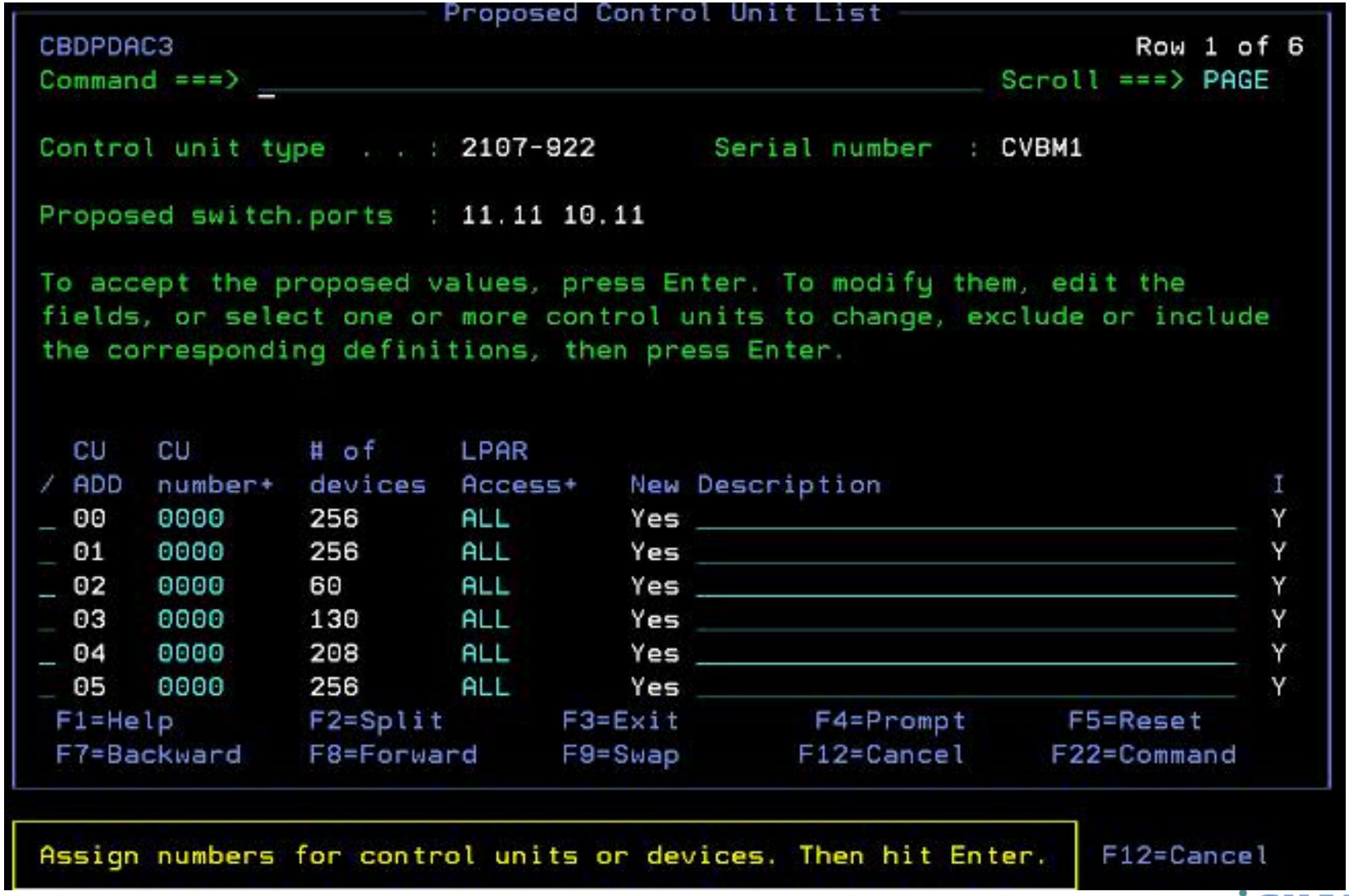
Changing AutoConfig Policy Options



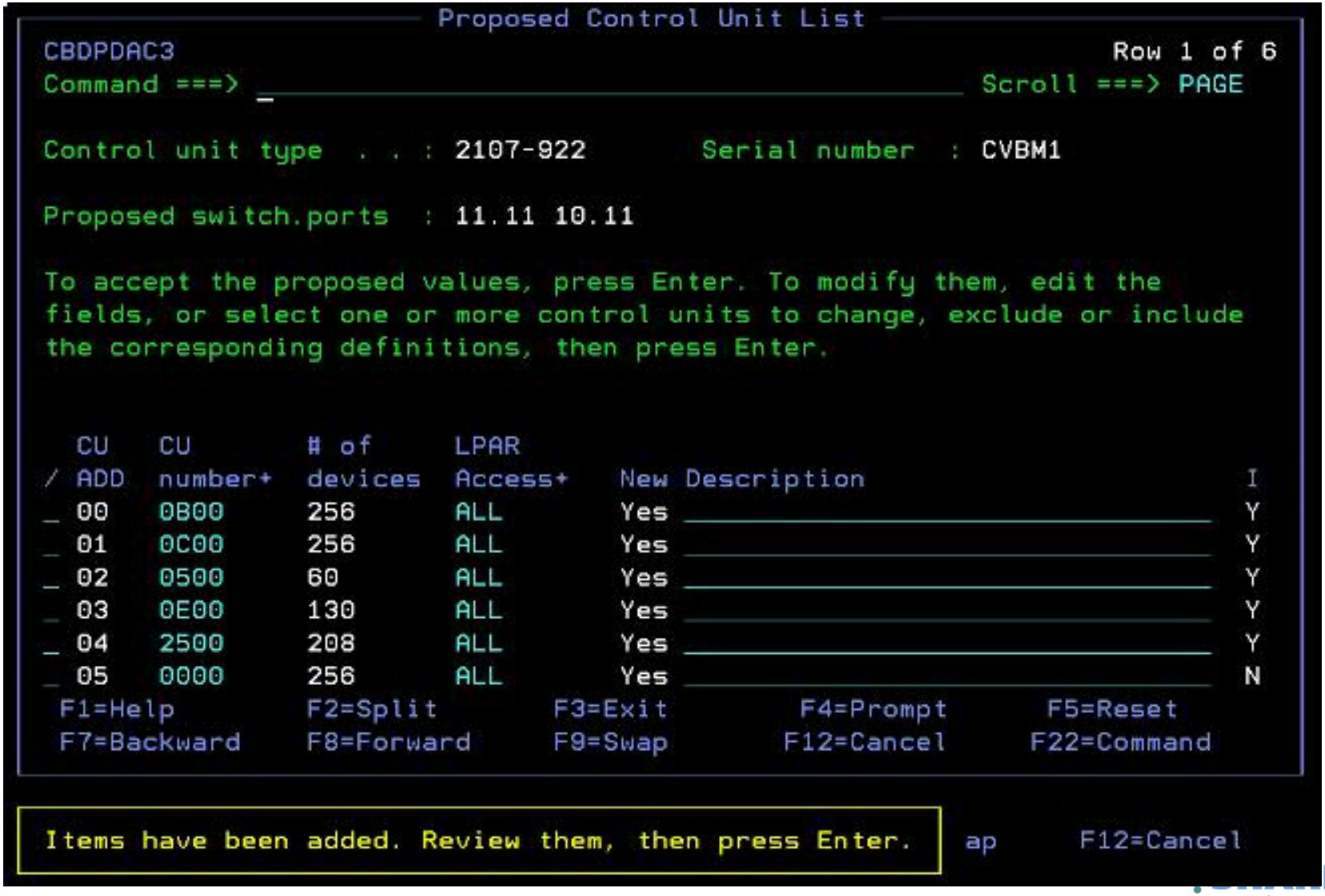
Changing AutoConfig Policy Options



AUTO_SS_DEVNUM_SCHEME=NONE



AUTO_SS_DEVNUM_SCHEME=NONE

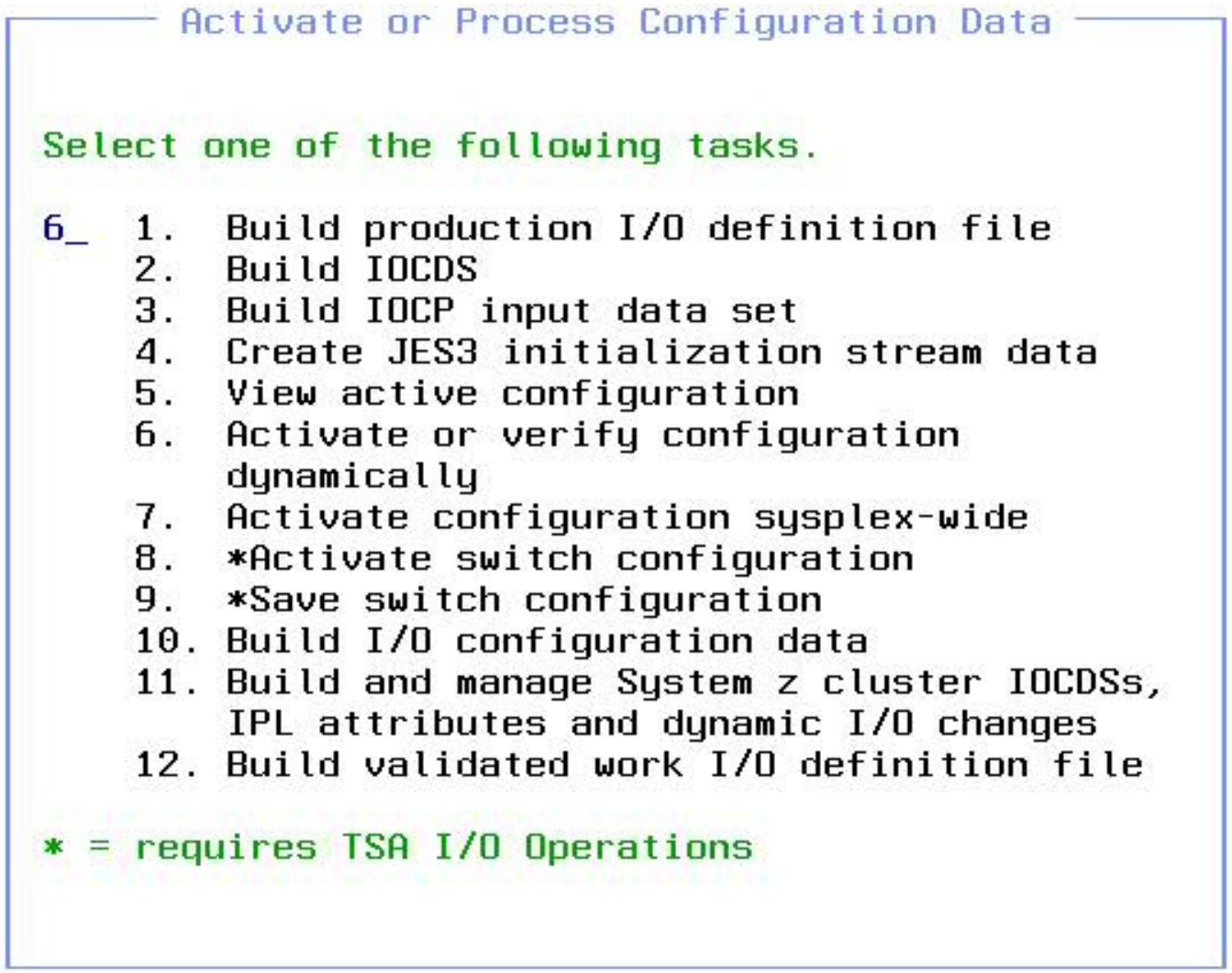


AUTO_SS_DEVNUM_SCHEME=NONE

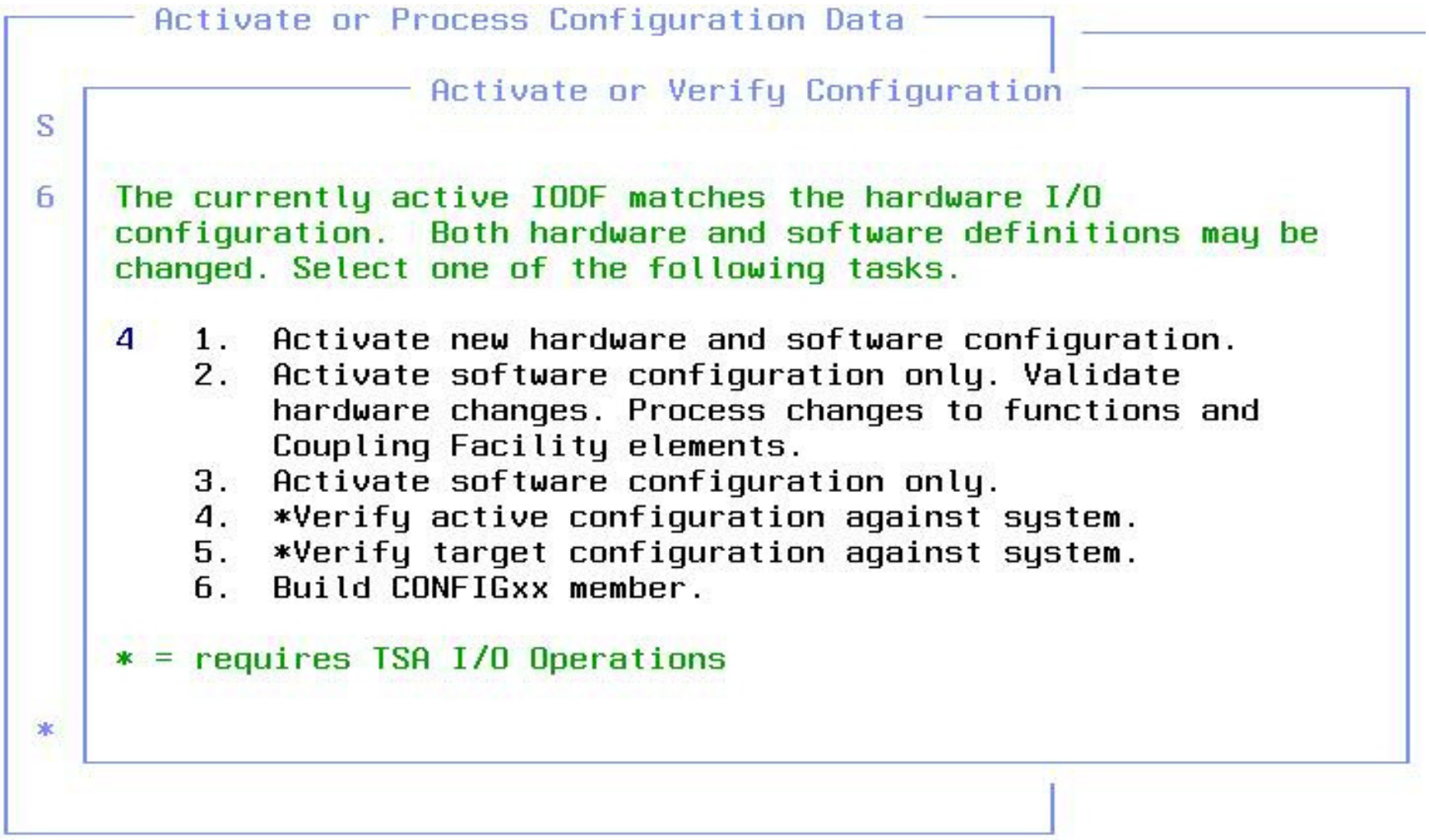
AUTO_SS_DEVNUM_SCHEME=NONE

```
CBDPDAC4              Proposed Control Unit / Device List              Row 1 of 5
Command ===> _                                                Scroll ===> PAGE

Control unit type  . . : 2107-922       Serial number  : CVBM1

To accept the proposed values, press Enter. To modify them, edit the
fields, or select one or more device ranges to change, exclude or include
the corresponding definitions, then press Enter.


  ------Device-----  S CU   UA    OS
/ Number    Type+    S Num  Range Access+  N Description                      I
_ 0B00,256  3390B    0 0B00 00-FF MVSVM    Y _____________________________ Y
_ 0C00,256  3390B    0 0C00 00-FF MVSVM    Y _____________________________ Y
_ 0500,60   3390B    0 0500 00-3B MVSVM    Y _____________________________ Y
_ 0E00,130  3390B    0 0E00 00-81 MVSVM    Y _____________________________ Y
_ 2500,208  3390B    0 2500 00-CF MVSVM    Y _____________________________ Y
******************************* Bottom of data ********************************


          Items have been added. Review them, then press Enter.
 F1=Help                                                        =Backward
```

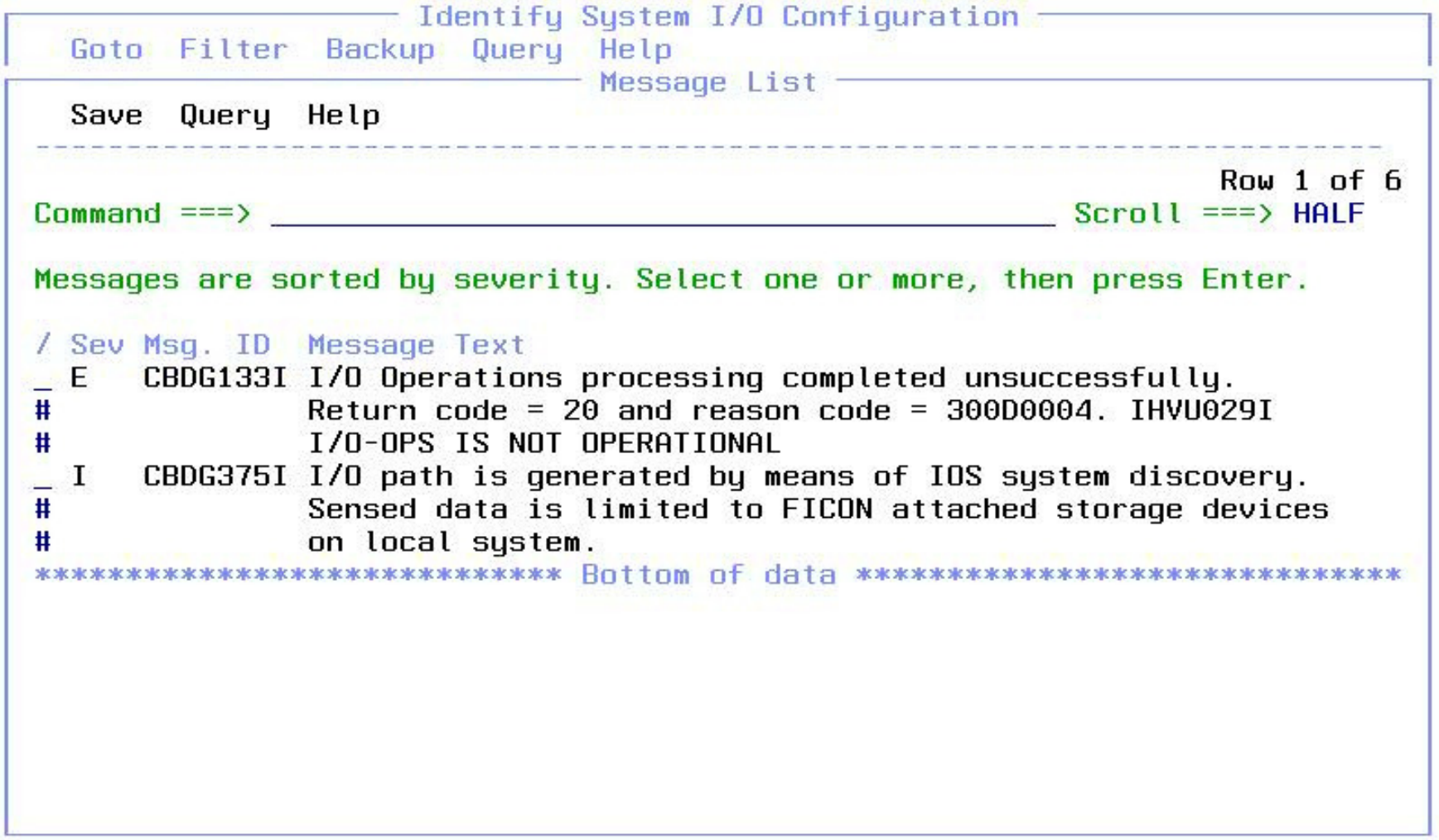
Verifying a Configuration via zDAC



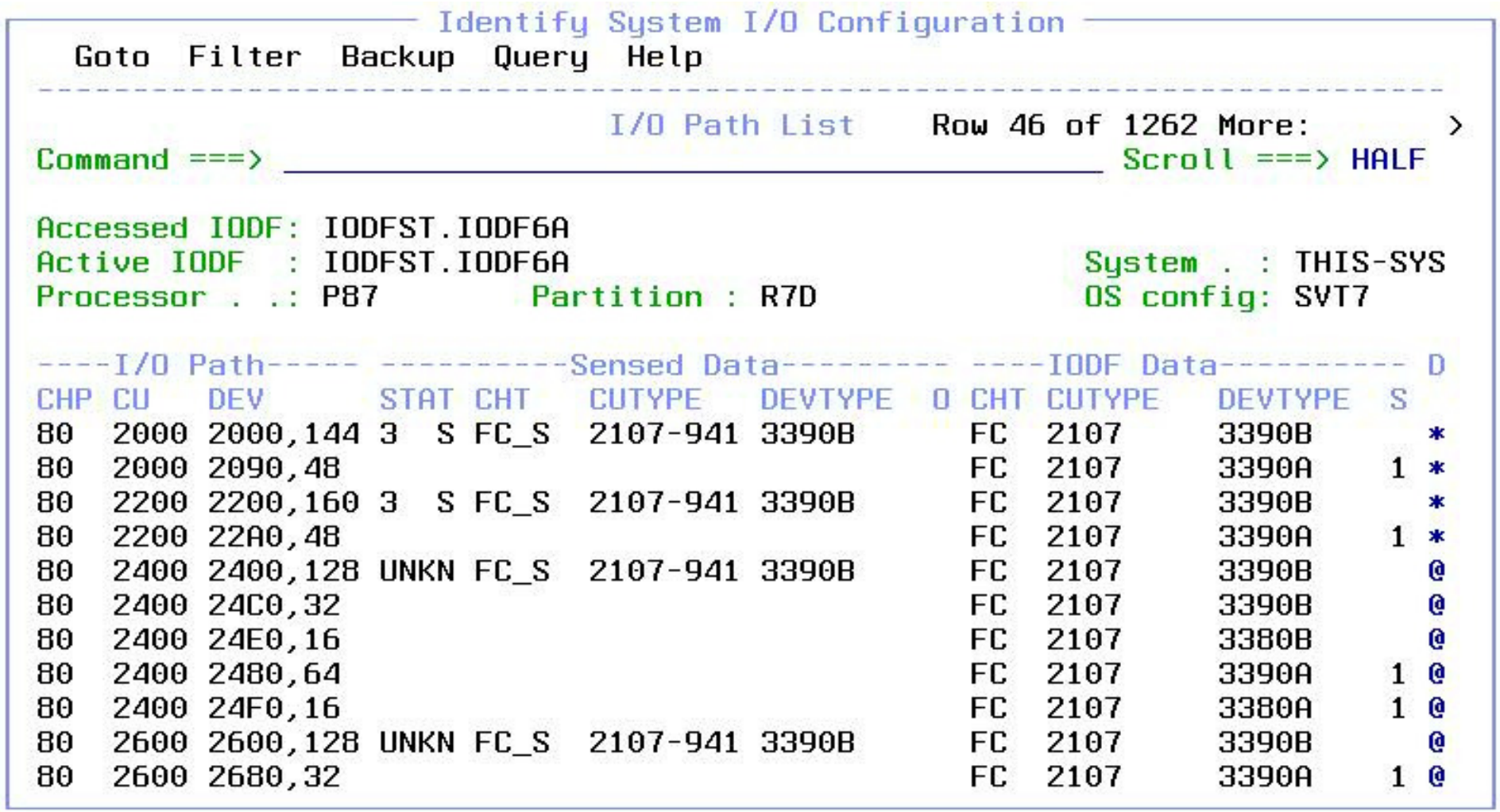
Verifying a Configuration via zDAC



TSA I/O Ops Not Available

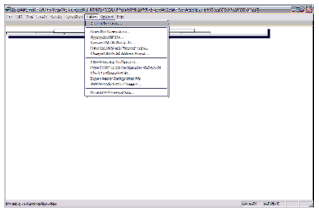


I/O Path List Display

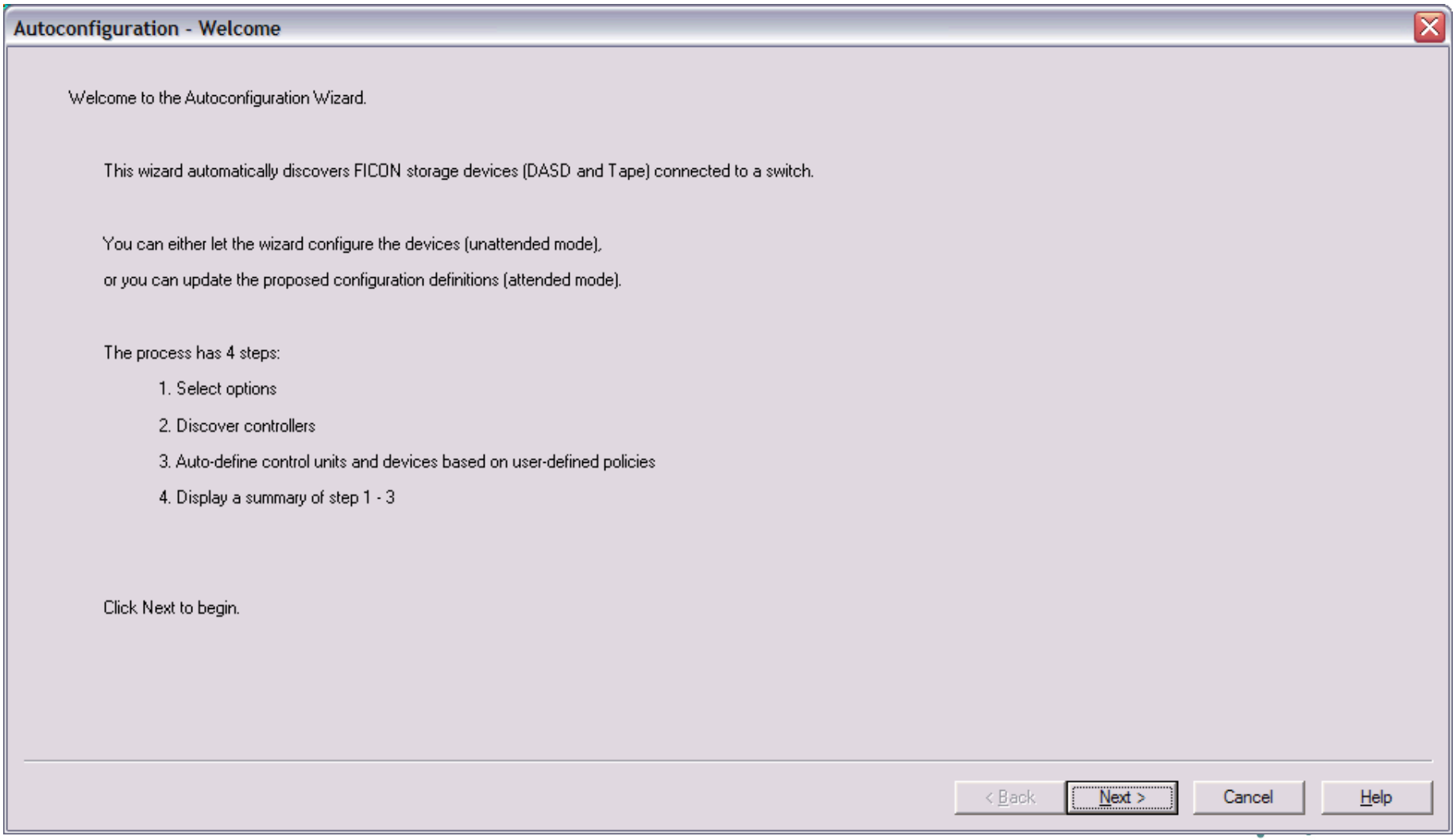


```
                    Identify System I/O Configuration
  Goto  Filter  Backup  Query  Help
------------------------------------------------------------------------------
                                I/O Path List     Row 46 of 1262 More:       >
Command ===> _____________________________________________ Scroll ===> HALF

Accessed IODF: IODFST.IODF6A
Active IODF  : IODFST.IODF6A                          System . : THIS-SYS
Processor . .: P87          Partition : R7D           OS config: SVT7

----I/O Path----- ----------Sensed Data--------- ----IODF Data---------- D
CHP CU   DEV      STAT CHT   CUTYPE   DEVTYPE  O CHT CUTYPE   DEVTYPE  S
80  2000 2000,144 3  S FC_S  2107-941 3390B      FC  2107     3390B      *
80  2000 2090,48                                 FC  2107     3390A    1 *
80  2200 2200,160 3  S FC_S  2107-941 3390B      FC  2107     3390B      *
80  2200 22A0,48                                 FC  2107     3390A    1 *
80  2400 2400,128 UNKN FC_S  2107-941 3390B      FC  2107     3390B      @
80  2400 24C0,32                                 FC  2107     3390B      @
80  2400 24E0,16                                 FC  2107     3380B      @
80  2400 2480,64                                 FC  2107     3390A    1 @
80  2400 24F0,16                                 FC  2107     3380A    1 @
80  2600 2600,128 UNKN FC_S  2107-941 3390B      FC  2107     3390B      @
80  2600 2680,32                                 FC  2107     3390A    1 @
```

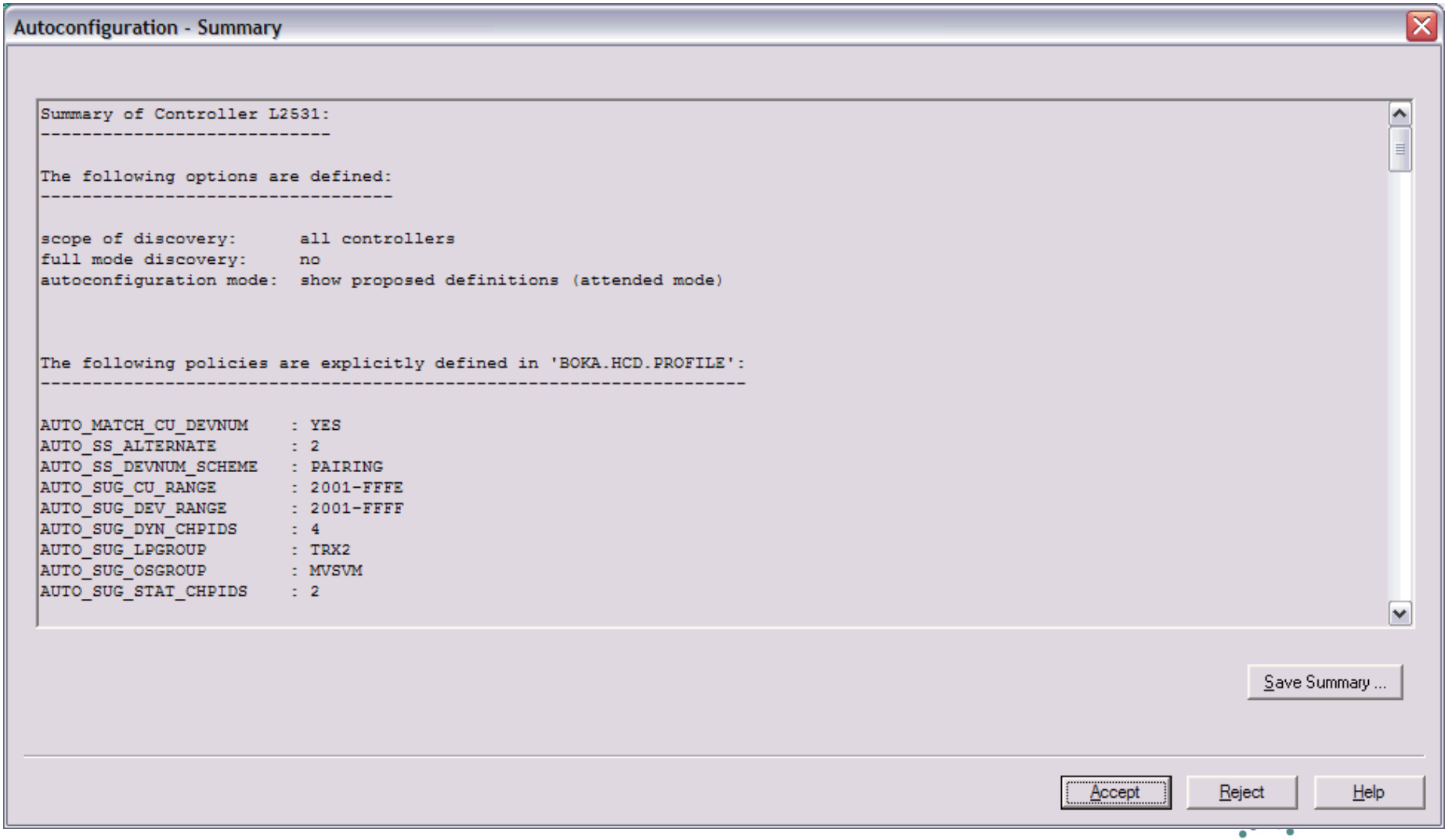
Discovering with HCM



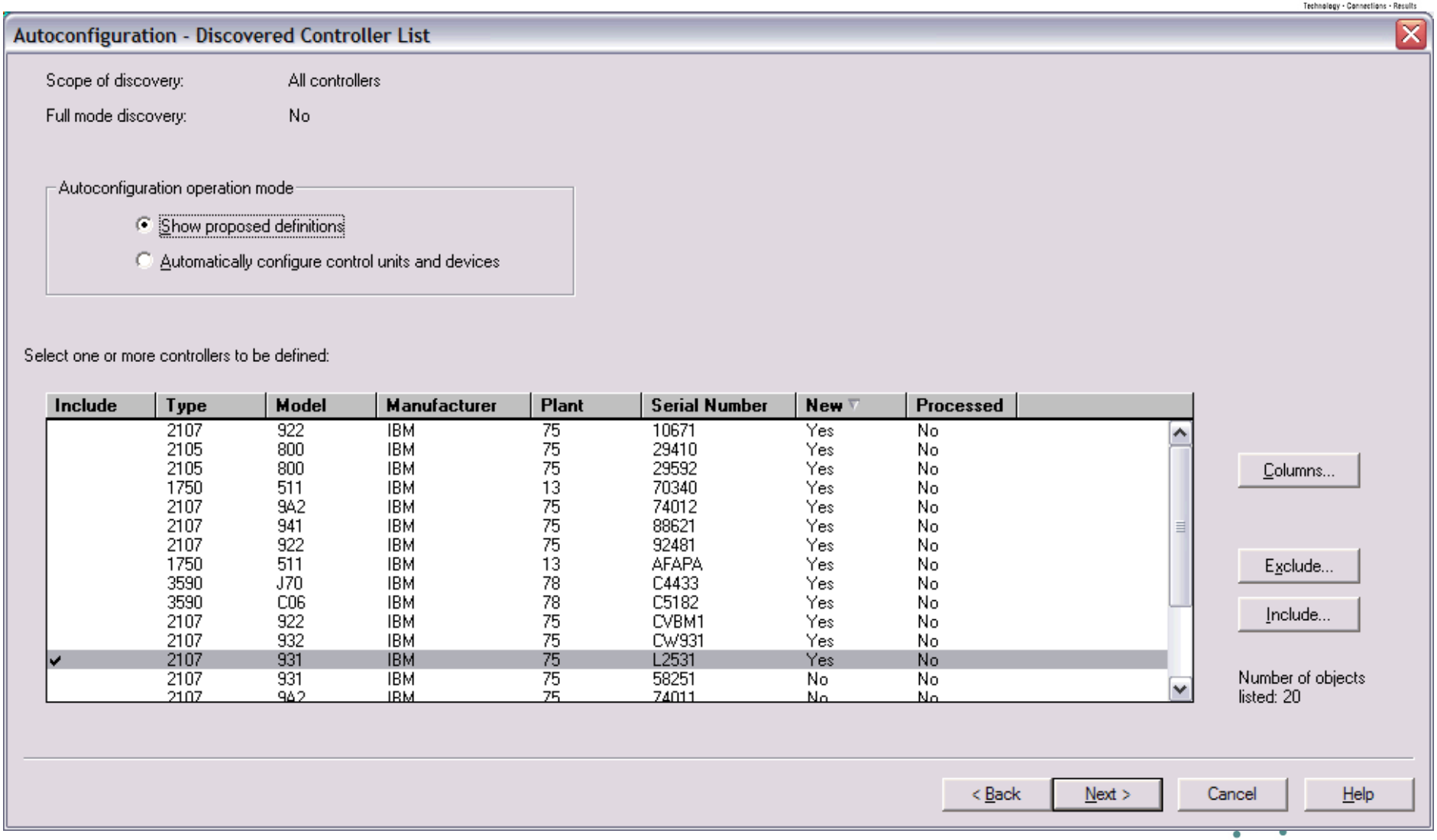
Discovering with HCM…



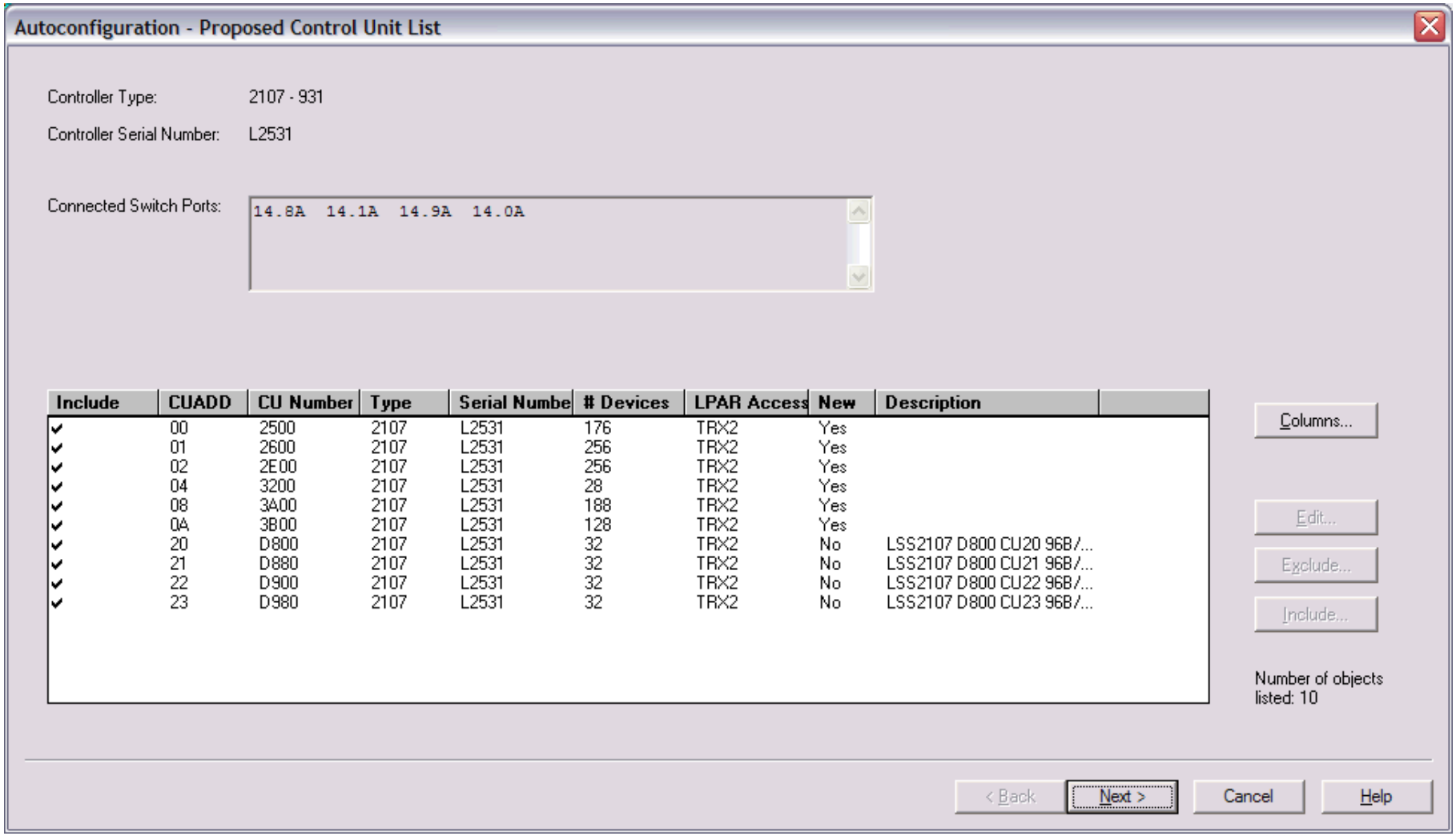
Discovering with HCM…



Discovering with HCM…



Discovering with HCM…



Discovering with HCM…