9121 Service Training
(Course Code 13740)

Student Notebook

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Education

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Comments concerning this notebook and its usefulness for its intended purpose are welcome. You may send written comments to:

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Course Overview

Course Description

Purpose

This **Classroom/Lab** course of **10 days** provides the training necessary for the National Service Division (NSD) Customer Engineers (CEs) to maintain the 9121 in proper functioning order in the customer environment.

The course is presented via the Lecture Lab format. The Lecture will be supported by Lab Projects and exercises. A student notebook will direct the student through the course material and the Lab Guide will be used for Lab Projects/exercises. The student will be presented with Trouble Analysis exercises on the 9121 to build the skills necessary to maintain the 9121 product line.

Audience

National Service Division Customers Engineers without prior 3090 training and having completed the required prerequisites.

Prerequisites

Both of the following Training Levels

Training Level	*Description*
01861	Fundamentals of System Management
03290	Fiber Optics Training

One of the following Training Levels

Training Level	*Description*
01138	S/370 Environmental Training
01339	GS Basic Training
02085	DS Basic Training
02105	Universal System I/O Training
02411	Systems I/O Environmental Training
09009	370 CPU Training

All of the following Courses

Course	*Description*
70526	S/370 Extended Architecture Training - 8 hrs
70542	3375/3370 DASD Product Training - 3 hrs
70668	PT-2 Channel Monitor - 8 hrs
74013	Introduction to RETAIN - 1 hr
77285	PT-2 Introduction and Operations - 4 hrs
80030	EREP - 12 hrs
77571	PR/SM Training (TL 03056)

Objectives

After completing this course, you should be able to:

- Identify High level connection of elements
- Identify available models
- Identify available features
- Identify naming conventions
- Identify high level hardware connections
- Identify the type of problems the maintenance package is limited to fix, and which types it is not intended to fix.
- Identify the entry point in the maintenance package (Start pages)
- Identify escalation criteria, rules, and procedures, including timelines.
- Identify functions of the Remote Support Facility.
- Identify unique RETAIN application and procedures.
- Identify how and why action plans are created and used
- Identify LSSC and LSPO involvement
- Identify document structure
- Identify overall product strategy, including any unique differences by element
- Identify typical service call sequence
- Identify deferred and concurrent service strategies.
- Identify unique reporting procedures using Data File Update (DFU) and how date is used through PSS (call closure, etc.).
- Identify patch strategy, including how often to apply.
- Define service disciplines for parts/cable swapping
- Define a Maintenance Package Escape (MPE).
- Identify parts stocking strategies.
- Identify the time for returning parts.
- Identify unique FRU P/N delivery strategy relating to DCS.
- Identify how the FRU table is used with FRU P/N delivery strategy (including relationship with DCS).
- Follow all safety procedures.
- Perform all unique safety tasks and procedures for this product.
- Identify and maintain all EMC hardware design integrity unique to this product.
- Operate the console (from the operators point of view) identify errors and provide assistance in interpretation of operator messages and documentation.
- Provide recovery assistance when required.
- Configure the processor complex for operation and/or maintenance.
- Operate the service panel/console, identify the functions of switches, lights, screens or other indicators.
- Use tools provided in the ship group.
- Identify actions to be taken by Service Console Messages.
- Identify EREP records unique to 9121 failures.
- Operate the console to perform service operations.
- Locate, remove, and replace any failing FRU using proper tools, maintenance procedures and documentation.

- Establish all types of RSF links for remote support.
- Perform "Direct File Update" (DFU) service action completion at the end of all repair actions.
- Invoke system level test for verification.
- Locate all points designated by the diagnostics, maintenance procedures, or on-site documentation.
- Relate a reference code to a failing element.
- Schedule and perform preventive maintenance using recommended frequency and instructions.
- Select and utilize options in the general PCE selection menu in service mode.
- Display and understand (interpret) the problems recorded in the problem analysis (PA) history file.
- Display the PCE Reference (Ref) Code to identify the failing area in the PCE.
- Use the maintenance package to isolate the failing FRU in the PCE (logic, power, and support processor).
- Setup and perform concurrent maintenance procedures.
- Invoke PCE diagnostics, exercisers, or extended testing as directed by the maintenance package or RSC.
- Use PCE documentation to remove and replace FRUs as directed by the maintenance package.
- Validate PCE repairs using the maintenance package.
- Display and use the Remote Support Facility (RSF) logs to identify the failing area in the RSF.
- Use the maintenance package to isolate RSF problems that are inboard to the PCE (including modem and ACU).
- Config the PCE for hardware levels
- Use tools as defined in the on-site documentation for the PCE.
- Exercise and isolate Service Channel (SVC) interface errors using documented procedures.
- Invoke Service Channel diagnostics.
- Display AQE Summaries, AQE by time and AQE by type.
- Display System EC (SEC) level.
- Alter/display FRU table entries.
- Display AQE repair configuration requirements.
- Replace FRUs using Maintenance Procedures for FRU replacement.
- Validate repairs using maintenance procedures, using repair validation.
- Invoke maintenance procedures for open FRU replacement when directed by RSC.
- Invoke manual diagnostics by functional element when directed by the maintenance procedure's RSC.
- Invoke diagnostics and interpret output (results).
- Power on/off any power boundary.
- Determine if primary power is in/out of specification.
- Determine if customer air is in/out of specification.
- Use options of P/T diagnostics at direction of RSC.
- Connect CHIM to service channel.
- Execute task list when directed by the maintenance package or RSC.
- Connect external power test equipment. FRU replacement when directed

- Manually set over-current threshold on a power supply or a group of supplies in a power boundary.
- Isolate channel problems to a single channel.
- Perform dynamic channel swap.
- Add, delete, or modify IOCDS statements for devices, control units, and/or paths.
- Assist the customer in defining IOCDS problems.
- Configure the channel for single channel service (SCS).
- Identify the cause of Interface Control Checks (IFCC) and determine if the problem is internal or external.
- Identify the failing device for Interface Control Checks (IFCC) when the problem is external.
- Relate channel and I/O errors to the physical channel, path, or link
- Invoke the channel exerciser concurrent with customer operation.
- Interpret the customer IOPD frames for system problems that are caused by I/O devices.
- Setup, invoke and display IOP trace for system problems caused by I/O devices.
- Setup, invoke, and interpret I/O trace and logs to identify interface errors.
- Setup and connect channel interface monitor (CHIM and SCAM).
- Verify channel path connectivity.
- Invoke channel diagnostics and follow recommended service actions.
- Perform Direct File Update (DFU), complete installation report panels at the end of installation activity.
- Install, discontinue, or relocate the 9121 Processor complex.
- Invoke exercisers for processor complex installation, relocation, and discontinuance.
- Invoke exercisers for I/O configuration checkout.
- Perform pre-installation planning for EC/MES installs.
- Install EC/MES using EC/MES instructions.
- Perform Direct File Update (DFU), complete EC and MES report panels at the end of EC or MES installation activity.
- Perform EC/MES recovery as directed by RSC.
- Display patch history files and identify (determine) whether a patch is present and is active or inactive for the Central Electronics Complex and PCE
- Receive, apply, and backout microcode patches, including both automated and manual patches.
- Follow retrieval procedures to obtain patches from Universal Remote Support Facility (URSF).
- Maintain microcode backup media.
- Receive, apply and backout traps used for LPAR.

Curriculum Relationship

There are no specific curriculum relationships.

Course Overview

Agenda

Table 1. Course 13740, Week 1.

Day 1	Day 2	Day 3	Day 4	Day 5
Classroom • Open • Unit 1 – Topic 1 • Unit 2 – General Information	Classroom • Review • Unit 3 – PCE	Classroom • Review • Unit 4 – MVS Commands – CPC Maintenance Procedures	Classroom • Review • Unit 5 • Channels – H/W Overview – Maps – Diagnostics – Exerciser – Swap	Classroom • Review • Unit 5 (Cont.) – IOCDS Create MINI – IOCDS HSA Subchannel – IOPD Frames – LPAR
Lab • Safety • Lab Preview • Locations • Power Up • Consoles	Lab • PCE Labs	Lab • L/P's	Lab • Channel L/P's • TA's	Lab • IOCDS - Create MINI • LPAR

Table 2. Course 13740, Week 2.

Day 6	Day 7	Day 8	Day 9	Day 10
Classroom • Review • Unit 6 – System Level Recovery – IPL Flow	Classroom • Review • Unit 7 – ESCON Fiber Overview	Classroom • Unit 8 – Power	Classroom • Review • Unit 9 – Install, Patches – MES / EC's • ~~Test~~ • ~~Review~~ Test	Classroom • Review • UNIT 1 TOPICS 2 AND 3 • TA's in Lab • Appraisals • Closeout Test
Lab • IPL Lab • TA's	Lab • TA's	Lab • Power Labs • T/A's	Lab • ~~IPL~~ • L/P's • T/A's	Lab • T/A's PP

1 ¼ hr.

Unit Synopses

Unit 1 9121 Overview/Service Environment

Items covered in this unit are models and features, naming conventions, maintenance package, document structure, connection of elements, function of Remote Support Facility/LSSC/LSPO, service disciplines, action plans, deferred and concurrent service strategies and a typical service call sequence.

Unit 2 9121 General Information

Items covered in this unit are Safety procedures, operation of console/service panel, configuring the processor complex, console messages, locating/removing/replacing FRUs, RSF links, Direct File Update,system level tests, and preventive maintenance.

Unit 3 9121 Processor Controller Element

Items covered in this unit are PCE selection menu, PCE documentation, PCE maintenance package, PCE Reference Code, PCE diagnostics, problem analysis history file, Service Channel and validation of PCE repairs.

Unit 4 9121 Maintenance Procedures

Items covered in this unit are Displaying AQE Summaries, Alter/Display FRU table, validation of repairs, open FRU replacement and invoking diagnostics by functional element.

Unit 5 9121 I/O Problem Determination

Items covered in this unit are Channel problems, dynamic channel swap, add/delete/modify IOCDS, causes of Interface Control Checks, IOP traces, use of CHIM & SCAM, channel diagnostics, channel path connectivity and assisting the customer.

Unit 6 9121 Complex Systems Environment

Items covered in this unit are Customer impacts related to system availability, MVS command usage, system recovery concepts and procedures, and MVS IPL flow.

Unit 7 9121 ESCON Environment

Items covered in this unit are the ES connection products and an overview of the ES connection architecture / connectivity.

Unit 8 9121 Power/Thermal

Items covered in this unit are Powering on/off by power boundary, power/air being in/out of specification, P/T diagnostics and connection of CHIM to service channel.

Unit 9 9121 Installation, EC/MES & Microcode

Items covered in this unit are Pre-installation planning for 9121/EC/MES, EC/MES recovery, Direct File Updates, patch history file, receive/apply/backout microcode patches, retrieval of patches and microcode backup. Receive, apply and backout traps used for LPAR.

Materials Available to You

Manuals Available in the Classroom

※

- *B01 9121 Service Information: Service Guide*, SY27-2609
- *B02 9121 Service Information: Processor Service Guide Part 1, General*, SY27-2610
- *B03 9121 Service Information: Processor Service Guide Part 2, Power*, SY27-2611
- *B04 9121 Service Information: Processor Service Guide Part 3, Input/Output*, SY27-2612
- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613
- *D01 9121 Service Information: Service Language Commands*, SY27-2615
- *D02 9121 Service Information: Frames, Part 1*, SY27-2617
- *D03 9121 Service Information: Frames, Part 2*, SY27-2622
- *E01 9121 Service Information: Installation*, SY27-2616
- *E02 9121 Service Information: Safety Inspection Guide*, SY27-2618
- *F01 9121 Service Information: Parts Catalog*, SY27-2619
- *G01 9121 Cable List, Part 1*, P/N 73F5795
- *H01 9121 Power Logic Diagrams*Class Manual Title

Units

Unit 1. 9121 Overview/Service Environment

What This Unit is About

This unit describes the primary maintenance packages for the 9121 Processor Complex, and the correct usage of the facilities involved. Included are remote support facilities, problem analysis, maintenance procedures, and diagnostics.

Items addressed in this unit are:

- Models and features
- DataFlow
- Locations
- Overall service strategy
- Microcode Patches
- Service call sequences
- Maintenance Package
- Reporting Procedures
- Parts Strategy
- Remote support mission
- Function of RSF
- Retain functions
- Action Plans

What You Should Be Able to Do

After completing this unit, you should be able to recognize the major components of the 9121 and strategy to support it.

Topic 1.1. Introduction to the 9121 System Complex

1.1.1. Hardware Layout

Learning Objective

After completing this activity, you should be able to identify the high level hardware layout of the 9121 System.

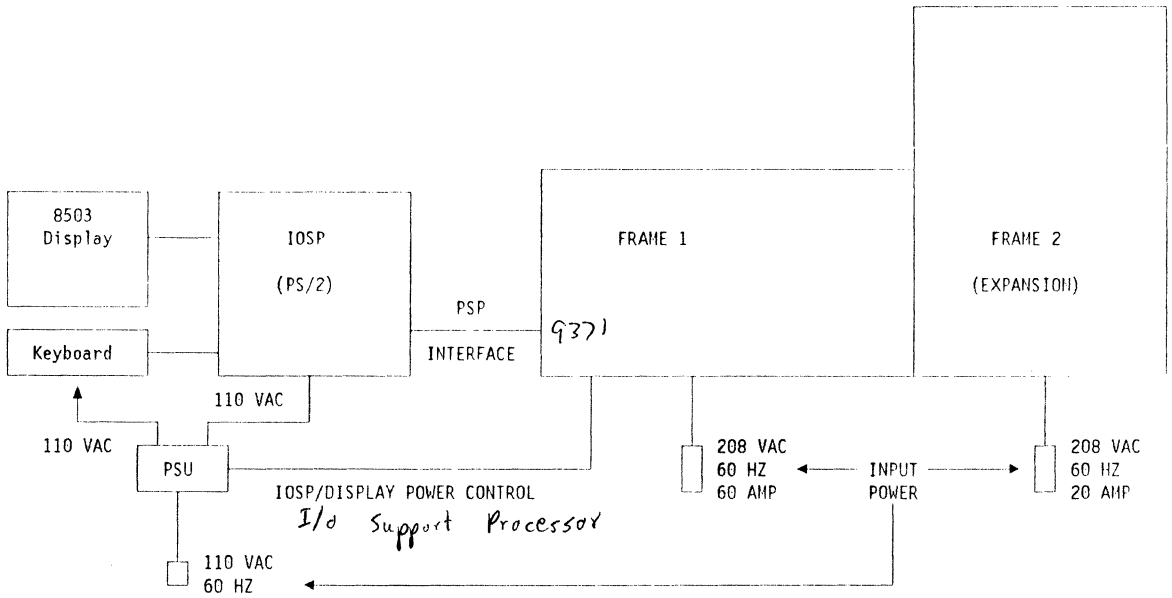
Supporting Activities

- Tour of the lab for a hands on look at the 9121 System complex.

Hardware Layout

Your Instructor will give you a Tour of the Lab and the layout of the 9121 hardware.

- CPC is frame 1 (and frame 2 if required).
- Modified PS2 is part of the PCE.



Visual 1-1. Hardware Layout

1.1.2. Documentation

Learning Objective

After completing this activity, you should be able to identify the entry point into the maintenance package and the structure of the documentation.

Supporting Activities

B01 - XVI

We will look at all the available 9121 documentation and determine the entry point into the MAPS for all service calls.

9121 Documentation

Refer to *B01 9121 Service Information: Service Guide*, SY27-2609 chapter 4 **On-site Service Library Overview**. Look at the *Maintenance Library Organization* Figure for the "Big Picture" of the service library. The table that follows this figure has names and order numbers for each service information guide.
Find the entry point into the maintenance package for all service activities.

Volume	B01
Chapter	1
Page	1-3
MAP	0100

Documentation Overview

Scan each volume of the documentation at a chapter level for a quick look at what is available to you in the field.

Notes

B01 - XVI - Service Library Summary

B01 : Start Maps ; General Locations; Theory

B02 : Maps for storage ; SVCH Maps; Locations for TCM, Storage Board, for the items

B03 : Power Maps; Power Locations; R+R for power components

B04 : I/O Guide, Maps (Channels); Location for channel components ; R+R for channel components & Service Aids

C01 : (Simplex Models) - PCE Maps ; Locations ; Theory ; R+R → 2 Volumes

(TCM) Thermal Conduction Module

B01 9121 Service Information: Service Guide, SY27-2609

D01 : Cmds to use from consoles

C01: Cable Recovery List (Serviceability Tool)

1.1.3. Models and Features

To find - BOI : Ch 4 or TSL

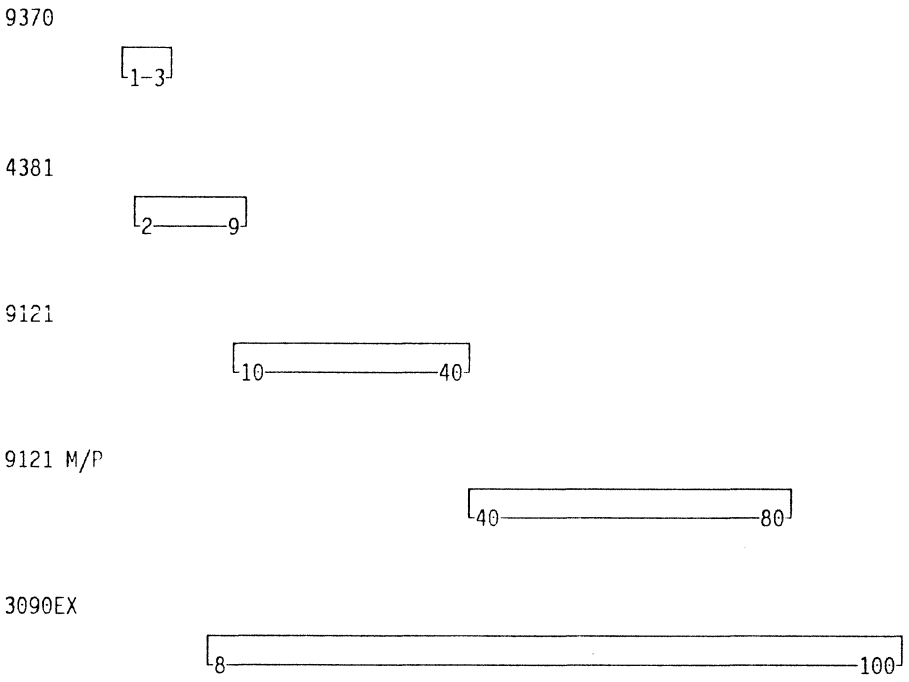
Learning Objective

After completing this activity, you should be able to identify available models and features of the 9121 System.

Supporting Activities

We will reference the on-site documentation for 9121 model and feature information.

MIPS Comparison



Visual 1-2. MIPS Comparison

Notes

Model(s) and Features

Refer to *B01 9121 Service Information: Service Guide*, SY27-2609 chapter 4

Table 1-1. Models and Features (CP and Vector)

Models	180	190	210	260	320	440	480
CPs	1	1	1	1	1	2	2
Cycle Time (nsec)	15	15	15	15	15	15	15
Cache Size		64K	64K	64K	128K	128K	256K
Vector		0/1	0/1	0/1	0/1	0/1/2	0/1/2
Expansion Frame	N/A	N/A	OPT	OPT	OPT	OPT	OPT

Models and Features (CP and Vector)

- 2 CPs may or may not require the expansion frame
- Notice the Cache differences

Expansion Frames have vector and/or channels

B01 9121 Service Information: Service Guide, SY27-2609; Chapter 4

Table 1-2. Models and Features (Storage)

Models	190	210	260	320	440	480
Storage (minimum)	64 Meg	64	64	64	128	128
Storage (maximum)	512	1024	1024	1024	1024	1024 Meg (1 Gig.
Central Storage (Main) (minimum)	~~32~~ 16 Meg	~~32~~ 16	~~32~~ 16	~~32~~ 16	~~32~~ 16	~~32~~ 16
Central Storage (Main) (maximum)	128	256	256	256	256	256 Meg
Storage Increments	64	64	64	64	128	128
Expanded Storage (minimum)	0	0	0	0	0	0
Expanded storage (maximum)	480	992	992	992	992	992

Models and Features (Storage)

- Notice the range available for central storage.
- Remainder of storage is used for expanded storage.

(Expanded) Storage : May be jobs or data

(Main) Central Storage : Cust Runs his jobs here

PMEO is Main storage

ES EO is expanded storage

ESA run as one machines

LPAR divide machine into individual pieces

Table 1-3. Models and Features (Channels)

Models	**190**	**210**	**260**	**320**	**440**	**480**
Standard Channels (Parallel)	8, 4 or 0	8, 4 or 0	12, 8 or 0	12, 8 or 0	12, 8 or 0	12, 8 or 0
Maximum Supported Channels (Parallel)	24	48	48	48	48	48
Maximum Supported Channels (ESCON, ESCON XDF)	28	44	44	44	44	44
Maximum Supported Channels (Combined)	32	48	48	48	48	48
Parallel Channel Increments	4	4	4	4	4	4
ESCON Channel Increments	4	4	4	4	4	4

Models and Features (Channels)

- To obtain the maximum channels, an expansion frame is required.
- Only model 190 has a maximum of 32 combined channels.

Note: The parallel channel I/O tailgates are "pre wired" for maximum supported channels. Only channel cards are added as required.

48 channels require additional frame

can only upgrade 320 or 480 to MP

Model(s) and Features - Multi Processors

Refer to *B01 9121 Service Information: Service Guide*, SY27-2609 chapter 4.

Table 1-4. M/P Models and Features (CP and Vector)

Model - MP	490	570	610
CPs	2	3	4
Cycle Time (nsec)	15	15	15
Cache Size	256K	384K	512K
Vector	0/1/2	0/1/2/3	0/1/2/3/4
Expansion Frame	OPT	OPT	OPT

Multi Processor Models and Features

- Multi Processor models are basically two 9121 processors put together:
  - A 320 + 320 = a 490
  - A 480 + 320 = a 570
  - A 320 + 480 = a 570
  - A 480 + 480 = a 610
- Each side of a 9121 MP system is given an identifier:
  - The model 490 side 0 contains CP1, side 1 contains CP3
  - The model 570 side 0 contains CP1 and CP2, side 1 contains CP3

    or
  - The model 570 side 0 contains CP1, side 1 contains CP3 and CP4
  - The model 610 side 0 contains CP1 and CP2, side 1 contains CP3 and CP4
- A Duplex Processor Controller Element (two sides) is required to monitor and control the the 9121 MP models
- These models can run in Single Image or Physical Partition mode.
- In Single Image mode all the 9121 hardware (CPs, Storage, Channels, etc.) in both sides work together as a whole.
- In Physical Partition mode the hardware in each side works independently as two separate Central Processing Complexes.
- Each side does not require identical amounts of CPs, storage, channels, or vectors.
- Expansion frame still may be required for additional channels, vectors, and I/O power sequencer.

B01 9121 Service Information: Service Guide, SY27-2609; Chapter 4

Table 1-5. M/P Models and Features (Storage)

Model - MP	**490**		**570**		**610**	
Side	A	B	A/B OR	A/B	A	B
Storage						
Standard	64	64	64/128	128/64	128	128
1st incr.	64	64	64/128	128/64	128	128
2nd incr.	128	128	128/256	256/128	256	256
3rd incr.	256	256	256/512	512/256	512	512
4th incr.	512	512	512/---	---/512	---	---
Maximum	1024	1024	1024/1024	1024/1024	1024	1024
Total Range	128 - 2048		192 - 2048		256 - 2048	
Central Storage						
Minimum	16	16	16	16	16	16
Maximum	256	256	256	256	256	256
Expanded Storage						
Minimum	0	0	0	0	0	0
Maximum	1008	1008	1008	1008	1008	1008

Multi Processor Models and Features (Storage)

- In Single Image mode the A and B resources are combined.
- In Physical Partition mode the A and B resources independent.

Table 1-6. MP Models and Features (Channels)

Models	**490**		**570**		**610**	
Side	A	B	A	B	A	B
Standard Channels (Parallel)	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0
Maximum Supported Channels (Parallel)	48	48	48	48	48	48
Maximum Supported Channels (ESCON, ESCON XDF)	44	44	44	44	44	44
Maximum Supported Channels (Combined)	48	48	48	48	48	48

Multi Processor Models and Features (Channels)

- To get the maximum channels, expansion frame is required

Note: The parallel channel I/O tailgates are "pre wired" for maximum supported channels, only channel cards are added as required.

Other Features (Applies To All Models)

- Remote Alarm attachment.
- Remote Power On/Off attachment.
- I/O Power Sequence control. supports 32 EPO /64 EPO (MP)
- IOSP Token-Ring (LAN) attachment.
- Remote Displays, Printer, and Modem.

1.1.4. Naming Conventions

Learning Objective

After completing this activity, you should be able to identify the naming conventions used with the 9121 System.

Supporting Activities

Acronyms will be identified for the 9121 System using the on-site documentation and your Instructor.

Naming Conventions

There are many new names and acronyms for the 9121 System as well as many you are already familiar with. Use *B01 9121 Service Information: Service Guide*, SY27-2609, chapter 4 as a reference or any 9121 Glossary to find the definition of these acronyms.

CPC Central Processing Complex

PCE Processor Controller Element Makes up PCE — IPC, PSP, IOSP, Co

CP Central Processor (TCM) - executed instructions

BCE Buffer Control Element

SCE System Control Element (Traffic Cop)

CCE Channel Control Element (Controls All I/O Operat

PMA Processor Memory Array (I.E. - Storage)

PSP Primary Support Processor

IOSP I/O Support Processor

continued on next page

PSPI Primary Support Processor Interface

PTC Power Thermal Controller (Planar Brd)

Service/LSA Logic Support Adapter

IOPS I/O Power Sequencer

IPC Initial Power Controller

AQE Action Queue Entry

More?

CPC (Central Processing Complex) FRU Location IDs.

01	L	A1	CB
FRAME	Gate	Board	Card

FRUs (Field Replaceable Units) in the CPC are identified using the standard IBM naming convention, Frame-Gate-Board-Card-Pin.

TCMs are identified by the same convention used by other large systems.

_____ - _____ - _____ - _____

Chapter 2 of the *B01 9121 Service Information: Service Guide*, SY27-2609 has a general location I isting with references to other manuals for more detail.

PCE Location IDs

PCE FRUs located in frame 1 use the IBM standard as mentioned already.

PCE FRUs located in the IOSP (Input Output Support Processor) have unique location IDs. The *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613 chapter 5 should be used as a reference to locate the correct FRU for replacement. Here are some examples:

- SB01 - System Board
- LC08 - Logic Card (SCSI Adapter Card)
- FD02 - Fixed Disk

Display Frame IDs

Use *B01 9121 Service Information: Service Guide*, SY27-2609 chapter 3 for a quick reference to di splay frame names and SLCs (Service Language Commands). *D01 9121 Service Information: Service Language Commands*, SY27-2615 and *D02 9121 Service Information: Frames, Part 1*, SY27-2617 should be used when detailed information is required for a specific Frame or SLC.

Find the Function description for:

- MANFE - Manual Diagnostic Installation Test

B01 9121 Service Information: Service Guide, SY27-2609; Chapter 2, 3

C01 9121 Service Information: Processor Controller Element Service Guide, SY27-2613; Chapter 1

Power Boundary Names

```
                                                  12 JUN 90  13:47:11
                          POWER CONTROL                      <PWRCON>

   A= POWER BOUNDARIES (- = OFF, AC = AC VOLT PRES, + = ON)
   + 1 AC POWER COMPARTMENT 1
   + 2 CP1/SCE/CCE
   + 3 VECTOR
   + 4 STORAGE LOGIC
   + 5 STORAGE ARRAY
   + 6 CHANNEL LOGIC 1
   + 7 CHANNEL INTERFACE 1




   B= POWER COMMANDS
     1. Power ON one boundary
     2. Power OFF one boundary
     3. Power OFF all Boundaries
     4. Recycle channel interface


COMMAND ==> _
```

Visual 1-3. PWRCON

Notes

1.1.5. Connection of Elements

Learning Objective

After completing this activity, you should be able to identify the high level connection of elements within the 9121 complex.

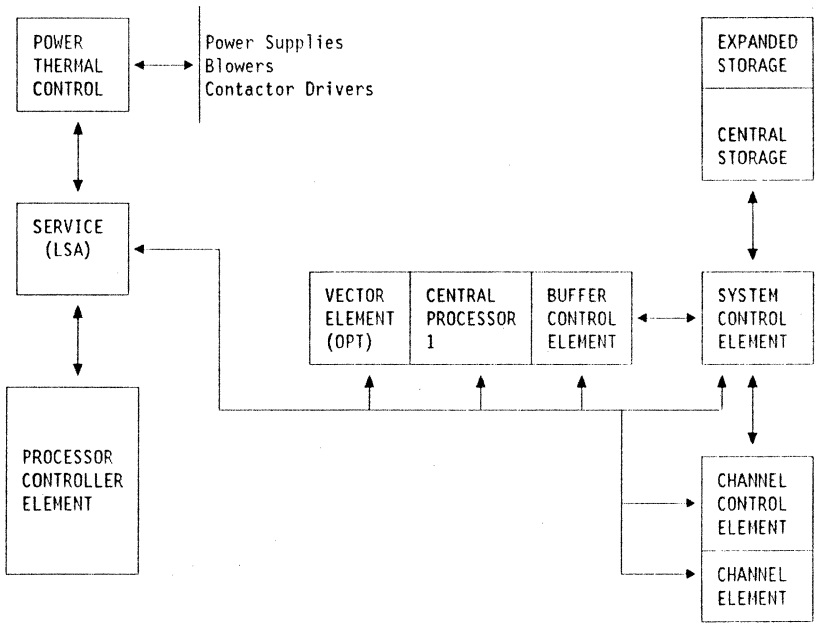
Supporting Activities

Review on-site documentation for a high level overview of the Functional Element Data Paths.

CPC and PCE Elements

B01 4-18

Refer to Vol. *B01 9121 Service Information: Service Guide*, SY27-2609 Chapter 4 for a description of the CPC and PCE Elements and their data paths beginning at **Central Processor Unit** thru but not including **Service Strategy Introduction**.



Visual 1-4. Element Connections

B01 9121 Service Information: Service Guide, SY27-2609; Chapter 4

1.1.6. Product Service Strategy

Learning Objective

After completing this activity, you should be able to identify the overall product strategy, including any unique requirements by element and define the meaning of Maintenance Package Escapes (MPE).

Supporting Activities

We will reference the on-site documentation for 9121 product strategy information.

Product Strategy

TSL

Refer to Vol. *B01 9121 Service Information: Service Guide*, SY27-2609 and scan for the "Major Points " in chapter 4 from **Service Strategy Introduction**
thru but not including **Repair State** and write them down.

- _____
- _____
- _____
- _____

A 58 - what

B01 9121 Service Information: Service Guide, SY27-2609, Chapter 4

Topic Summary

You should be able to identify the 9121 models and features and the layout of the hardware. Also you should be able to identify the high level hardware connection data flow.

Topic 1.2. Servicing 9121

1.2.1. Maintenance Package Design

Learning Objective

After completing this activity, you should be able to describe a typical service call and be able to identify the types of problems the maintenance package is intended to fix and which types it is not intended to fix.

Supporting Activities

We will discuss what a typical service call will be and what the maintenance package is intended to fix.

Maintenance Package Design

TSL A-79

Discuss with the instructor and the class what you think the Maintenance Package should fix and what it should not fix. Use the space below to write down the outcome of the discussion.

Typical Service Call Sequence

Your instructor will start a discussion with you on what a typical call sequence will be.

Use your previous experience and help the class identify the sequence. (machine breaks, error logs, etc...)

Notes

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

1.2.2. Service Disciplines

Learning Objective

After completing this activity, you should be able to identify service disciplines for parts/cable swapping.

Supporting Activities

We will reference the on-site documentation and discuss parts (FRU) / cable swapping strategies.

Class Discussion

Use Vol. *B01 9121 Service Information: Service Guide*, SY27-2609, Chapter 4 "FRU Exchange," and look for the sub-heading "FRUs Swapping."

You will discuss with the instructor and the class FRU swapping disciplines.

Highlights of the discussion

TSL

A-60

- _____
- _____
- _____
- _____
- _____
- _____

1.2.3. Deferred/Concurrent Service

Learning Objective

After completing this activity, you should be able to identify deferred and concurrent service strategies.

Supporting Activities

We will reference the on-site documentation and discuss the deferred and concurrent service strategies.

Class Discussion

Use Vol. *B01 9121 Service Information: Service Guide*, SY27-2609 chapter 4 "Repair State" and "Deferred Service" for information on deferred and concurrent service strategies.

You will discuss with the instructor and the class what a deferrable service call might be and how to manage a deferred call with the customer.

Highlights of the discussion

TSL
A52 + A59

- _____
- _____
- _____
- _____
- _____
- _____

1.2.4. Parts Stocking and Return Strategies

Learning Objective

After completing this activity, you should be able to identify parts stocking strategies and the time period for returning parts.

Supporting Activities

We will discuss parts strategy information and timeliness for returning parts.

Parts Stocking and returns

TSL

A Technical Service Letter will be available to the field that will outline both parts stocking strategies and parts return timeliness. This letter should be available sometime near General Availability.

- _____
- _____
- _____
- _____

1.2.5. Parts Delivery Strategy

Learning Objective

After completing this activity, you should be able to identify the unique FRU P/N delivery strategy and how the FRU table is used including the relationship with DCS.

Supporting Activities

We will discuss parts information received by dispatch and transmitted to you through DCS.

FRU List

```
                                                        25 JUN 90 08:30:24
          MANAGEMENT OPERATIONS - GENERAL AQE DATA (FRUs)      <AQEGEN>

                  --FIRST OCC.-- --LAST OCC.--- NO.  NO. MSG
AQEID    AQE TYPE DDMMMYY HHMMSS DDMMMYY HHMMSS OCC. FRU IND REFERENCE CODE

0000586A FRUREPL  22JUN90 133046 22JUN90 133046 001  003  N  2C00450600000000

Action            Location    Part Number Type       FEID  Inst Date - How
NONE RECOMMENDED  01FA1           42F7739 BOARD      1200    19MAY90 - MFG
POTENTIAL REPLACE 01FA1B2         53F0180 CARD       1200    19MAY90 - MFG
REPLACE           01FA1C2         31F9957 CARD       2A00    19MAY90 - MFG



A= ACTION
 X1. DISPLAY MESSAGES

R= CALL OR RETURN TO                                      AQEID => 0000386A
 1. MAINT. PROC. INDEX      3. MGMT. OP. - AQE
 2. MGMT. OP. - AQ          4. MGMT. OP. - FRU
```

Visual 1-5. FRU List

Discuss with the class and instructor typical FRU lists, what is included in the list and what will be transmitted to your PT.

- _____
- _____
- _____
- _____

1.2.6. Patch Strategy

Learning Objective

After completing this activity, you should be able to identify patch strategy, including how often to apply.

Supporting Activities

We will discuss patch strategy for the 9121 System.

Patch Types

A Technical Service Letter will be available to the field that will outline patch strategy. This TSL should be referenced for details on patch strategy. You should already have a good background in this area to discuss patch strategy.

1.2.7. Escalation Criteria

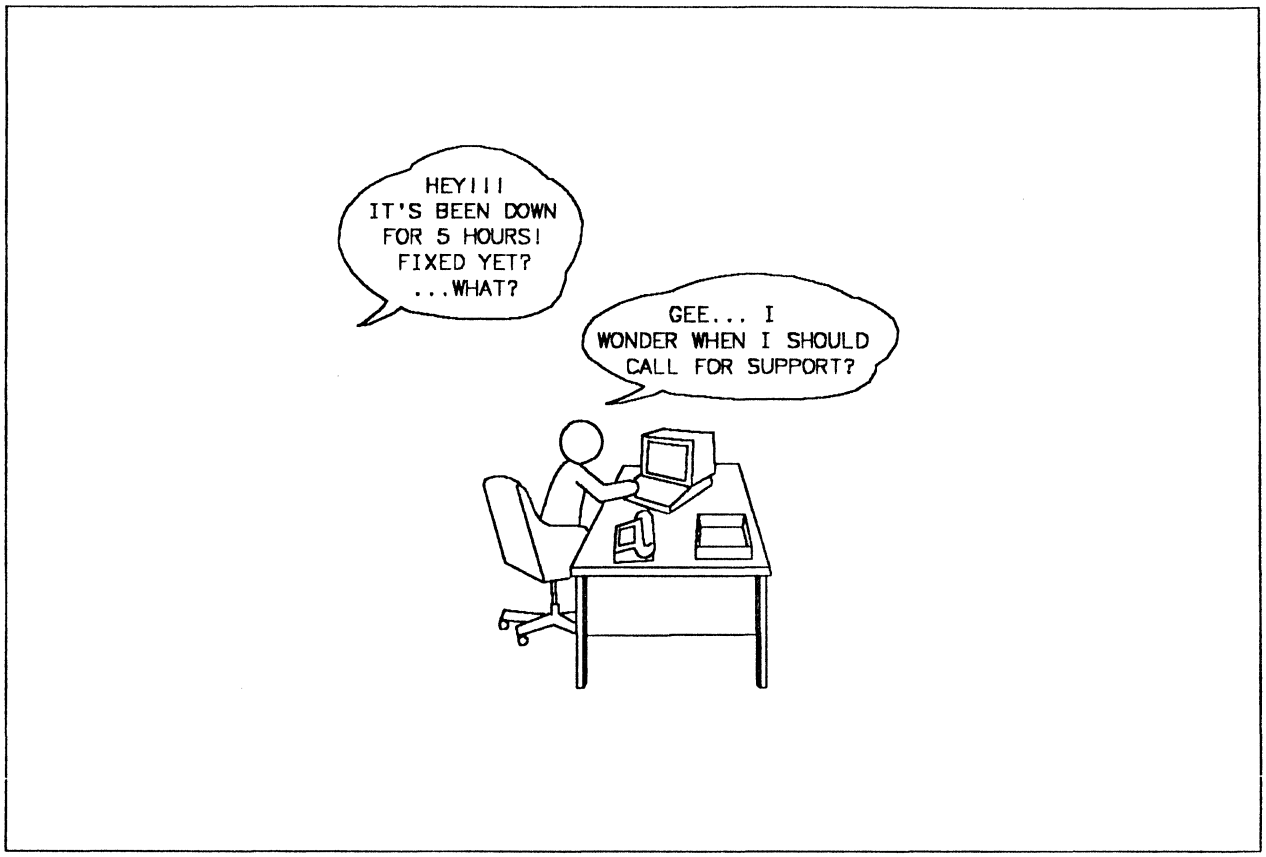
Learning Objective

After completing this activity, you should be able to identify escalation criteria, rules and procedures, including timeliness and identify LSSC and LSPO involvement. You should also be able to identify how, when, and why action plans are created and used.

Supporting Activities

We will discuss escalation criteria rules procedures including timeliness and the involvement of the Large System Support Center and Large System Project Office.

Escalation Criteria



Visual 1-6. Escalate!

A Technical Service Letter will be available to the field that will outline escalation criteria. This TSL should be referenced for details on escalation criteria. You may have escalated a service call in the past that you can relate to for a class discussion.

The next level of support (RSC) should be called when:

- When the maintenance package is exhausted.
- At 3 hours after service call is placed, if the call is not complete.
- The maintenance package requests the next level of support.
- The CE needs additional assistance.

Specific Group Responsibilities

To help understand the escalation process we will discuss the responsibilities of the:

- CE
- _____
- _____
- _____
- _____
- _____
- Remote Support Center - LSSC
- _____
- _____
- _____
- _____
- _____
- Product Engineer
- _____
- _____
- _____

TSL
A73,74,75

LSSC and LSPO Mission

Large System Support Center (RSC) mission

- _____
- _____
- _____

Large System Project Office mission

- _____
- _____
- _____

Action Plans

Action Plans are created by the LSSC and/or Product Engineering to resolve:

- maintenance package escapes
- intermittent problems
- Multiple problems

Action plans will be placed in a Problem Management Record in Retain and execution of the action plan is the responsibility of the CE.

Topic 1.3. Remote Support

1.3.1. Remote Support Facility

Learning Objective

After completing this activity, you should be able to identify functions of the Remote Support Facility.

Supporting Activities

We will reference on-site documentation for information on RSF call types.

You will use the call types in the Lab.

RSF

- Automatically Initiated Calls
  - This is known as a DL2 type call
  - Used to call Retain for hardware failures
  - Used for the weekly Service Update (patch transmission, etc.)
- Manually Initiated Outbound Calls
  - This is known as a DL1 type call
  - Used to manually transmit files to Retain
  - Used to attach the Remote Support Console
- Manually Initiated Inbound Calls
  - This is known as a DL3 type call
  - Used to attach the Remote Support Console

Visual 1-7. RSF

- *B01 9121 Service Information: Service Guide*, SY27-2609; chapter 3

1.3.2. RETAIN Application

Learning Objective

After completing this activity, you should be able to identify unique RETAIN application and procedures.

Supporting Activities

We will reference on-site documentation for Retain applications and procedures.

You will use these procedures in the Lab.

Retain

- Data Bank Access allows you to look at Problem Management Records for the machine type and serial number you are working from.
- Hardware Search Facility (HSF) is available.

Visual 1-8. Retain

- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 3

1.3.3. Customer Engineering Reporting Facility

Learning Objective

After completing this activity, you should be able to identify unique reporting procedures using Customer Engineering Reporting Facility (CERF) and how the data is used (call closure, etc).

Supporting Activities

We will use the on-site documentation to overview the CERF application and procedures.

You will use CERF to complete call closure information in the Lab.

CERF

CERF is used to report to Retain the following items:

- Service Actions
- Installations
- ECs
- MESs
- Discontuance
- Review/Update Archived Reports
- Survey Questions

Visual 1-9. CERF

- You must fill out the reports at the end of any of these activities.
- If you end out of the report facility, a partial report will be sent to Retain.
- The report information will be going into a previously opened PMR in Retain.

Must fill out at machine

Must fill out at each qser action

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Appendix A

Topic Summary

You should have a good understanding of RSF and CERF including how they are related to Retain.

Unit Checkpoint Activity

9121 Overview

This unit has given you an overview of the 9121 Processor and the Service Environment. The lab projects associated with this unit should reinforce the lecture.

Unit 2. 9121 General Information

What This Unit is About

This unit will give you general information on the following subjects:

- 9121 safety procedures
- Safety tasks
- EMC maintenance
- Special tools
- FRU locations and replacement procedures
- Test point locations
- Reference codes and failures
- Console message interpretation
- Processor configuration
- Console operations
- System test and messages
- RSF links
- Invoking the support structure
- Data collection
- Assisting with recovery
- Preventive Maintenance

What You Should Be Able to Do

After completing this unit, you should be able to recognize and discuss general information related to the 9121.

How You Will Check Your Progress

Your progress will be checked through discussion during lecture and also through the lab projects.

Topic 2.1. Safety Procedures/EMC/PM

2.1.1. Safety Procedures

Learning Objective

After completing this activity, you should be able to follow all standard safety procedures as well as all unique safety tasks and procedures for the 9121 system.

Supporting Activities

1. Use the Safety Inspection Guide, Vol. E02, page VII, to review the 9121 Processor Complex safety practices.
2. Note that these procedures continue through XVIII.
3. Follow all standard safety guidelines as well as those specific to 9121 during all lab activities.

- *E02 9121 Service Information: Safety Inspection Guide*, SY27-2618; Pages VII-XVIII

Safety Procedures Unique to 9121.

There are a few items pertaining to safety that are unique to the 9121 Processor Complex that you should be aware of. A few of these unique items are listed here and should be reviewed in the appropriate documentation:

- Power-Off Maintenance
- Power-On Maintenance
- Servicing the Power Subassembly
- Servicing an Isolation Transformer (Forget it, WT only)
- Servicing the Lithium Battery

Visual 2-1. Safety Concerns for 9121

Safety Notes

- Notice the caution on page XVi of Vol E02.
- There are other Safety factors relating to the IOSP which will be discussed later.
- Student Notes

Almost always you will turn CB off for voltage high current power supplies

2.1.2. EMC Hardware Design

Learning Objective

After completing this activity, you should be able to identify and maintain all EMC hardware design integrity unique to the 9121 system.

Supporting Activities

A locations lab project will give you an idea of what to look for in EMC hardware. During the install Lab project you will see what is involved with EMC.

- *E01 9121 Service Information: Installation*, SY27-2616; Post Install Tasks

EMC Hardware

EMC Hardware is important to the 9121 to ensure that noise susceptibility is minimized and that FCC requirements are met. Following is a list of the EMC covers the CE must verify are installed properly during installation of the machine.

- Cover over tailgates 01N and 01H.
- Cover over Parallel channel tailgates G and H.
- Cover over I/O power sequencing tailgate.
- External signal and power cable cover.
- 50/60 Hz input power connector cover.

Covers located in E01 book

Visual 2-2. EMC Hardware

EMC Hardware

- EMC hardware is important to help eliminate noise problems.
- The EMC covers also keeps the 9121 within FCC requirements.
- Student Notes

2.1.3. Preventive Maintenance

Learning Objective

After completing this activity, you should be able to schedule and perform preventive maintenance using recommended frequency and instructions.

Supporting Activities

During the Locations Lab Project you will be directed to the locations of the filters, TCM air inlets and the TCM heat sinks.

- *B01 9121 Service Information: Service Guide*, SY27-2609; START section.

Preventive Maintenance.

P/M should be performed at least once every 6 months on the 9121. The primary concern with this product is dust contamination. The P/M Procedure for the 9121 is located in Vol. B01, Chapter 3. Some of the points covered are:

- Grillwork in the bottom of the frame.
- Filters on the I/O Channel gate.
- Air inlet to the TCM heat sinks.
- Dust buildup on the TCM heat sinks.

Visual 2-3. Preventive Maintenance

Preventive Maintenance Notes

- Schedule once every 6 months.
- Follow PM Procedures in Vol.B01, Chapter 3.
- Student Notes

2.1.4. EREP Records

Learning Objective

After completing this activity, you should be able to identify EREP records unique to 9121 failures.

Supporting Activities

- Student Notes

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

Topic 2.2. 9121 Tools

2.2.1. Ship Group Tools

Learning Objective

After completing this activity, you should be able to properly use all the tools provided in the ship group.

Supporting Activities

- *B01 9121 Service Information: Service Guide*, SY27-2609; Page 3-61

Special Tools from the 9121 Ship Group

As with all our machines the 9121 comes with its own array of special tools. We will mention them here and you will have the opportunity to use most of them during your Lab activities.

- TCM Camming Tool
- Clip-on TCM Cover
- TCM Pin Gauge
- TCM Pin Aligner
- Torque Tool
- TCM Cam Gauge
- Torque Wrench
- Signal Cable Unlatch Tool
- Circuit Breaker Removal Tool

Visual 2-4. Special Tools

Special Tools

- Student Notes

Topic 2.3. 9121 Console Operations

2.3.1. Console Operation

Learning Objective

After completing this activity, you should be able to properly operate the console, from an operators point of view, and identify errors in operation. Also be able to use the consoles to service the 9121 subsystems.

Supporting Activities

- We will discuss console operations relating to servicing the IOSP, PSP (PCE), and servicing as well as operating the CPC.
- Use the ***Operating Guide*** to introduce the type of document the customer has for normal operations.

- *ES/Harmony Operating Guide*, GA23-0375 ***Operating Guide***

9121 Console Introduction

Operating the consoles effectively is key to successful operation and service of the 9121 processor complex.

It is important to understand what part of the 9121 complex you are working with or need to work with. There are three levels of Console support:

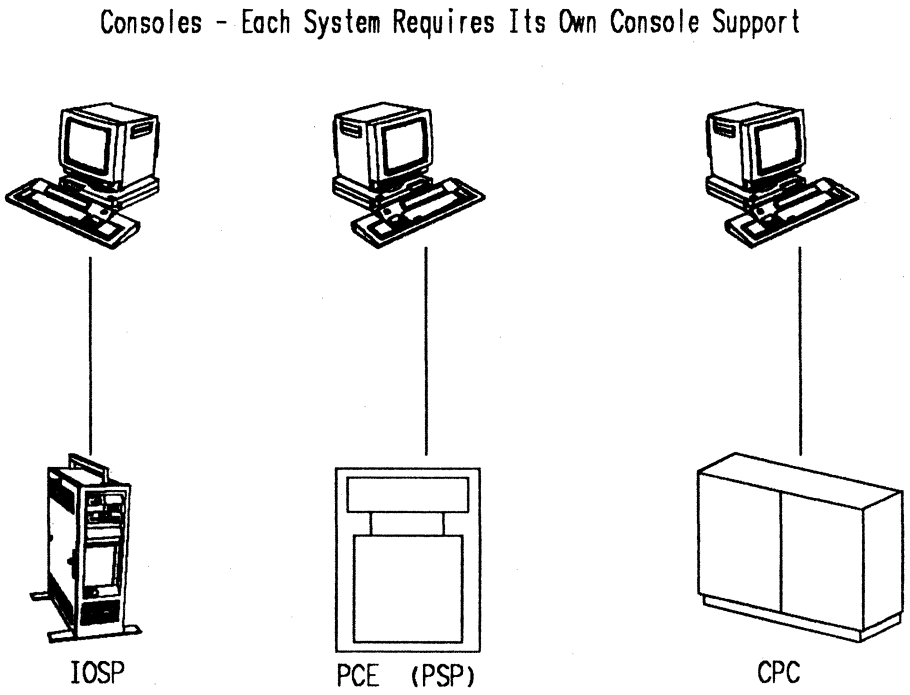
- Central Processor Complex (CPC)
- Primary Support Processor (PSP)
- Input/Output Support Processor (IOSP)

It is also important to know that there are actually three independent CPUs that run their own operating system or SCP (System Control Program) and each one has a specific function.

- Central Processor Complex (CPC) CPU.
  - The SCP running in the CPC would be the Customer's (MVS, VM, etc.)
- Primary Support Processor (PSP) CPU.
  - The SCP running in the PSP is called "Processor Controller Code" or "PCC." This system monitors and controls the CPC.
- Input/Output Support Processor (IOSP) CPU.
  - The SCP running in the IOSP controls and monitors the PSP and manages PSP I/O operations (DASD, Tape, etc.)

Note: The Primary Support Processor (PSP) and Input/Output Support Processor (IOSP) and the Initial Power Controller (IPC) make up the Processor Controller Element (PCE).

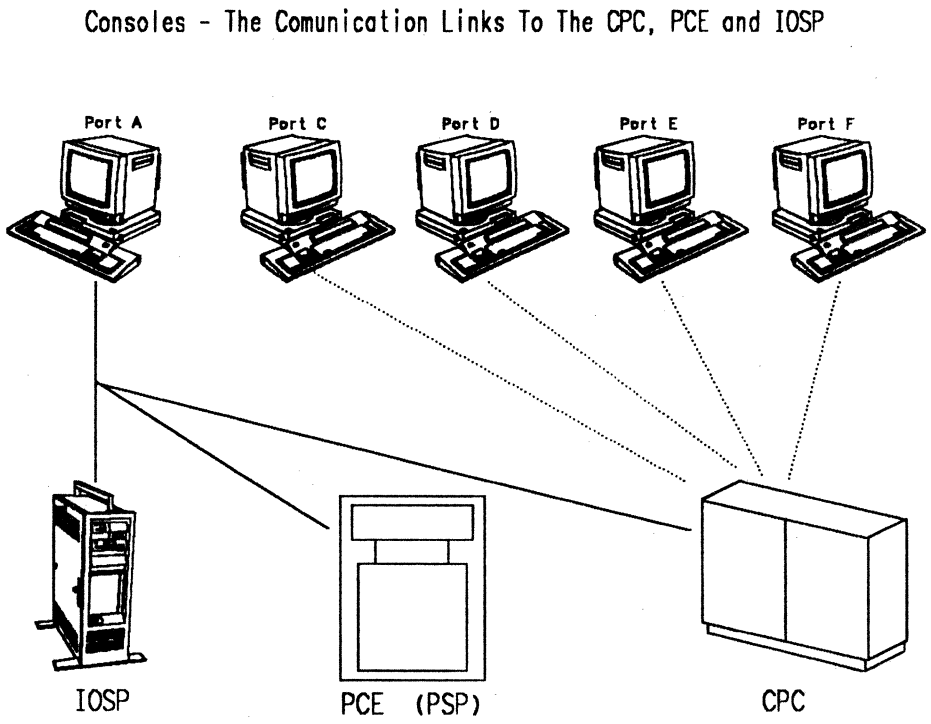
You will use the keyboard on the 9121 console to access all these CPUs by invoking a "Session Selection Menu" and choosing the console support you need or by IMLing the IOSP Maintenance Diskette.



Visual 2-5. Console Support

Console Support for Servicing and Operating the 9121.

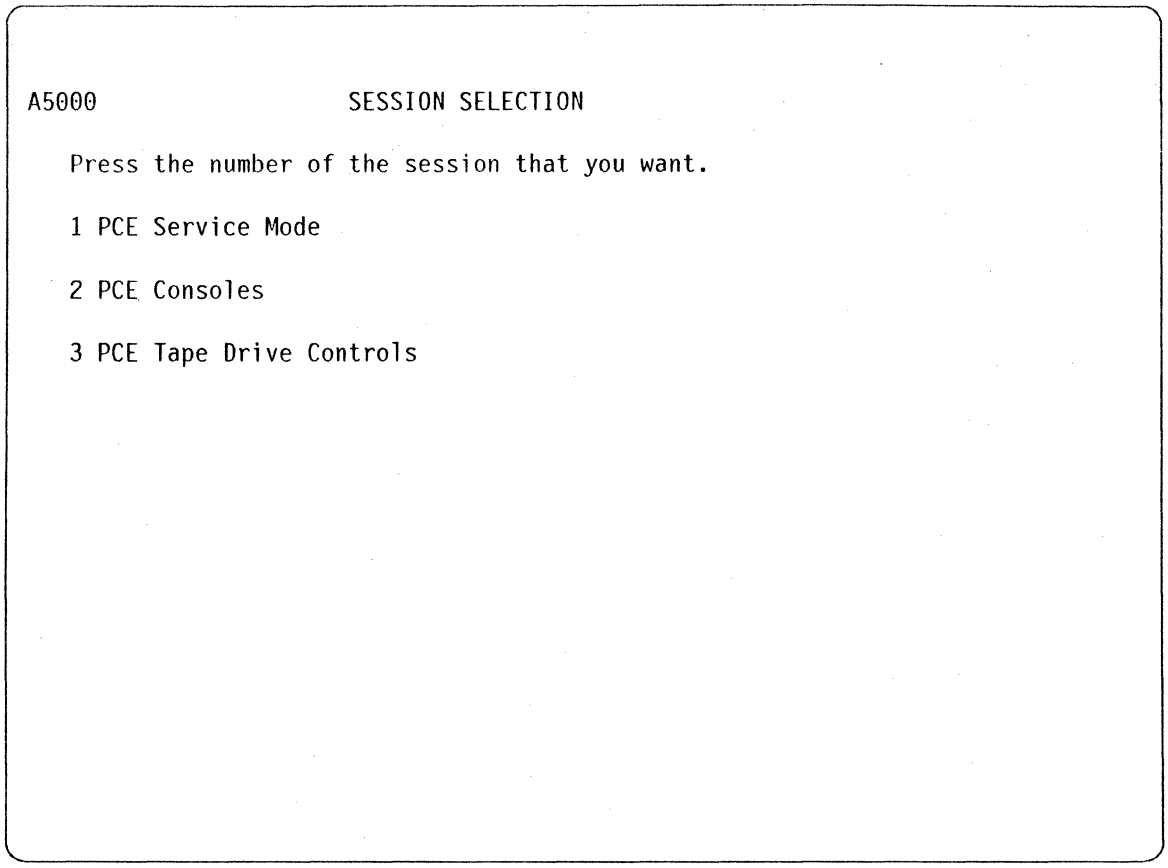
- Each CPU has its own level of console support to service and/or operate it.
  - CPC console frames provide a means for the Customer to **OPERATE** the 9121, that is, **MAKE THE 9121 DO WHAT THEY BOUGHT IT TO DO!**
  - CPC console frames also provide a means for the CE to **SERVICE** the 9121, that is, **FIX THE 9121 SO THE CUSTOMER CAN DO WHAT THEY BOUGHT IT TO DO!**
  - PSP console frames provide a means for the CE to **SERVICE** the PSP, that is, **FIX THE PSP SO IT CAN CONTROL AND MONITOR THE CPC!**
  - IOSP console frames provide a means for the CE to **SERVICE** the IOSP, that is, **FIX THE IOSP SO IT CAN CONTROL AND MONITOR THE PSP!**
- CPC and PSP frames can be selected by using keyboard functions
- IOSP frames require a Maintenance Diskette to be IMLed in the IOSP.
- Student Notes



Visual 2-6. Console Support

Console Support Communications

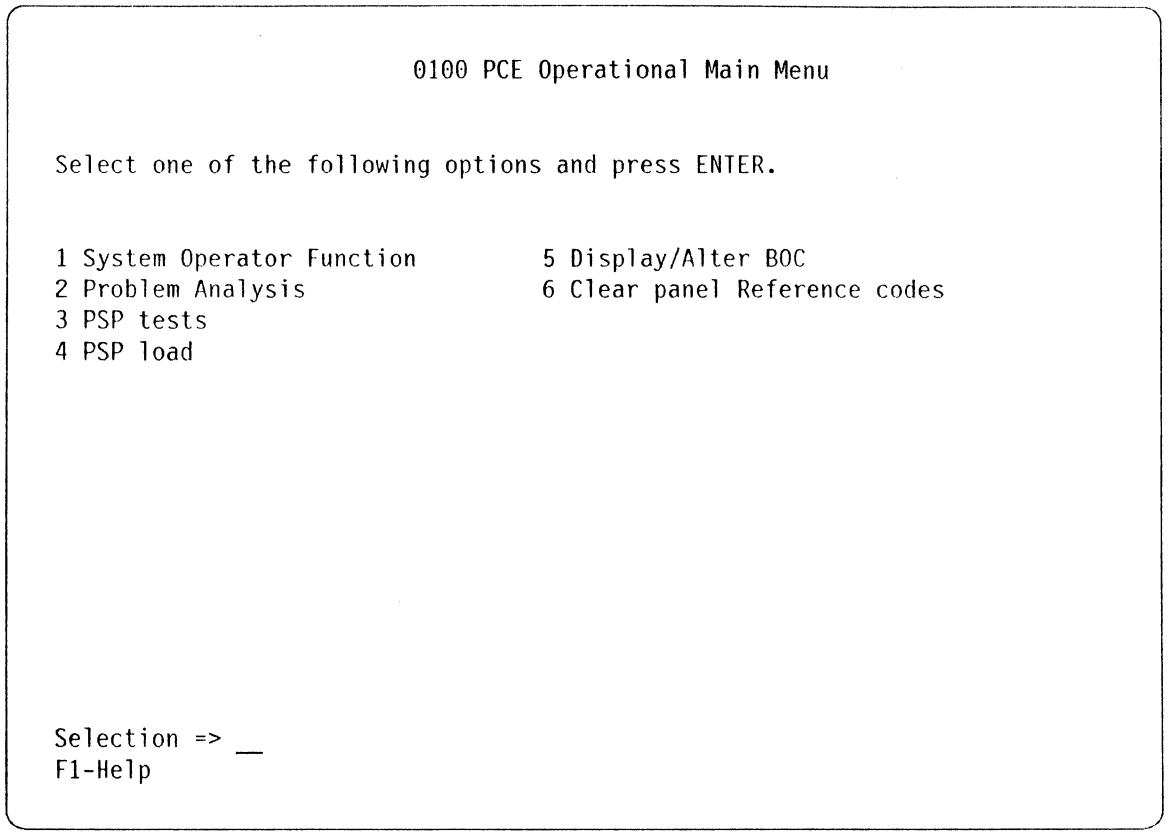
- The Customer can order optional displays that will physically attach to the IOSP. Their functions however are restricted to CPC operations and servicing. **NO** PSP or IOSP console functions can be done from these optional displays and some CPC service functions are restricted also.
- The optional displays have physical port assignments that are determined by what port connection they are plugged into the IOSP. the ports are **C, D, E,** and **F**.
- The display shipped standard with the 9121 is the "Port A" display. This display can perform **ALL** console functions on all levels including PSP and IOSP functions without restriction.
- **None of these displays can be used by the Customer to operate their System Control Programs (MVS, VM, etc.). A channel attached console (e.g. attached to a 3274) must be used.**
- The Displays attached to the 9121 IOSP are sometimes referred to as the "Hardware System Console." The Customer will initiate an IPL from this console and then continue the IPL process and SCP operation from the channel attached consoles.
- Student Notes



Visual 2-7. Session Selection

The Session Selection Screen.

- This frame can be displayed by pressing the "**SvPCE**" key on the Port A display (the Hardware System Console).
- **When ever you want to exit one Session and select another use this key and select the session you want!**
- Session 1 allows you to access frames for servicing the PCE. PSP diagnostics can be run with this selection.
- Session 2 Allows access to CPC frames. The Customer uses this session to access frames to IPL their SCP and monitor status of the CPC. **CPC service frames are also in this session**.
- Session 3 is used to make the 8mm tape drive "Ready," "Unload" and other functions. It is not used often but take a look at it in the lab.
- Student Notes



Visual 2-8. PCE Operational Main Menu

Session 1 - PCE Service Functions.

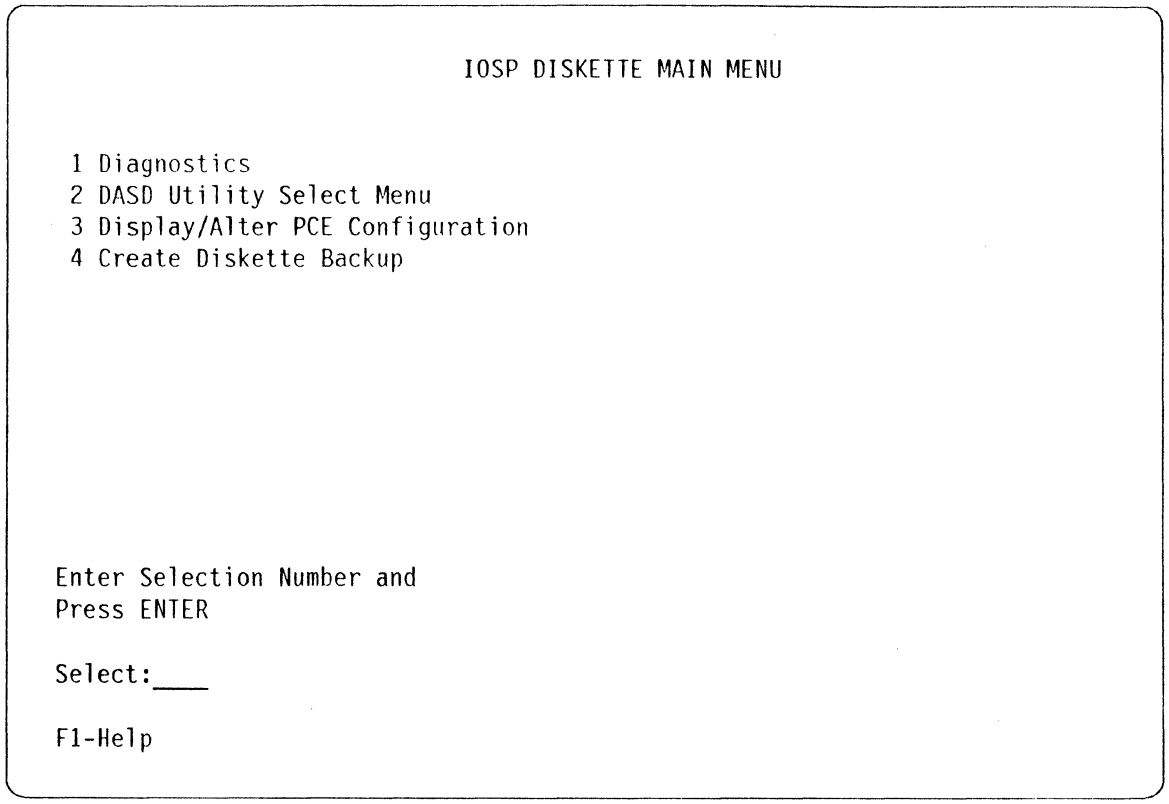
- This is the PCE Operational Main Menu. PSP service actions normally start with this frame. You will perform some of these functions in the lab.
- Student Notes

```
                                                dd mmm yy   hh mm ss
                        Console assignment

                      PHYSICAL DEVICE PORT : A

    A= ASSIGN CONSOLE              Port:
    -> 1. System ................. A
    -> 2. Service ................ A
    -> 3. Program Mode ........... A
      x4. System-Monitor ......... D
      x5. Service-Monitor ........ C
       6. Data Bank Access ........
       7. URSF Console ...........
       8. Remote Console .........


   To activate the      System     console, press END.
   To switch between assigned consoles, press SWAP CONS.

  COMMAND ==>
  sys name
```

Visual 2-9. Console Assignment

Session 2 - CPC Functions.

- CPC system operation and service will be performed using some of the available consoles on this menu. You will use these consoles in the lab to do both.
- Student Notes



Visual 2-10. IOSP Diskette Main Menu.

IOSP frames - Not Selected using the Session Selection Menu.

- The IOSP frames are only available when the Maintenance Diskette is IMLed in the IOSP. These frames are used to service the IOSP. You will also perform these functions in the lab.
- Student Notes

Operating the 9121 - Customer Functions

Operating Guide

This activity will give you an opportunity to take a closer look at the Customer Operating Guide. Take a few minutes to read the first chapter of the document to be familiar with how the manual is used. You will notice it is unique in that the "before beginning" block will ensure preconditions for the task and then step by step blocks which include operator action as well as system response to the action. Now find the procedure required to define and activate a logical partition. Read through this procedure to become more familiar with the doc and answer the questions that follow.

Visual 2-11. Operating Guide

Operating Guide for the 9121

- Note: This manual is a customer document and should be handy at or near the operator area.
- Student Notes

Setting Up For Daily Operation.

This activity will give you a closer look at the procedures the customer uses to perform most daily tasks. A few of these procedures you may be required to use during normal maintenance. Refer to *ES/Harmony Operating Guide*, GA23-0375 ***Chapter 3*** , page 3-1 to get an idea of the different procedures used by the operator. Most actions, such as Assigning Access Levels, Assigning Consoles to Physical Displays, etc are used by the CE as well and this document should be handy to use as a reference until you feel comfortable with these commands.

Visual 2-12. Setting Up for Daily Operations

Setting up for daily operations

- Note: Take a look at the procedures used to assign consoles.
- Note: Refer to Assign Consoles to Physical Displays and continue on next page.
- Student Notes

```
                                                dd mmm yy   hh mm ss
                        Console assignment

                      PHYSICAL DEVICE PORT : A

   A= ASSIGN CONSOLE                Port:
   -> 1. System ..................  A
   -> 2. Service .................  A
   -> 3. Program Mode ............  A
     x4. System-Monitor ..........  D
     x5. Service-Monitor .........  C
      6. Data Bank Access ........
      7. URSF Console ............
      8. Remote Console ..........


  To activate the      System     console, press END.
  To switch between assigned consoles, press SWAP CONS.

COMMAND ==>
sys name
```

Visual 2-13. Console Assignment

Assigning consoles to physical displays

- Refer to the screen above. Notice that there are at least 3 consoles attached to this system. We have assigned System, Service, and Program consoles to Port A, System Monitor to Port D, and Service Monitor to port C. The particular console we are looking at is Physical Device Port A and has System, Service, and and Program Mode Consoles assigned to it.
- In order to swap between Logical consoles assigned to a Physical port, "END" the console assignment screen and use the "SWAP CONS" key.
- Not all consoles need to be assigned at any one time as is evident by options 6, 7 and 8 which are used by the CE.
- Read "Before Beginning" and follow the steps to assign a console.
- Student Notes

Topic 2.4. 9121 Console Messages

2.4.1. Service Console/Operator Messages

Learning Objective

After completing this activity, you should be able to identify the actions to be taken by Service Console/Operator Messages.

Supporting Activities

- Gain the ability to recognize a Service Console message and what resources are available to handle them.
- Take a look at the 9121 Recovery Guide and realize its usefulness as a tool.

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617
- *D03 9121 Service Information: Frames, Part 2*, SY27-2622
- *9121 Messages-Part 1*, GA23-0377

MESSAGES

There are hundreds of messages that may show up during normal activities on the consoles. These messages could relate to anything from the result of performing an operation to signifying a catastrophic error. Messages will normally show up on line 22 of the Service Console with a one liner indicating the problem and possibly an indication to press view log if there is additional text involved and on the right side of line 22 there will be a message number in parenthesis. There are also PRIORITY messages that come up on the system console as a result of an important system condition such as a power/thermal fault. The message number will still be in parenthesis within the priority screen. These messages can be looked up using the message manuals. These Message Manuals, *D04 9121 Messages-Part 1*, GA23-0377 and *D05 9121 Messages-Part 2*, GA23-0378, have the one line message as well as an explanation of the message and any response or system action that may be involved.

Visual 2-14. Messages

Service Console Messages.

- There are very few places in the documentation where there is reference to the Frames and Messages volumes of the documentation.
- Use the following example to take a look at Messages.
- Student Notes

```
                                                dd mmm yy   hh mm ss
                          Power Control            <PWRCON>

  A= POWER BOUNDARIES (- = OFF, AC = AC Volt Pres, + = ON)
+   1. AC Power Compartment
+   3. Processor
AC  5. SCE\CCE
AC  6. Vector
AC  7. Storage Logic
AC  8. Storage Array
+   9. Channel Logic
AC 10. Channel Interface

  B= POWER COMMANDS
    1. Power ON one boundary          5. Power ON I/O power sequencer
    2. Power OFF one boundary         6. Power OFF I/O power sequencer
    3. Power OFF all boundaries       7. Power OFF all boundaries & I/O
    4. Recycle channel interface

   POWER-ON SEQUENCE FAILURE. PRESS VIEW LOG.                   (20167)
COMMAND ==>
```

Visual 2-15. PWRCON

Service Console Messages.

- Use the example above to look at the various ways of handling messages and locate where in the documentation there is help.
- Use the Customer Recovery Guide and find the procedure necessary for the operator to recover from this situation.
- Student Notes

Exercise. 2.1: Console Familiarization

What This Exercise is About

This exercise familiarizes you with the SYSTEM and SERVICE consoles and their uses.

What You Should Be Able to Do

After completing this exercise, you should be able to use the consoles effectively along with the maintenance documentation to effectively service the 9121 processor complex.

Introduction

In order to use the maintenance package effectively, it is important to become familiar with the consoles. The objective of this exercise is to practice your skills of displaying frames.

Required Materials

You will need the following materials to complete this exercise:

- 9121 ET3 Simulator Running
- Vol D01 Service Language Commands
- Vol D02 Processor Complex Frames Manual Part 1
- Vol D03 Processor Complex Frames Manual Part 2

Directions to the Student

Prerequisites: 9121 ET3 Simulator invoked by the Instructor.

Console Assignment

_ **Step 1** From the Console Assignment menu, assign your console as a SYSTEM console only, then press the END key to activate it.

A. What frame is displayed? _____

_ **Step 2** Press the SWAP CONS key.

B. What frame is displayed? _____

_ **Step 3** Assign the SERVICE console, press the END key to activate it.

C. What frame is displayed? _____

D. What happens when you press the SWAP CONS key? _____

_ ***Step 4*** Select any menu on either the SYSTEM or SERVICE console.

_ ***Step 5*** Now press the VIEW LOG key from either console to display the log for each console.

_ ***Step 6*** View the SERVICE log and the SYSTEM log. Notice that each log records its own events.

_ ***Step 7*** Now go back to the INDEX0 frames.

E. What other indication tells you this is a SERVICE or SYSTEM screen? _____

Menu Selection

From each INDEX0 menu frame (SERVICE or SYSTEM) you will have access to different frames. These frames can be invoked by using the INDEX selection screen or by keying in a SLC (Service Language Command) in this format **F XXXXXX** as a bottom line command.

_ ***Step 1*** From the SERVICE console, access the INDEX0 frame.

F. What SLC will you have to enter to access the Manual Service Control and Display frame? _____

_ ***Step 2*** Enter that SLC now.

Note: Do not select PWRCON frame, it will cause a simulator error.

_ ***Step 3*** Try to access the frame RSFTRC by entering "05" on the command line.

G. Why do you not have access to this frame? _____

H. What is the current Access Level? _____

Now invoke the Console Access Control frame. The Console Access Level Control menu gives you the ability to select Access Level 1. Access Level 1 is used by System Programmers or by CEs, under the direction of the RSC (Remote Support Center), for the purposes of in depth trouble-shooting.

_ ***Step 4*** Invoke Access Level 1.

I. What does the system request? _____

_ **Step 5** Enter Access code "IBMSVC"

_ **Step 6** Return to the MANSVC frame. Notice that RSFTRC is now available.

Screen Indicators

Display the Operator Index frame. Observe to the right of the title, you have **(1 of 2)**. This means that there is not enough room to display all of the selections on one screen.

_ **Step 1** Press the FWD key. Now look at the title, you will see **(2 of 2)**.

_ **Step 2** Select the Maintenance Procedures Index frame. Here, you will see that you have access to the A1, A2, and A3 options.

_ **Step 3** Enter "A1" on the command line to see if any AQEIDs exist.

_ **Step 4** On the AQ frame, select "A1" and press enter.

_ **Step 5** On this screen, simply press enter using the default choice of ALL

_ **Step 6** Press the INDEX key to get back to the INDEX0 screen.

_ **Step 7** Press the SWAP CONS key.

You should now be on the SYSTEM console INDEX0 frame.

Access Levels

J. Is this a complete listing of all the menu selections available from the INDEX0 frame? _____

K. What key must you press to display the second half of this frame?

_____

L. Are you allowed to select the IOCDS Display frame? _____

M. Why not? _____

_ **Step 1** Enter the appropriate commands to allow access to the PATLR frame.

Note: We don't need the Access Code for the SYSTEM console.

_ **Step 2** Now go back and display the PATLR frame.

This frame may be used by the customer for Problem Analysis Action tailoring.

_ **Step 3** Do the necessary selections to put your console back to Access Level 2.

N. From the correct console, what is the bottom line command that you would enter to invoke the Maintenance Procedures Index frame? _____

_ **Step 4** Enter this command.

O. Observe the menu. Why don't we have access to all of the frames?

_____

SERVMODE

_ **Step 1** Display INDEX0 on the SERVICE console and observe the line below the title line. Two indications are very important.

Current Access Level = X (1 or 2)

Service Mode XXX (ON, OFF, or PARTIAL)

Two SLCs can change the status of service mode.

SERVMODE and SERVPART

_ **Step 2** From the SERVICE console INDEX0 frame, key in the SLC "SERVMODE."

P. Was it successful? _____

To turn service mode on, you have to be at INDEX0 on both the SYSTEM and the SERVICE console and you can only turn it on from the SYSTEM console.

_ **Step 3** Switch to the SYSTEM console and enter the SLC "SERVMODE"

Q. Was it successful? _____

_ **Step 4** Press ENTER to clear the priority message.

_ **Step 5** Observe the SYSTEM console, INDEX0 frame.

R. What happened to the available selections? _____

At this point, the SERVICE console has taken control of all of the functional elements of the processor complex.

NOTE

This means that you could start diagnostics on any part of the machine, regardless of customer operation and you will lose the POR (Power On Reset) condition. Never use SERVMODE while the customer is running unless directed by the Maintenance Procedures.

_ **Step 6** Return to the MPINDX frame and observe that selections for Repair Actions and Manual Diagnostics are now available.

_ **Step 7** From the SERVICE console, enter "SERVMODE," to turn service mode off.

_ **Step 8** When you get the priority message, press the ENTER key.

_ **Step 9** Press the CLEAR key when directed.

S. What frame is displayed? _____

_ **Step 10** Press the END key until the INDEX0 frame is displayed.

Exercise Summary

This exercise gave you an opportunity to practice your console skills, and also see a few new screens and added features of the consoles.

Answers to Questions

A. INDEX0

B. Assign Console frame

C. Service Console INDEX0 frame

D. SERVICE switches to SYSTEM

E. <INDEX0> or (INDEX0)

F. F MANSVC

G. x indicates that the selection is not available.

H. ACCESS level 2

I. Access Code

J. No

K. The FWD key

L. No

M. You must be at Access Level 1

N. F MPINDX

O. SERVMODE must be turned on

P. NO

Q. Yes

R. The selections have been Xed out or disabled

S. PRPSEL

Unit 3. 9121 Processor Controller Element

What This Unit is About

The Processor Controller Element (PCE) provides a means of initiating, controlling, servicing, and monitoring the operation of the 9121 Processor Complex. It consists of a processor, associated I/O devices, and a connection to the remainder of the 9121 Processor Complex. Items addressed in this unit are:

- PCE Manuals
- Functional Elements of the PCE
- Concurrent maintenance configuration
- Use of menus
- Display and interpretation of PA/History files and Reference Codes
- Diagnostic exercisers
- Use of Maintenance Package for FRU isolation, removal, replacement, and verification procedures
- Service Channel maintenances
- RSF (Establish remote connection, use of logs, modem problems)
- Use of PCE tools
- Introduction to the 9121 M/P Duplex PCE

What You Should Be Able to Do

After completing this unit, you should be able to identify the purpose of the PCE and the elements of the PCE, utilize the PCE maintenance package to diagnose and repair elements of the PCE.

Topic 3.1. Introduction to the PCE

3.1.1. PCE Documentation

Learning Objective

After completing this activity, you should be able to locate a given section within the PCE Service Guide,

Supporting Activities

- A tour through the PCE documentation to see the structure and content.
- You will be using the PCE documentation in the following activities and with Lab activities in detail.
- Two volumes make up the PCE documentation:
  - *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613
- Some initial power problems however are covered in MAPS contained in *B03 9121 Service Information: Processor Service Guide Part 2, Power*, SY27-2611.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613

3.1.2. Functions of PCE

Learning Objective

After completing this activity, you should be able to identify the functions of the Processor Controller Element.

Supporting Activities

- The Processor Controller Element (PCE) is a S/370 Processing Unit.
- The PCE with its associated I/O are used to support the 9121 Central Processing Complex.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6

Purpose of the PCE

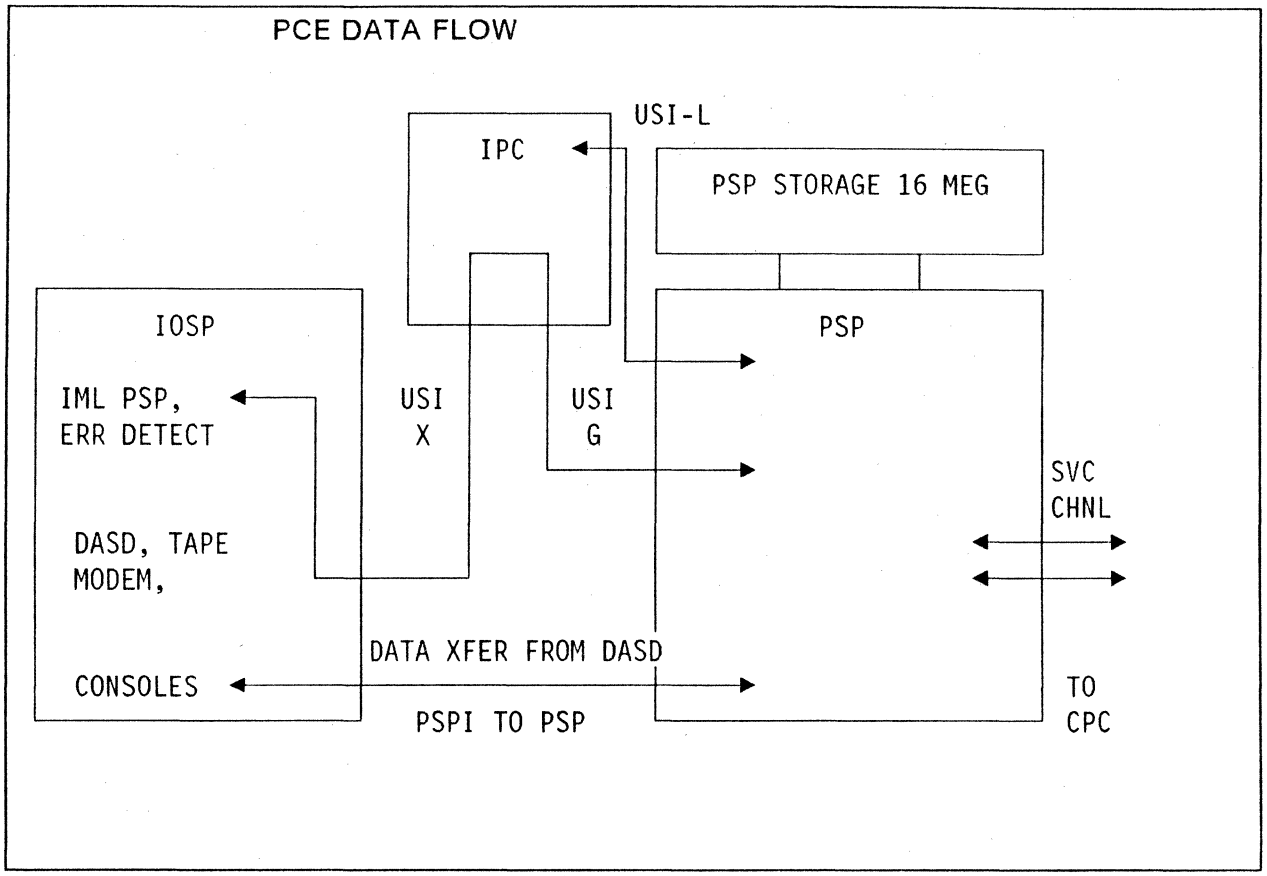
The Processor Controller Element (PCE) is a S/370 processing unit used to support the 9121 Central Processing Complex (CPC). The PCE provides the following services to the CPC:

- Power ON/OFF function
- Power monitoring
- System initialization
- System error data management and recovery
- System functional data maintenance
- CPC service and system consoles
- Remote Support Facility (RSF)

Visual 3-1. Purpose of the PCE

PCE Notes

- Use Volume *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613 chapter 6 for reference.
- Student Notes



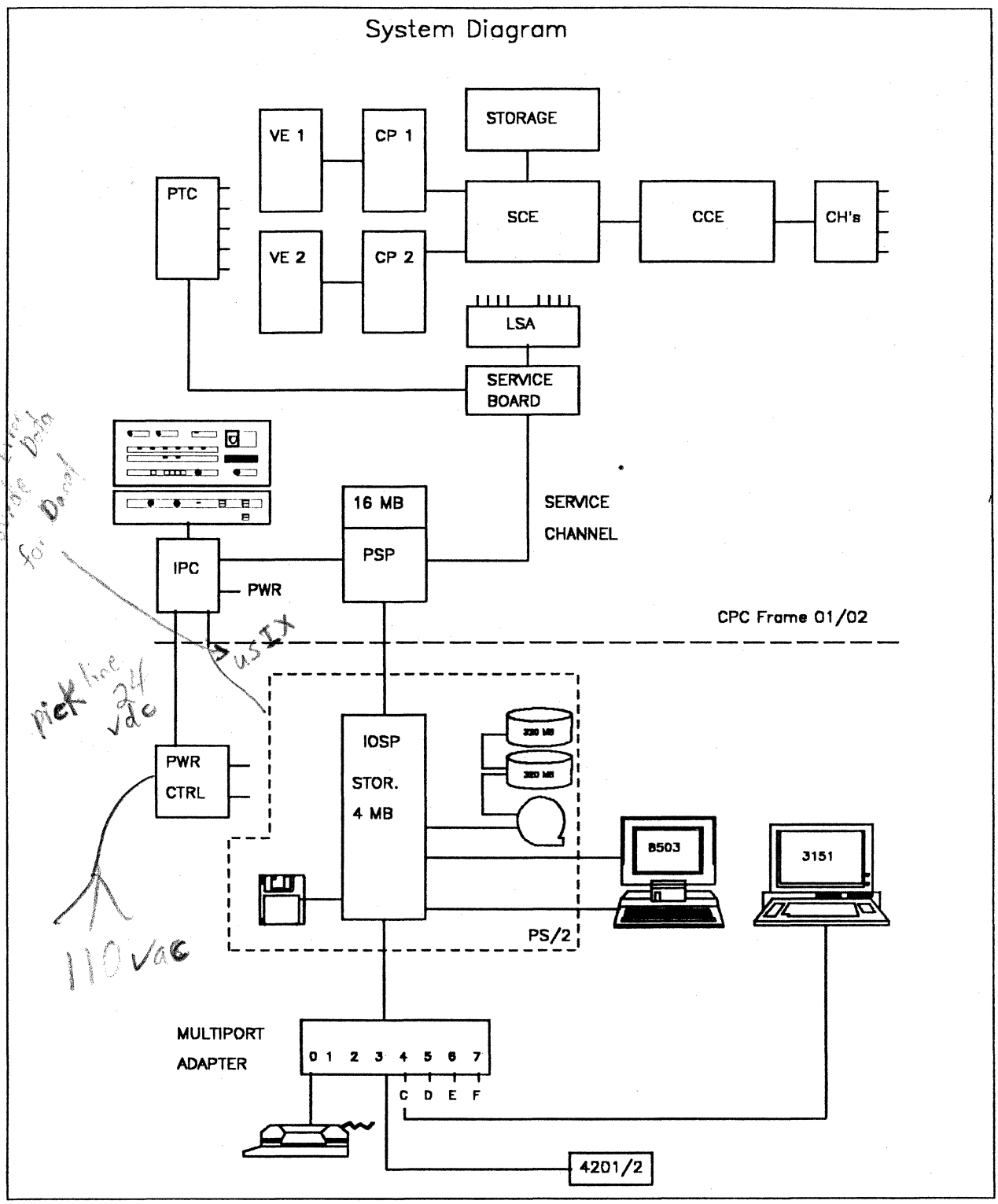
Visual 3-2. PCE DATA FLOW

PCE DATA FLOW Notes

The IOSP provides two major functions to the PSP:

1. Support Processor to the PSP
2. I/O to the PSP

- The IOSP provides Support Processor functions through the USI interface such as IMLing the PSP and error detection/recovery and error logging.
- The IOSP also performs Channel, Control Unit and I/O Device functions for the PSP through the PSP Interface. This means that when the PSP needs to access the DASD, Tape, Consoles or Modem for PCC operations the IOSP provides a Channel attached Control Unit type configuration for the PSP to use.
- Student Notes



Visual 3-3. System Diagram

3.1.3. Primary Support Processor

Learning Objective

After completing this activity, you should be able to identify the functions of the Primary Support Processor.

Supporting Activities

- The function of the Primary Support Processor
- The interfaces to and from the Primary Support Processor
- The physical location of the Primary Support Processor within the 9121

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 2

Primary Support Processor

- The PCE S/370 Primary Support Processor (PSP) is mounted on a single planar board on the 01B gate, location 01B-A1
- The PSP is the same PU as the 3092 Mod 4/5, (minus the floating point chip)
- The PSP is a one MIP 9371 model 25 processor
- The PSP has 16 megabytes of storage on a separate planar board
- The PSP supports the following interfaces:
  - Service Channel to PTC and LSA
  - PSPI to the IOSP
  - USI-G/X (5 wire bus) to the IOSP via the IPC card.
  - USI-L (5 wire bus) to the IPC

Visual 3-4. Primary Support Processor

Primary Support Processor Notes

- Use Volume *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613 Chapter 6 for reference.
- Student Notes

3.1.4. I/O Support Processor

Learning Objective

After completing this activity, you should be able to identify the functions of the Input Output Support Processor.

Supporting Activities

Determine the functions of the I/O Support Processor and the attached I/O.

- DASD
- Modem
- Service Console
- System Console(s)
- Printer

Determine the interfaces to and from the I/O Support Processor.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6

Input Output Support Processor

The IOSP is a PS/2 model 80 K-31 with 4 megabytes of storage. The IOSP handles all of the I/O activity for the PCE with the exception of the service channel.

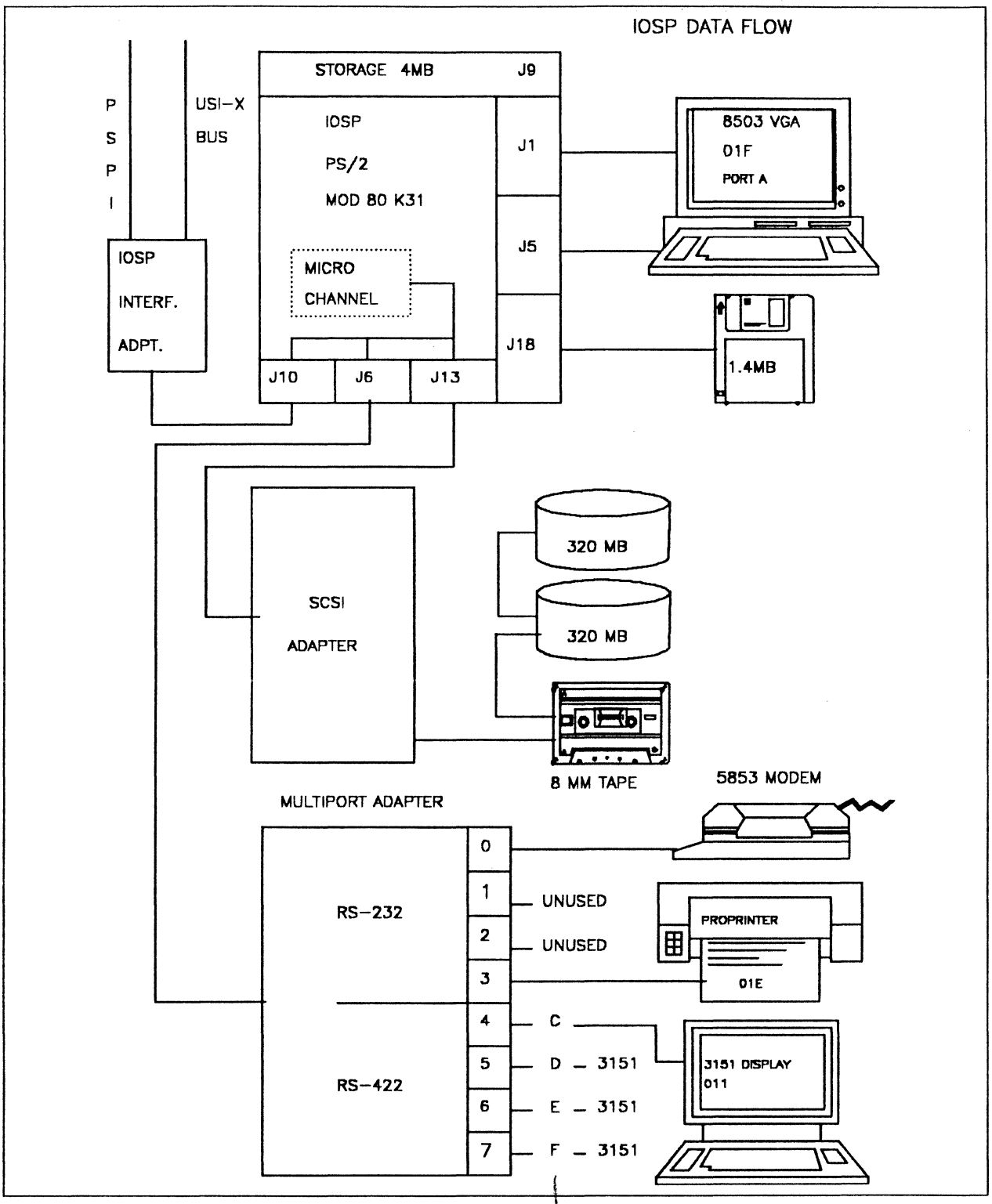
The IOSP supports the following devices:

- DASD
- Modem
- Service console
- System console(s)
- Proprinter
- PSPI
- USI-X (5 wire bus) to the IPC
- The IOSP is the Service Processor for the PCE

Visual 3-5. Functions Input Output Support Processor

Functions IOSP Notes

- Use Volume *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613 chapter 6 for reference.
- Student Notes



Visual 3-6. IOSP Data Flow

This ... would actually shows up on display

IOSP Data Flow Notes

- Student Notes

3.1.5. Primary Support Processor Interface

Learning Objective

After completing this activity, you should be able to identify the functions of the Primary Support Processor Interface

Supporting Activities

- The functional units that attach to the PSPI
- The types of information that 'travels' on the PSPI

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6

Primary Support Processor Interface

- The PSPI is a special two byte bus that runs between the PSP and the IOSP
- The PSPI is used for I/O emulation
- The PSP data to and from the I/O devices goes over the PSPI

Visual 3-7. PSPI

PSPI Notes

- The PSPI is used for paging (in/out) pageable VM code, between the PSP and the IOSP DASD
- Student Notes

3.1.6. Initial Power Controller

Learning Objective

After completing this activity, you should be able to identify the functions of the Initial Power Controller.

Supporting Activities

- What the IPC controls
- The interfaces to and from the IPC
- The physical location of the IPC

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 5
- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6

Initial Power Controller

- The IPC is an intelligent Initial Power Processor
- The IPC has Power On Self Test (POST)
- Mounted on a planar board on 01B-A3
- The IPC becomes active as soon as 60 Hertz is applied to the 9121
- The IPC provides the interface to the Control Panel Assembly
- The IPC controls:
  - Power and Cooling for the Service Gate 01E & 01B
  - Power to the IOSP
  - The Alarm
  - The Battery-Operated Clock (BOC)
- Provides Timed Power Off (TPO) function for the PTC if PTC is unable to power the system down
- The IPC supports the following interfaces:
  - USI-L/G from the PSP
  - USI-X from the IOSP
  - USI-G to the PSP

  The USI-X is redriven in the IPC to become the USI-G to the PSP

Visual 3-8. Initial Power Controller

IPC Notes

- Student Notes

3.1.7. 9121 Control Panel

Learning Objective

After completing this activity, you should be able to identify the functions of the 9121 control panel.

Supporting Activities

- Contains switches that allow different modes of operation
- Indicators as to the status of the system
- Refcodes & Progress Codes

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6

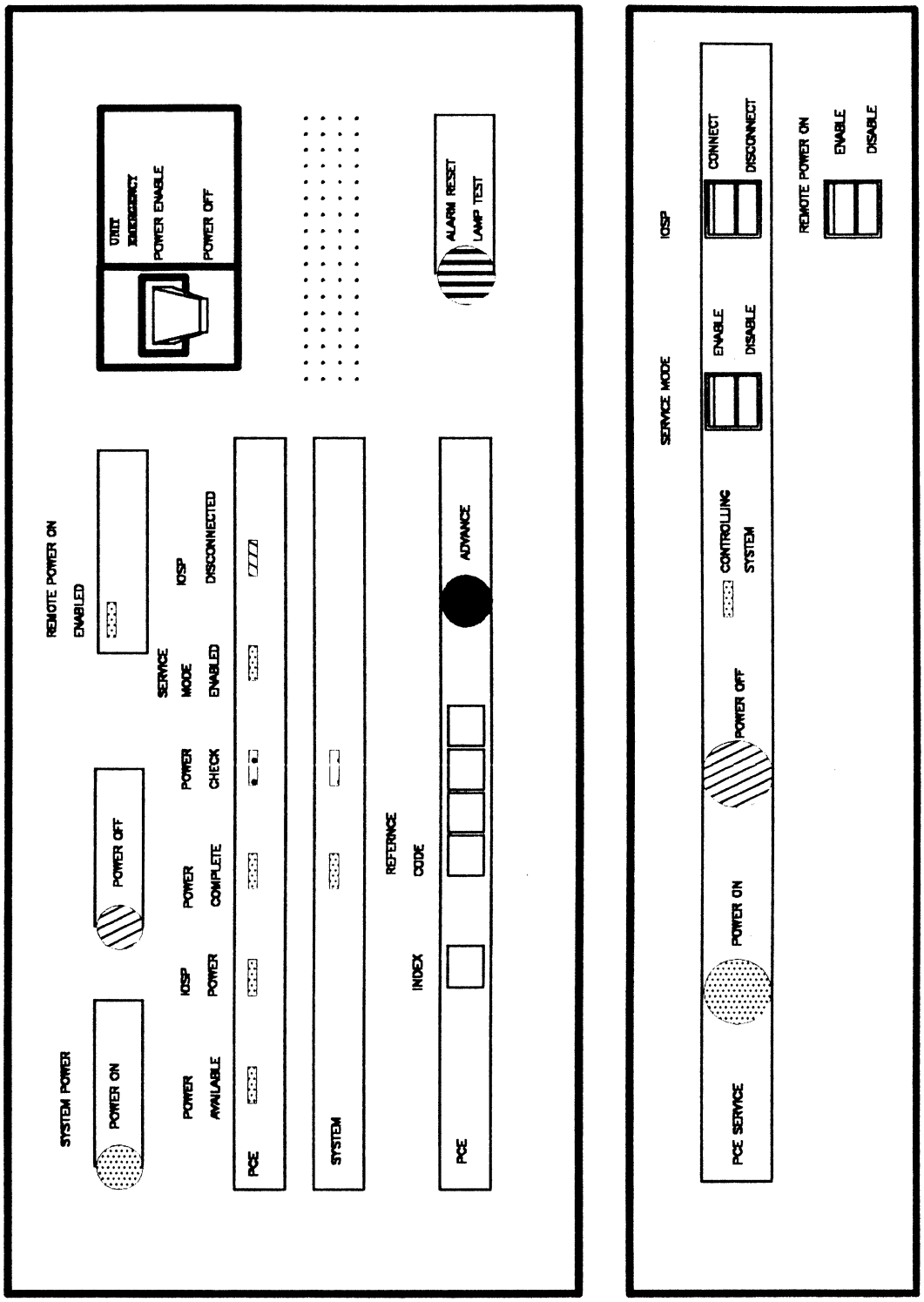
Control Panel Assembly

- The CPA is similar in appearance to 3092 Mod 4/5
- +5 volt power is supplied from the IPC
- The IPC monitors all switch action on the CPA with the exception of the UEPO
- The IPC controls all of the indicators on the CPA
- The refcode display is controlled by the IPC

Visual 3-9. Control Panel Assembly

Functions of CPA Notes

- IPC = Initial Power Controller
- UEPO = Unit Emergency Power Off
- Student Notes



Visual 3-10. Control Panel Assembly

CPA Notes

- Student Notes

Service Mode Switch

- The Service Mode switch in the on position:
  - Enables IOSP Connect/Disconnect switch
  - Enables Service Power on/off switch
  - Blocks System Power on
  - Blocks IOSP Auto Restart (IPC powering off and on the IOSP)
  - Allows power up for noncritical "Base Power" faults

Visual 3-11. Service Mode Switch

Service Mode Switch Notes

- Student Notes

Service Power ON/OFF Switch

PCE Service Power Off switch

- If "Controlling System Indicator is ON" and not CMM - does nothing
- If "Controlling System Indicator is ON" and CMM - powers off IOSP

PCE Service Power On switch

- If "Controlling System Indicator is ON and not CMM" - does nothing
- If "Controlling System Indicator is ON and CMM" - powers on IOSP and CPC base power

Visual 3-12. Service Power On/Off Switch

Service Power On/Off Switch Notes

- Student Notes

3.1.8. Service Channel

Learning Objective

After completing this activity, you should be able to identify the functions of the Service Channel.

Supporting Activities

- The functions that are performed by the Service Channel
- What is attached to the Service Channel
- The interfaces to and from the Service Channel
- The physical location of the Service Channel

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 5

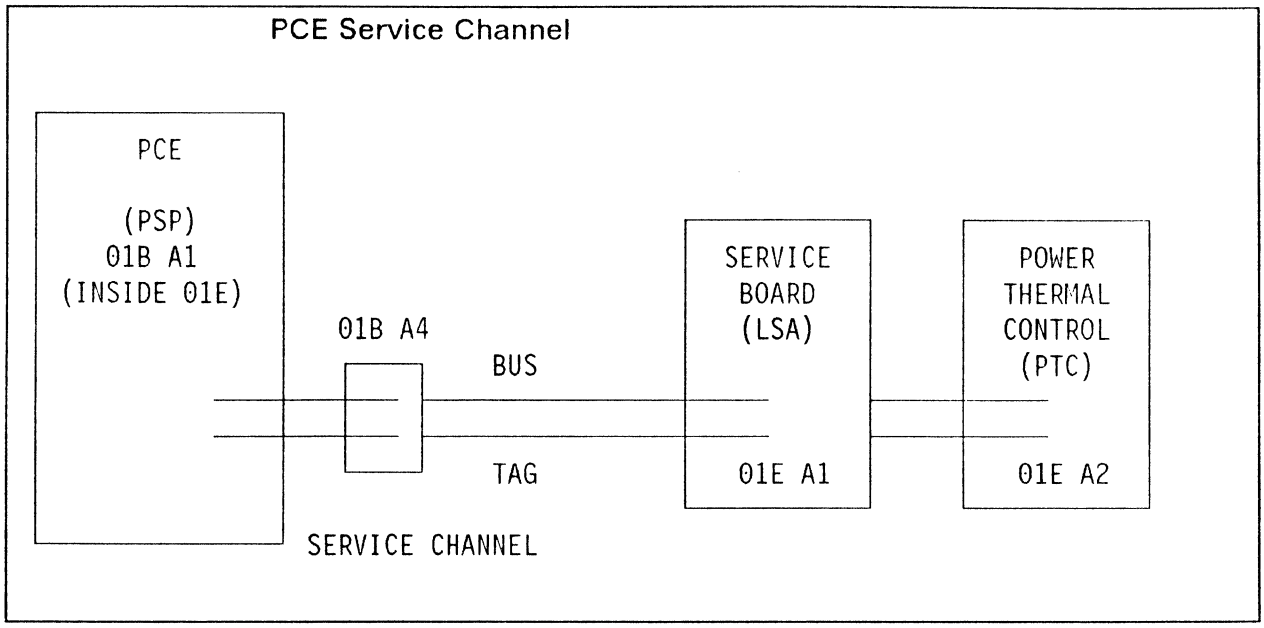
Service Channel

- The Service Channel is functionally equivalent to previous PCEs
- The Service Channel tailgate is mounted just below 01B gate
- The LSA and PTC are the only units attached to the Service Channel outboard of the PSP
- Service Channels wraps are available to be run

Visual 3-13. Service Channel

Service Channel Notes

- The Service Channel is the interface to the CPC from the PSP
- The Service Channel is the path used to Initialize the CPC and the path used from the CPC to report errors (logic & power)
- Student Notes



Visual 3-14. PCE Service Channel

PCE Service Channel Notes

- Student Notes

Topic 3.2. PCE Service Configuration

3.2.1. Concurrent Maintenance Mode

Learning Objective

After completing this activity, you should be able to describe the meaning of Concurrent Maintenance Mode.

Supporting Activities

Concurrent Maintenance Mode allows the servicing of the IOSP while the CPC continues to function running customer jobs.

What parts of the 9121 are supported while in Concurrent Maintenance Mode.

What elements of the 9121 can be serviced while in Concurrent Maintenance Mode.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 3

Concurrent Maintenance Mode

- Two methods of entry into CMM:
  - PCC detected I/O error
  - Manual switch action
- Customer continues to run without IOSP
- Customer can issue config commands via MVS console
- While the PCE is in CMM:
  - No console support
  - No SAD
  - No RSF
  - No SLC
- Two Methods to exit CMM:
  - Manual switch action
  - Auto Restart

Visual 3-15. Concurrent Maintenance Mode

CMM Notes

- Student Notes

3.2.2. Enter/Exit Concurrent Maintenance Mode

Learning Objective

After completing this activity, you should be able to enter and exit Concurrent Maintenance Mode without affecting customer operation.

Supporting Activities

- The procedure to manually enter Concurrent Maintenance Mode
- The procedure to manually exit Concurrent Maintenance Mode
- Lab activities to enter/exit CMM

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 3

3.2.3. Configure the PCE

Learning Objective

After completing this activity, you should be able to configure the PCE for the different hardware levels.

Supporting Activities

A configuration table exists for the PCE which resides on the fixed disk file as well as the maintenance diskette. The configuration table contains the information of what I/O devices are attached to the PCE.

Lab activities on configuring the PCE.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 7

3.2.4. PCE Selection Menu

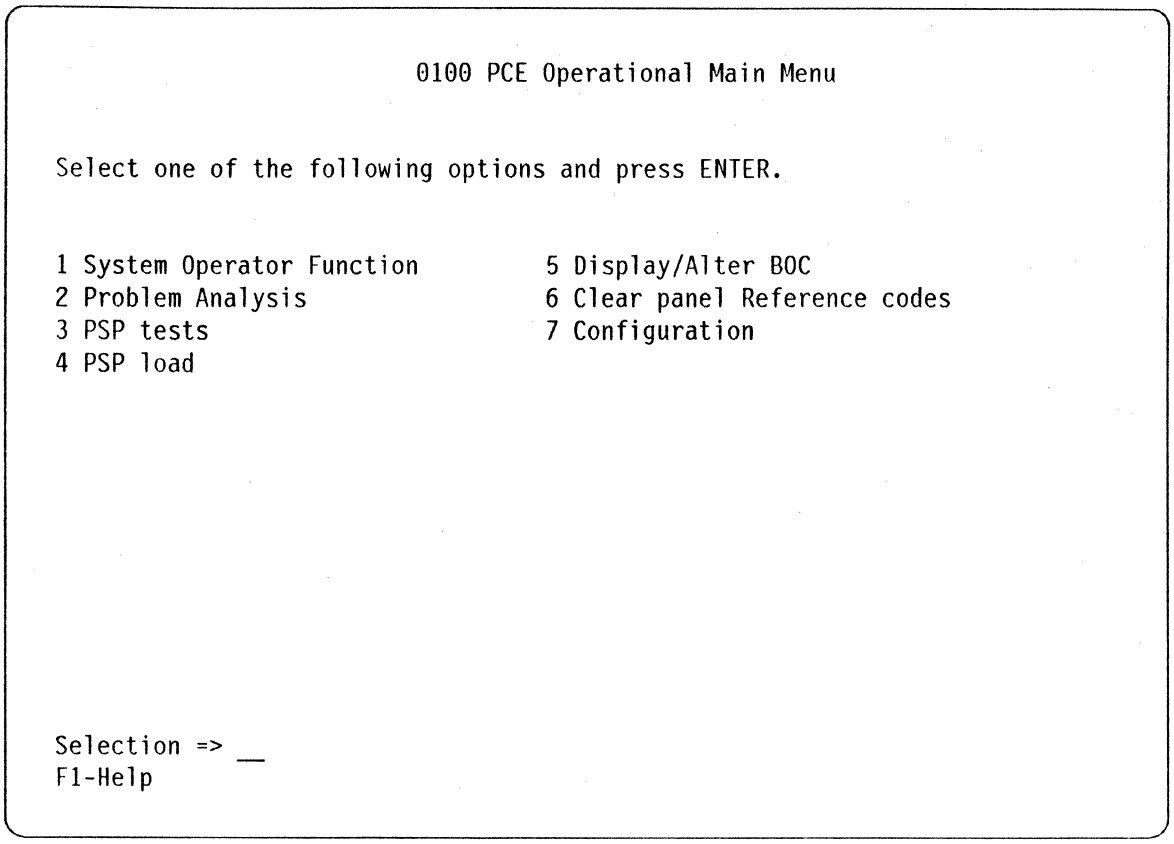
Learning Objective

After completing this activity, you should be able to select and utilize options in the general PCE selection menu while in service mode.

Supporting Activities

- What functions can be performed on the PCE
- what Refcodes can be cleared

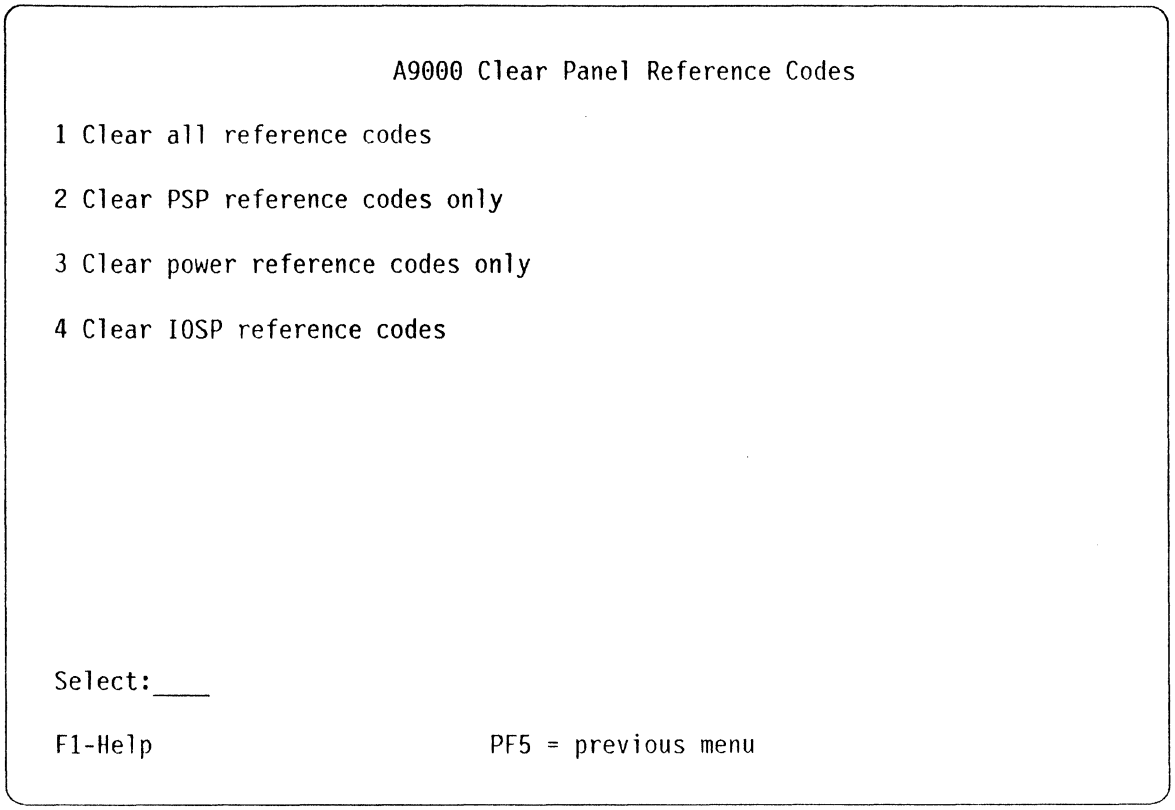
• *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 3



Visual 3-16. PCE Operational Main Menu

PCE Operational Main Menu Notes

- USE SV PCE button, Option #1. to select the PCE OPERATIONAL MAIN MENU



Visual 3-17. Clear Panel Reference Codes

Clear Panel Reference Codes Notes

- Student Notes

Topic 3.3. PCE Reference Codes and History Files

3.3.1. What is a PCE Reference Code

Learning Objective

After completing this activity, you should be able to identify a PCE Reference Code.

Supporting Activities

Reference codes are generated by the IPC, following the detection of a PCE malfunction.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 2
- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 3

3.3.2. Progress Codes

Learning Objective

After completing this activity, you should be able to identify a PCE Progress Code.

Supporting Activities

Progress codes indicate normal progress during power up.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6

3.3.3. Display a PCE Reference Code

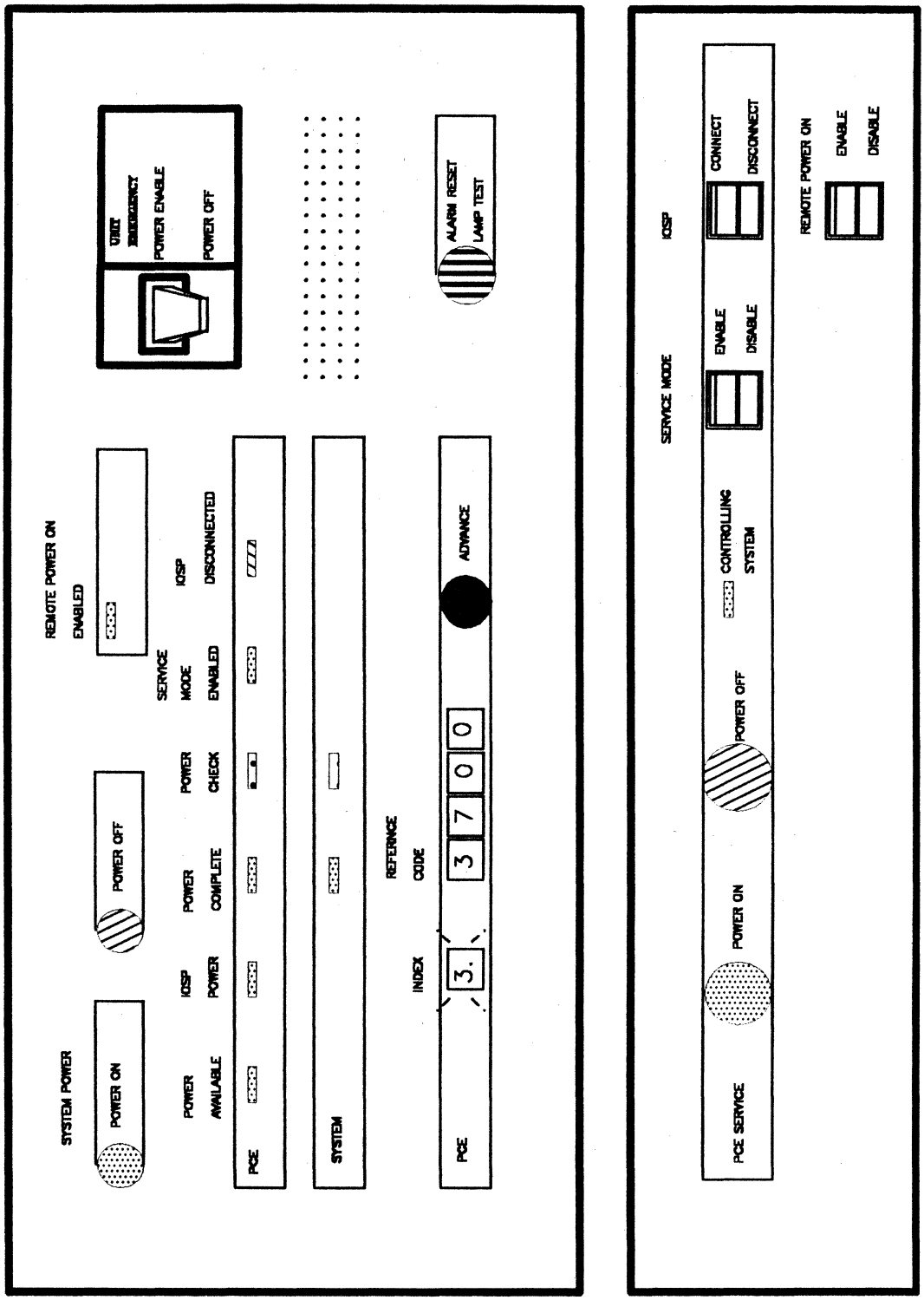
Learning Objective

After completing this activity, you should be able to display the PCE Reference Code to identify the failing area of the PCE.

Supporting Activities

- How to display a PCE Refcode
- What is Vertical & Horizontal Mode

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6



Visual 3-18. CPA Refcode

CPA Refcode Notes

- Student Notes

Stored in the IPC

Reference Code Display

		0	1	2	3	4	5	6	7	8	9
INDEX	0	3700	2301	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
	1	3202	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
	2	3401	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
	3	3700	2303	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX
	4										
	5										
	6										
	7										
	8										
	9										

Visual 3-19. Reference Code Buffer

Reference Code Buffer Notes

- Student Notes

Number with a (dot). - more control word code.

3.3.4. History Log Analysis File

Learning Objective

After completing this activity, you should be able to display and interpret the problems recorded in the problem analysis file.

Supporting Activities

The IOSP records PCE hardware exceptions in the IOSP History Log on Fixed Disk 1. ***Note: CPC problems are not in the History Log*** .

- History Log Analysis is used to resolve all problems in the PSP and intermittent IOSP problems.
- History Log Analysis preselects the most likely Refcode/allows manual selection of Log entries.
- Based on the Refcode selected, Log analysis will determine the probable FRU(s) or a #PA-ID.

• *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 7

Topic 3.4. PCE Diagnostics/FRU Isolation/Replacement

3.4.1. PCE Diagnostics

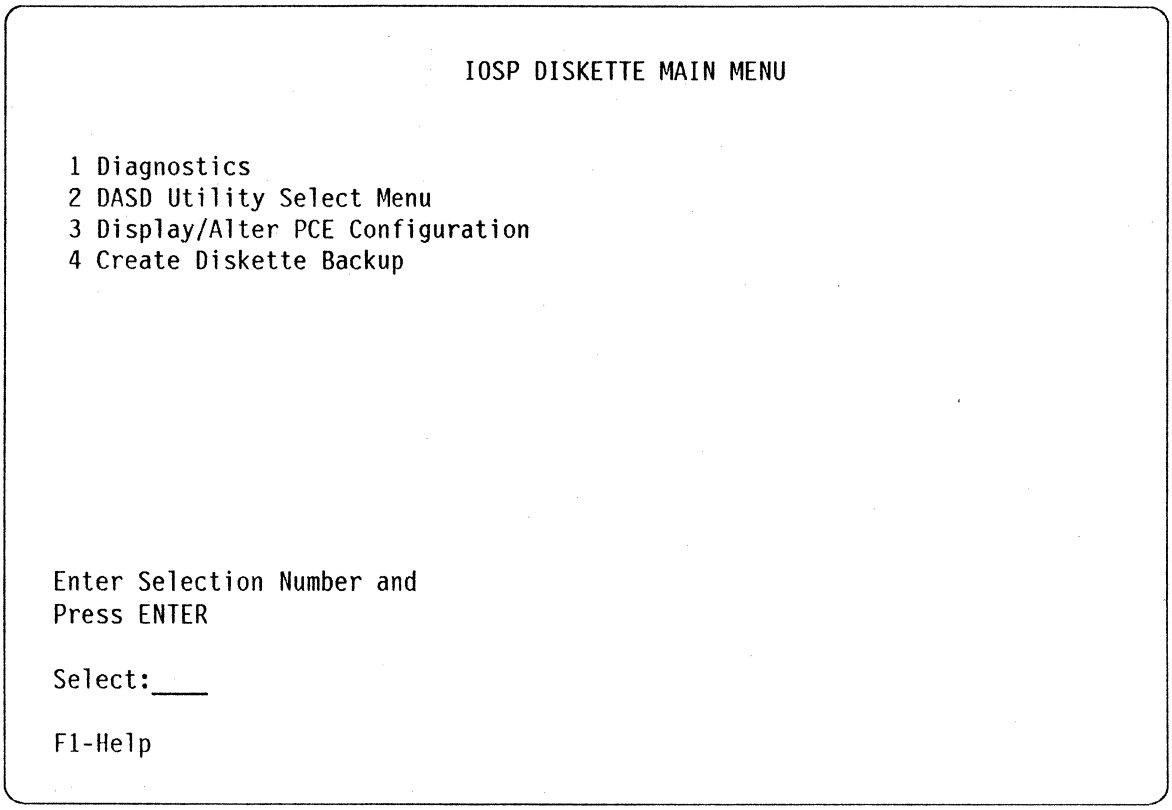
Learning Objective

After completing this activity, you should be able to invoke PCE diagnostics, exercisers or extended testing as directed by the maintenance package or RSC.

Supporting Activities

- Diagnostics - Tests all IOSP Hardware
  - Test Parameters - Looping & Stop on error
  - Function Number - Indicates further tests
  - Function Parameters - Which Port to run test on
- Test Status Screen - Displays Test Group being tested, error Refcodes & current pass number

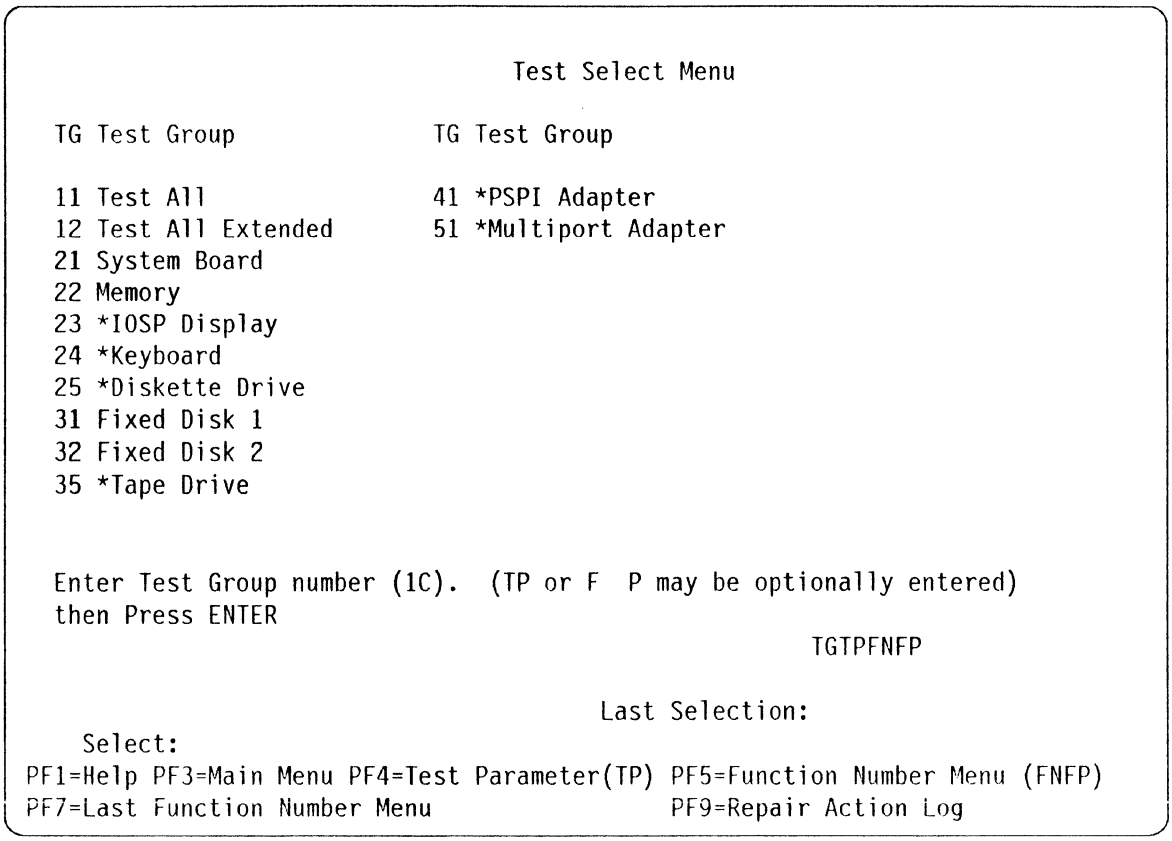
- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 2
- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 7



Visual 3-20. Diskette Main Menu

Diskette Main Menu Notes

- Student Notes



Visual 3-21. Test Select Menu

Test Select Menu Notes

- Student Notes

3.4.2. PCE FRU Isolation

Learning Objective

After completing this activity, you should be able to use the maintenance package to isolate the failing FRU within the PCE (logic, power and support processor).

Supporting Activities

Repair Action Log - Log entry number, FRU info, etc

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6
- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 0

3.4.3. Validate PCE Repairs

Learning Objective

After completing this activity, you should be able to validate PCE repairs using the maintenance package.

Supporting Activities

Verify Repair and End Repair Action

- Verify the repair after a FRU has been replaced, ensure all cables/cards have been reinstalled and the PCE is working correctly.

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 5

Topic 3.5. Introduction to the 9121 M/P Duplex PCE

What This Topic is About

This topic will introduce you to the 9121 M/P Duplex PCE. The hardware that makes up the duplex PCE will be discussed as well as the connection to the MP Central Processing Complex. Also discussed is the responsibilities each side of the duplex PCE has when supporting the MP CPC in Single Image or Physical Partition mode.

3.5.1. Functions of the Duplex PCE

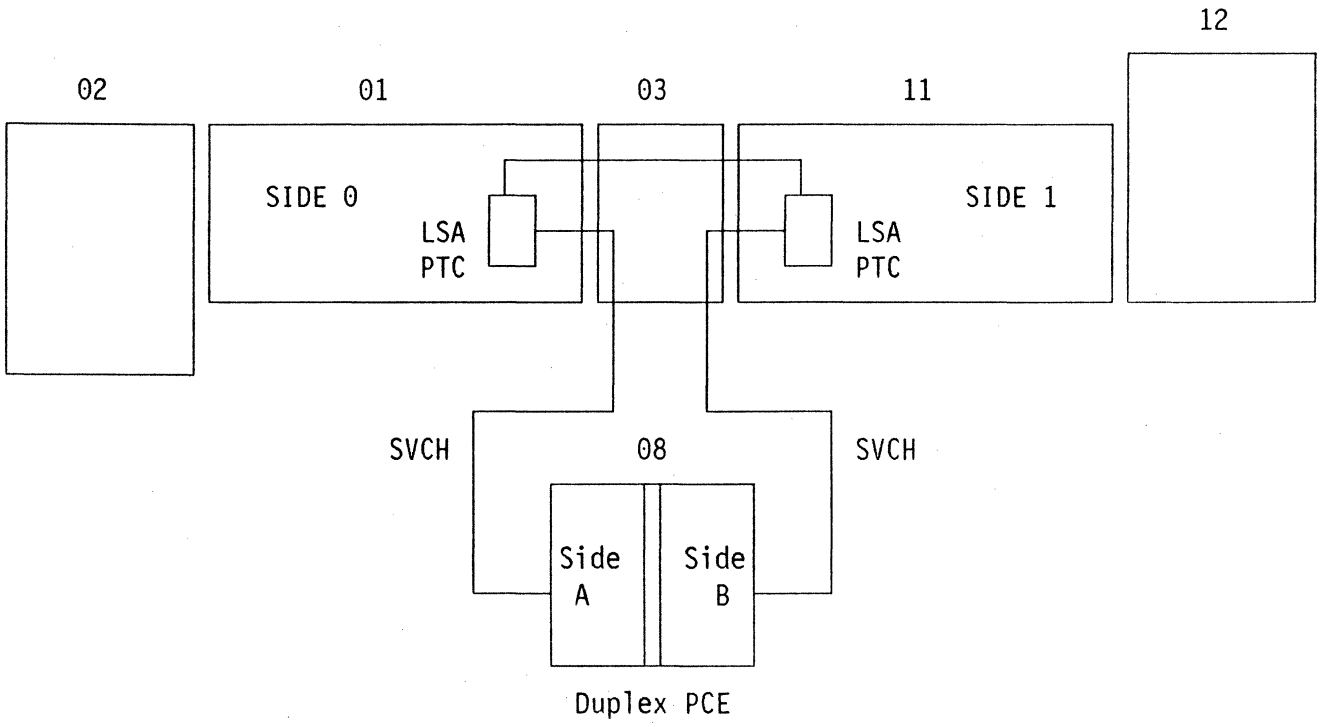
Learning Objective

After completing this activity, you should be able to identify the functions of the Duplex Processor Controller Element and the differences between it and the Simplex PCE.

Supporting Activities

- The Duplex Processor Controller Element (PCE) includes two sets of Simplex PCE units (PSP, IPC, and IOSP) housed in one frame.
- The PCE with its associated I/O is used to support the 9121 M/P Central Processing Complex.

• *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Chapter 6



Visual 3-22. Connection of the Duplex PCE

The Duplex PCE

- The duplex PCE frame 08 consists of two independent Processor Controller Elements (side A and Side B). Each side can run active Processor Controller Code to monitor and control the 9121 MP CPC or the Idle Side Exerciser Code (ISEX) as an ongoing self check diagnostic.
- When the 9121 MP is in Single Image mode one side of the PCE will be "Active" (controlling the 9121 MP CPC) and the other side will in "Backup" (running ISEX). The PCE sides maintain a "side to side" communication between themselves to monitor each others condition. If for any reason the active side of the PCE fails, the other side currently in backup mode will take over and become the "Active" side and put the failing side offline.
- In Physical Partition mode the A side of the PCE will be active (monitoring and controlling) for side 0 of the 9121 MP and the B side of the PCE will be active for side 1 of the 9121 MP. In PP mode there is no backup for a failing PCE side. PP mode PCE operations are the same as non MP 9121 models.

- The duplex PCE frame 08 contains all the IOSP hardware (system board, fixed disk drives, etc.), the PSP board, and IPC for each side. It also contains the 8504 (port A display) and keyboard for each side as well. The optional displays, printers, and modems for each side attach to an integrated Multi Port Adapter Block within the duplex PCE frame 08.
- The Duplex PCE has the same basic functions as the Simplex. The locations of components are different as well as a few additions to support side to side communications.

  The IOSP still has the same responsibility.

  1. Support Processor to the PSP
  2. I/O to the PSP

- Each PCE side has its own Service Channel connected to its respective sides Service board (LSA) and PTC. The Service boards and PTCs use additional hardware for side to side communication when the MP complex is running in SI mode (one Service Channel must be able to communicate to both sides 0 and 1).

- Student Notes

Unit Checkpoint Activity

All of the PCE information discussed will also be used in the PCE related lab activities.

Unit 4. 9121 Maintenance Procedures

What This Unit is About

Items addressed in this unit are:

- Displaying the System EC Level
- Display AQE Summaries by time and type
- Alter/Display of FRU table entries
- Display of AQE repair configuration requirements
- Available manuals
- Open FRU replacement
- Replace FRUs
- Repair validation
- TCM Diagnostics
- Storage Diagnostics
- Invoking Manual Diagnostics

What You Should Be Able to Do

After completing this unit, you should be able to perform maintenance on the 9121 using the documented procedures.

Topic 4.1. MVS Commands

What This Topic is About

This topic will introduce you to, and allow you to use the various MVS commands, in a system environment, to see what the customers configuration consists of, and to isolate paths and devices offline for service, without disrupting customer operation.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Use all available MVS commands to display the current customer configuration and device status.

2. Use all available MVS commands to remove and return system elements and devices, non disruptive to customer operation.

Exercise. 4.1.1: MVS Commands

What This Exercise is About

This Lab activity reinforces the use of MVS commands to customize console display, as well as check the status of the system and its devices.

What You Should Be Able to Do

After completing this exercise, you should be able to enter MVS commands to modify console screen output and show the status of MVS jobs and devices.

Introduction

The MVS/ESA Commands are entered from the Master or Alternate Console. This lab project will be performed in the classroom using the consoles along with the MVS/ESA operations reference. This topic is divided into three activities.

CONTROLLING THE CONSOLE OUTPUT

Control command K

Roll, non-roll modes

Screen format

DISPLAY CONSOLE STATUS

Display and reply to messages

Using console display commands

DISPLAY I/O STATUS

Using display matrix commands

Required Materials

You will need the following materials to complete this exercise:

- *MVS/ESA Operations/System Commands*, GC28-1826
- an active MVS operator's console

CONTROLLING THE CONSOLE OUTPUT

The CONTROL K command is used to tailor the displayed message output and to allow operator control of a console message area.

_ ***Step 1*** Enter the following CONTROL command.

```
K A,12
```

This command reserves the bottom 12 lines for a 'frame' of text. To generate a multi-frame display, enter the following.

Note: If the K A,12 command generates an error ask your Instructor to verify that there is no display area data currently being displayed on your console.

_ ***Step 2*** Enter the following DISPLAY command, where 2B0 is your IPL address.

```
D U,DASD,,2B0,32
```

- What frame number is displayed? _____1_____

_ ***Step 3*** To display the next frame, enter K D,F to delete the current frame and go forward to the next frame. Continue to delete the frames until 'FRAME LAST' is displayed.

```
K D,F
```

_ ***Step 4*** Erase the last frame by entering the following.

```
K E,D
```

_ ***Step 5*** Before you are allowed to change your display area. You must delete all message frames in order to set up your console to not have a framed display area. Use the command K E,D if there are any display frames on your console. Now enter the following command to set up your console to not have a framed display area.

```
K A,NONE
```

_ ***Step 6*** To alter or see your console's Specifications, enter the following.

```
K S
```

Change the message deletion mode in the delete field to roll, if not already defined, using DEL=R.

__ **Step 7** Set the Roll Number of messages included in one message roll to 12, and Roll Time in seconds between rolls to 5 by entering the following.

```
K S,RNUM=12,RTME=5
```

Do a DISPLAY MATRIX command and observe the way the messages roll by entering the following.

```
D M
```

__ **Step 8** Change DEL=R to **DEL=N**, the same way you changed it earlier using K S.

__ **Step 9** Enter the Display Matrix command again. What do you notice different about the display?

IEE159E Message Waiting

This can be very helpful when you need to study information from the operator's console. Just remember to restore the console to DEL=RD MODE or DEL=R MODE when you are through.

Con: K / K E, 19 (To Delete Just Certain Lines)

__ **Step 10** To remove these messages from the screen, you must tell the system to remove them. The CONTROL command that will allow you to do this is:

```
K E
```

__ **Step 11** A console that will be unattended should be left in in roll-delete mode so that messages roll off except for highlited action messages. In order to place a console in roll-delete mode, enter the following.

```
K S,DEL=RD
```

DISPLAY CONSOLE STATUS

Using the Display command, you can display information about the jobs, operating system, the processors, device states, consoles, PF keys, and several other system items. Let's do a few DISPLAY commands.

_ **Step 1** Enter the following command.

```
D R,R
```

This command shows all messages that require a reply.

_ **Step 2** Enter the following command.

```
D R,L
```

This command is used to display "list" messages not requiring a reply.

_ **Step 3** Enter the following command.

```
D A,L
```

This command is used to display all active jobs.

_ **Step 4** Display frequently used functions assigned to Program Function keys.

```
D PFK
```

PFK1	No KE,1	PFK7	D A,L
PFK2	K E	PFK8	D R,L
PFK3	K E,D	PFK9	D C,A
PFK4	K D,	PFK10	K D,U
PFK5	K S,DEL=N	PFK11	Yes D U,,,,X
PFK6	K S,DEL=RD	PFK12	S Subd,J=MVSREC

_ **Step 5** Enter the Display command to display your console status.


```
D C,*
```

Record the Device Number C3F ID 32 Cond Active Auth All

__ **Step 6** Determine which console is the Master with the following command.

```
D C,M
```

Record the Device Number 160 ID 33 Cond Master Auth All

__ **Step 7** Look at the Active consoles on your partition. Only the active consoles will be displayed when you use this command.

```
D C,A
```

__ **Step 8** Examine the console list defined by the System Parameters Library.

```
D C,L
```

__ **Step 9**

1. What display command would you use to display the status of online DASD?

D U,DASD,online

Enter the command

__ **Step 10**

2. What display command would you use to display the status of all the active jobs?

D A,L

Enter the command

__ **Step 11**

3. What display command would you use to display any outstanding replies?

D R,R

Enter the command

Verify the correct answers to the last three steps. The answers are on the back of this topic.

DISPLAY I/O STATUS

The DISPLAY MATRIX command is useful to determine device status and number of logical paths to a device in a system's configuration. When questioned what devices are available to MVS/ESA, the DISPLAY MATRIX command provides a big picture in a matrix format. An example follows.

```
IEE174I 17.52.38 DISPLAY M 540
DEVICE STATUS: NUMBER OF ONLINE CHANNEL PATHS

     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F

00   .  .  .  .  .  .  .  .  .  .  .  .  .  .  #  .

02  2@ 2@ 2@ 2@ 2@ 2@ 2@ 2@  #  #  #  #  #  #  #  #

0F  DN 1  1  1  1  1  DN DN DN DN DN DN DN DN DN DN

2B  4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@ 4@

16   1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1

87   #  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1

C2   1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1

C3   1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1

**************** SYMBOLS EXPLANATION ***************

@ ONLINE, PHYSICALLY ONLINE, AND OPERATIONAL INDICATORS ARE NOT EQUAL
+ ONLINE     # DEVICE OFFLINE      . DOES NOT EXIST

DN  DEV. NOT AVAILABLE
```

_ Step 1 Enter the following DISPLAY command at your console: D M=DEV

The left-most column contains the first digits of device numbers and the last digit is displayed along the top row of the matrix (0-F).

Device number C2 is located in the top-left corner of the matrix.

Find the ***SYMBOLS EXPLANATIONS*** and determine the status of your console. Your console device's status is obviously online, and it has at least one usable path online. The symbols change as the device and path states change. A number in the device status fields indicates the number of online channel paths to a device.

What are the number of paths defined to your console device?

1

The @ symbol indicates that at least one of your paths is unusable.

To understand the @ , the command: D M=DEV(ddd) will be used. An example follows.

D M=DEV(2B0)

```
IEE174I 17.51.35 DISPLAY M 531
DEVICE 2B0    STATUS=ONLINE
CHP                    0A 0B 02 03
PATH ONLINE            N  N  N  Y
CHP PHYSICALLY ONLINE  N  N  Y  Y
PATH OPERATIONAL       N  N  Y  Y
```

Enter D M=DEV(ddd) and replace ddd with YOUR CONSOLE device number.

To restate the @ symbol meaning- "The PATH ONLINE, CHPID PHYSICALLY ONLINE, and the PATH OPERATIONAL indicators are not equal". Look at the output from the D M=DEV(ddd) command you entered, and examine these three fields for each channel path. One of the two paths has an indicator of "N" which means "no" for that particular field. The indicators are NOT all equal to "y"; therefore, they ".....do not match".

The output from the D M=DEV(ddd) command comes from a combination of control blocks used by the software (Operating System) and the hardware (Channel Subsystem) for handling I/O operations in MVS/XA.

SUMMARY OF INDICATORS

```
IEE174I 17.51.35 DISPLAY M 531          MVS message number, time, conlog
DEVICE 2B0    STATUS=ONLINE             Dev. # and status
CHP                    0A  0B  02  03    H/W Chpid
PATH ONLINE            N   N   N   Y     UCB LPM = S/W indicator (v path)
CHP PHYSICALLY ONLINE  N   N   Y   Y     Sch PAM = H/W indicator (cf chp)
                                                   (chpid xx on)
PATH OPERATIONAL       N   N   N   Y     Sch POM = H/W indicator(sel-in),
                                         plus MVS's Installed Channel
                                         Path Table (ICHPT)
```

PATH ONLINE- a "y" indication means that the LOGICAL path is online to this device. This indicator comes from the SOFTWARE UCB LPM field (Unit Control Block, Logical Path Mask).

4. What MVS command can the operator enter to change the logical state of an online path to offline ?

V Path(dddd,cc), offline

CHPID PHYSICALLY ONLINE- a "Y" indication means that the PHYSICAL channel path identifier (CHPID) is part of the HARDWARE configuration. This field comes from the Subchannel PAM (Path Available Mask) field.

5. What MVS command can the operator use to remove the physical CHPID from the config(uration)?

CF CHP(cc) OFFLINE

6. What Service Language Command changes the physical availability of a CHPID from "on" to "off" ?

Chp cc1 OFF

PATH OPERATIONAL- a "Y" indicates the path was operational out to the device the last time this I/F was used. "Select-in", or a disabled I/F condition can cause the indicator to be "N". The subchannel POM field reflects the HARDWARE state of the channel path to the device. The subchannel POM bit and MVS's (ICHPT) are anded together to create the "Y", which is being displayed in the PATH OPERATIONAL field when a D M=DEV(ddd) command is entered.

The DISPLAY CHPID command is useful to determine the Chpids that are available to the system. When examining Chpid states in LPAR mode, do not forget that reconfigurable Chpids can be moved to other partitions, and may appear not to exist. An example of the DISPLAY CHPID command follows.

- D M=CHP

```
IEE174I 17.53.45 DISPLAY M 549
CHANNEL PATH STATUS
   0 1 2 3 4 5 6 7 8 9 A B C D E F
0  + + + + + + . - - . + + . . + +
1  . + + + . - . . . . + . + . . +
2  + + + . . + . + + + . + + . + -
******************** SYMBOLS EXPLANATION ***********
+ ONLINE  ' PATH NOT VALIDATED  - OFFLINE. DOES NOT EXIST
```

- The range of Chpids in the example begins at 00 and ends at 2F.
- Chpid 2F in the example reflects a status of _____.

__ **Step 2** Enter the following DISPLAY command at your console: D M=CHP

- Record the ONLINE Chpids for your partition in the matrix below.

```
   0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
0
1
2
3
******************** SYMBOLS EXPLANATION ***********
+ ONLINE  ' PATH NOT VALIDATED  - OFFLINE. DOES NOT EXIST
```

__ **Step 3** DISPLAY CHPID Command: D M=CHP(xx)

- The Chpids can be displayed individually. The matrix will provide the status of the paths and devices using the Chpid. The following is an example of the DISPLAY MATRIX=CHP(xx) command.
- D M=CHP(10)

```
IEE174I 17.53.08 DISPLAY M 543
CHANNEL PATH 10 STATUS BY DEVICE
   0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
87 *  +  +  +  $  $  $  $  $  $  $  $  $  $  $  $
88 $  $  $  $  $  -  -  -  $  $  $  $  $  $  $  $
******************** SYMBOLS EXPLANATION ***********
+ ONLINE   ' PATH NOT VALIDATED  - OFFLINE
$ PATH NOT OPERATIONAL   * PHYSICALLY ONLINE/LOGICALL OFFLINE
```

If a device has paths which are Physically Operational to it. Yet all of the Logical Paths have been varied offline. Then a * would be in the the matrix for that device when you enter the command D M=CHP(xx). In this example all of logical paths for device 870 have been varied offline. You can see that the LOGICAL PATHS in the UCB are offline and the PHYSICAL PATHS are OPERATIONAL when you enter the command D M=DEV(ddd).

```
IEE450I 08.07.45 UNIT STATUS 328
UNIT  TYPE  STATUS   VOLSER  VOLSTAT    UNIT  TYPE  STATUS   VOLSER  VOLSTAT
870   3480  OFFLINE            /REMOV 871   3480  OFFLINE          /REMOV
```

7. What MVS display command was entered to get the information above?

D U,,870,2

_ ***Step 4*** Enter the same type of command for your IPL device.

SUMMARY

We have seen how to use **K** command to handle display variations. We have also seen how to use variations of the **D** command to show the status of the system and devices.

Use the D M=DEV command to see what devices are in the system, the state of the devices, and the number of paths to the devices. When an unusable path is indicated (@), use the command D M=DEV(ddd) to see the chpid(s) being used.

Examine the PATH ONLINE, CHP PHYSICALLY ONLINE, and the PATH OPERATIONAL indications to determine if the problem is with the logical or the physical path, IOCDS, or if an operator action is required.

(This page skipped to align the following page.)

Answers to Questions

1. D U,DASD,ONLINE
2. D A,L
3. D R,R
4. V PATH(ddd,cc),OFFLINE
5. CF CHP(cc),OFFLINE
6. CHPID XX OFF
7. D U,,,870,2

4.1.1. MVS Display Commands

Learning Objective

After completing this activity, you should be able to use all available MVS commands to display the current customer configuration and device status.

Display Units Command (D U)

Format and use of the D U command:

```
D U,,,ddd,nnn            Display status of devices starting at
                         device 'ddd' for 'nnn' devices
D U,DASD,ONLINE          Display status of online DASD
D U,TAPE,ONLINE          Display status of online TAPE
D U,,ALLOC,ddd,1         Display device allocation for device 'ddd'
D U,,,ddd,1              Display status of device 'ddd'
```

DEVSERV Path Command (D S)

Format and use of the D S command:

```
DS P,ddd                 Display status of a DPS DASD or tape device
DS P,ddd,nn              Display status of nn DPS DASD or tape devices
```

NOTE: Issuing a DEVSERV command to devices with a bad interface (ie open interface) could have an impact on the system. Try the command to a single device before issuing it to a string of devices.

- Student Notes

- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 4
- *MVS/ESA Operations/System Commands Reference Summary, GX22-0013*;

Display Matrix Command (D M)

Format and use of the Display Matrix command (D M)

D M=DEV(ddd)	Display CHPIDs device 'ddd' is connected to
D M=DEV	Display # of paths, path status, and device status for all online devices
D M=CHP(cc)	Display status of CHPID 'cc'
D M=CHP	Display status of all CHPIDs
D M=HIGH	Display highest real storage
D M=HSA	Display Hardware System Area adr & size
D M=SIDE(x)	Display side status (MP only)
D M=STOR	Display storage status
D M=STOR(E=n)	STOR(E=n) Storage element status
D M	Status of all hardware components
D M=CONFIG(xx)	Display deviations from PARMLIB MBR xx
D M=CPU	Display CP status for all CPs
D M=CPU(x)	Display status of CP(x)

Display Console Command (D C)

Format and use of the Display Console command:

D C,*	Display console information about where command is entered
D C,A	Display list of active consoles
D C,L	Display the console ring
D C,M	Display MASTER console information

Display Jobs and Outstanding Messages

D A,L	Display all active jobs
D R,R	Display outstanding messages requiring a "reply"
D R,L	Display "list" messages not not requiring a reply

- Student Notes

4.1.2. MVS Configuration/Vary Commands

Learning Objective

After completing this activity, you should be able to use all available MVS commands to remove and return system elements and devices, non disruptive to customer operation.

Vary Command (V)

Format and use of vary command

V ddd,ONLINE	Vary device online
V ddd,OFFLINE	Vary device offline
V PATH(ddd,cc),ONLINE	Logical vary of path online
V PATH(ddd-ddd,cc),ONLINE	Logical vary of path online for a range of devices
V PATH(ddd,cc),OFFLINE	Logical vary of path offline

Configuration Command (CF)

Format and use of the MVS config command

CF CHP(cc),OFFLINE	Configure offline CHPID
CF CHP(cc),ONLINE	Configure online CHPID
CF CPU(x),OFF	Configure offline CP
CF CPU(x),ON	Configure online CP
CF STOR(E=2),OFFLINE	Configure offline STOR CS2
CF STOR(E=2),ONLINE	Configure online STOR CS2
CF OFF	Configure off CPU-CHP-STOR-none
CF ON	Configure on CPU-CHP-STOR-none

- Student Notes

- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 4
- *MVS/ESA Operations/System Commands Reference Summary, GX22-0013*;

Feedback questions

8. The initial MVS command that should be used to display ALL I/O devices on the active operating system is D M=DEV

9. T (F) The correct method of removing a CHPID is to use the H/W System Console and perform the CHPID XX OFFLINE Service Language Command.

10. After varying a device offline you get a message DEVICE XXX OFFLINE PENDING. What should be entered at the MVS console to get the device offline correctly ?X.

11. The most effective MVS command to use to identify the state of DASD devices is D M.

Topic 4.2. Introduction to 9121 Maintenance Procedures

4.2.1. System EC Level

Learning Objective

After completing this activity, you should be able to display the System EC (SEC) level.

Supporting Activities

We will use the Service Information manual Vol. D02, Frames, to review the System EC (SEC) level for the 9121 Processor.

Follow procedures in lab to display the System EC level information on the SYSDEF frame.

System EC Level

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027            A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
    X 1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
    X 2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
    X 3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
    X 4. Open FRU Replacement (OPENREP)
    X 5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => _______
 Specify an AQEID, or Select A1 to review list of all AQEs              (59001)

COMMAND ==>


I  2A   A:a MODE            S ()              PA
```

Visual 4-1. SEC

- This frame can be displayed for many reasons however in this case what we want is the System EC Level. The SEC Level is a composite of the hardware, microcode, and documentation levels.
- Knowing the SEC Level will be necessary when installing ECs, MESs and Patches.
- This frame can only be selected from the Service Console Index #07 or by entering "F MPINDX" at the command line from any Service Console Frame.
- SEC Level can also be found on the "PATCH," "SYSDEF" and "ECSTAT" frames as well.

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Chapter 1

Topic 4.3. AQE Summaries

4.3.1. AQE Summaries

Learning Objective

After completing this activity, you should be able to display AQE Summaries, AQEs by time and AQEs by type.

Supporting Activities

- We will discuss what an AQE is and the information it contains.
- We will use on-site documentation for information on displaying AQEs by Time and Type.
- You will display AQEs in the Lab

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Chapter 1

WHAT AN AQE IS.

AQE stands for "Action Queue Entry." AQEs contain error information specific to Central Processor Complex (CPC) failures, not PCE failures.

AQEs contain the following information:

- The time(s) the error occurred.
- The number of occurrences.
- A reference code (related to the CPC, not PCE).
- The type of AQE (FRU replace, Assistance required, etc.).
- The type of failure (power, logic, storage, etc.).
- Messages related to the error (not on all AQEs).
- FRU information related to the error (not on all AQEs).

It is necessary for you to be able to display AQE data when servicing the 9121.

Information can be gathered about a failure by displaying AQE frames with SERVMODE **OFF**. When FRU replacement is indicated by the AQE data the Customer must give you the machine and SERVMODE must be **ON**.

CPC FRUs **CAN NOT** be replaced concurrent with Customer operations!

THE GENERAL AQE DATA FRAME: (AQ frame)

When the AQE for a given failure is not known, the (AQ) frame is used to display a list of the active AQEs. You may display the AQEs by TYPE, or TIME STAMP.

THE GENERAL AQE DATA FRAME BY TYPE: (AQTYPE frame)

If you select TYPE, the (AQTYPE) frame is automatically called, and the type of AQEs you selected, is displayed.

AQ FRAME FOR DISPLAY BY TIME STAMP: (AQTIME frame)

If you selected TIME, the (AQTIME) frame is automatically called. All the AQEs that occurred within the time frame that you specified are displayed.

Steps to view "active" AQEs

1. Select the MPINDX frame and select A1. Or, you can go to the (AQ) frame directly with an F AQ command.

2. When (AQ) frame is displayed select A1.

3. When TYPE data appears, press ENTER to display ALL active AQEs. Or, enter one TYPE to display all active AQEs of a particular type.

INDEX0 Selected

```
                                                        15 AUG 90  11:23:41
                          Service Console Index                    <INDEX0>

                     Current Access Level    Service Mode
                              2                   OFF

    FRAME NAME      Description
    01  ACCESS   Console Access Control
    02  CHERLG   Channel Error Log Index
    03  ERRLOG   System Error Log Index
    04  INDEX1   Operator Index
    05  MANSVC   Manual Service Control and Display
    06  MODEM    PCE Modem Switch Manual Cotrols
    07  MPINDX   Maintenance Procedures Index
    08  PATCH    Patch Status
    09  PCECNF   PCE Configuration
    10  PCWSMN   Processor Controller Warmstart Management
   X11  TRAP     Trap Facility




COMMAND ==> 07


I  2A   A:a MODE            S ()               PA
```

Visual 4-2. INDEX0

- This Frame can be selected by entering "F INDEX0" at the command line of any Service Console Frame or by pressing the "INDEX" Key on the Keyboard.
- We need to get to "MPINDX" frame where the Maintenance Procedures frame has the "AQE" options.

MPINDX Selected

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE        MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027             A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
    X 1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
    X 2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
    X 3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
    X 4. Open FRU Replacement (OPENREP)
    X 5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => ________
 Specify an AQEID, or Select A1 to review list of all AQEs              (59001)

COMMAND ==> A1


I  2A   A:a MODE            S ()              PA
```

Visual 4-3. MPINDX

- This Frame can be selected by entering "F MPINDX" at the command line of any Service Console Frame.
- The "A1" option will allow you to see all AQEs by type or time stamp.

AQ Selected

```
                                                        15 AUG 90  11:23:41
                  Management Operations - General AQE Data                <AQ>


     A= SELECT DATA DISPLAY
       1. Action Queue Entry Summaries (AQTYPE)
       2. AQEIDs by Time Stamp (AQTIME)









     R= Call OR RETURN TO
       1. Maint. Proc. Index      3. Mgmt. Op. - AQE
       2. Mgmt. Op. - AQ          4. Mgmt. Op. - FRU

COMMAND ==> A1


I  2A   A:a MODE             S ()                PA
```

Visual 4-4. AQ

- This Frame can be selected by entering "F AQ" at the command line of any Service Console Frame.
- The "A1" option will list all AQEs by type.

AQ - TYPE Selected

```
                                                        15 AUG 90  11:23:41
                  Management Operations - General AQE Data                <AQ>


     A= SELECT DATA DISPLAY
     ->1. Action Queue Entry Summaries (AQTYPE)
       2. AQEIDs by Time Stamp (AQTIME)


                            VALID TYPES:
                            ALL
                            NORPR
     Type(A/N) => ALL_____  FLTISO
                            FRUREPL
                            ASSTREQ
                            RESOLVED
                            VALDREQ


     R= Call OR RETURN TO
       1. Maint. Proc. Index     3. Mgmt. Op. - AQE
       2. Mgmt. Op. - AQ         4. Mgmt. Op. - FRU

COMMAND ==> A1

I  2A   A:a MODE             S ()                PA
```

Visual 4-5. AQ TYPE selected

- The "search argument" for the type of AQE you want to look at can be narrowed down to one type (e.g. FLTISO) by typing over the default of ALL other wise you will see all the AQEs.

AQTYPE Selected

```
                                                          15 AUG 90  11:23:41
                    Management Operations - Action Queue Entries       <AQTYPE>

                  --FIRST OCC.-- --LAST OCC---  NO.  NO. MSG
AQEID     AQE TYPE DDMMMYY HHMMSS DDMMMYY HHMMSS OCC. FRU IND REFERENCE CODE


00000282T FRUREPL  13AUG90 170351 13AUG90 170351 001   4   Y  0000000000000000
00000284A FRUREPL  14AUG90 103208 14AUG90 103208 001   1   N  040001FA00040000
00000286P FLTISO   14AUG90 102132 14AUG90 102817 002   1   Y  EF000A00F00A0000









     R= Call OR RETURN TO                                      Type => ALL
       1. Maint. Proc. Index     3. Mgmt. Op. - AQE
       2. Mgmt. Op. - AQ         4. Mgmt. Op. - FRU

COMMAND ==> R2

I  2A   A:a MODE            S ()               PA
```

Visual 4-6. AQTYPE

- In this example the type of AQE is displayed (FLTISO, ASSTREQ, FRUREP, etc.) and the type of failure is also indicated in the AQE number (P, T, A, etc.) as well as other information.
- This Frame can be selected by entering "F AQTYPE" at the command line of any Service Console Frame.
- The "R2" will be used to return to the AQ frame.

AQEID

To classify an action queue entry identifier (AQEID), use the last alphabetic character (eg. 00000286P) of the AQEID:

- The letter A shows a logic type failure.
- The letter E shows an engineering change (EC) management type failure.
- The letter F shows a manual diagnostic type failure.
- The letter I shows a fault isolation type failure.
- The letter M shows a processor controller (PCE) failure.
- The letter P shows a power/thermal type failure.
- The letter S shows a processor memory array (PMA) type failure.
- The letter T shows a manual diagnostic by test type failure.
- The letter U shows a user generated (OPNREP frame) type failure.
- The letter V shows a repair validation type failure.

AQ - TIME Selected

```
                                                          15 AUG 90  11:23:41
                    Management Operations - General AQE Data              <AQ>


     A= SELECT DATA DISPLAY
       1. Action Queue Entry Summaries (AQTYPE)
     ->2. AQEIDs by Time Stamp (AQTIME)


                  ---START---     ----END----
                  DDMMMYY HHMM    DDMMMYY HHMM

     Time(A/N) => 13AUG90 0800    15AUG90 1100




     R= Call OR RETURN TO
       1. Maint. Proc. Index      3. Mgmt. Op. - AQE
       2. Mgmt. Op. - AQ          4. Mgmt. Op. - FRU

COMMAND ==> A2


I  2A   A:a MODE             S ()                PA
```

Visual 4-7. AQ TIME selected

- The time frame can be changed by typing over the default time to narrow the search argument.
- This Frame can be selected by entering "F AQ" at the command line of any Service Console Frame.

AQTIME Selected

```
                                                          15 AUG 90  11:23:41
          Management Operations - AQE IDs by Time Stamp                <AQTIME>

          TIME STAMP                TIME STAMP                TIME STAMP
AQEID     DDMMMYY HHMMSS   AQEID    DDMMYY HHMMSS   AQEID     DDMMYY HHMMSS


00000284A 14AUG90 103208
00000286P 14AUG90 102817
00000286P 14AUG90 102132
00000282T 13AUG90 170351









     R= Call OR RETURN TO                          Start Time => 130890 0800
       1. Maint. Proc. Index     3. Mgmt. Op. - AQE  Stop Time => 150890 1100
       2. Mgmt. Op. - AQ         4. Mgmt. Op. - FRU      AQEID => ________

COMMAND ==>

I  2A   A:a MODE            S ()               PA
```

Visual 4-8. AQTIME

- Note that the same AQEID will be displayed if the same error has occurred more than once. Also note that the type of AQE (e.g. FRUREP) is not shown on this frame.
- This Frame can be selected by entering "F AQTIME" at the command line of any Service Console Frame.

MPINDX AQE - Selected

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE        MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320           20027            A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
    X 1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
    X 2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
    X 3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
    X 4. Open FRU Replacement (OPENREP)
    X 5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => ________
 Specify an AQEID, or Select A1 to review list of all AQEs              (59001)

COMMAND ==> A2


I  2A   A:a MODE            S ()              PA
```

Visual 4-9. AQE selected

- To display information for a specific AQE select the "A2" option.
- This Frame can be selected by entering "F MPINDX" at the command line of any Service Console Frame.

AQE With AQEID Selected

```
                                                        15 AUG 90  11:23:41
                  Management Operations - Single AQE Data                <AQE>


    A= SELECT DATA DISPLAY                      B= FUNCTION
      1. Repair Configuration (AQECNF)            1. ERASE
      2. General Data (AQEGEN)
      3. Specific Data (AQESP)
      4. Time Stamps (AQTIME)
      5. AQE History AQEHST)
      6. AQE Logout (AQELOG)









    R= Call OR RETURN TO
      1. Maint. Proc. Index     3. Mgmt. Op. - AQE          AQEID => 0000282T
      2. Mgmt. Op. - AQ         4. Mgmt. Op. - FRU

COMMAND ==> A2

I  2A   A:a MODE            S ()              PA
```

Visual 4-10. AQEID Selected

- Specify the AQEID you want information on and hit the enter key. Now select option "A2" for general data.
- This Frame can be selected by entering "F AQE" at the command line of any Service Console Frame.

AQEGEN With AQEID Selected

```
                                                          15 AUG 90  11:23:41
              Management Operations - General AQE Data (FRUs)          <AQEGEN>

                   --FIRST OCC.-- --LAST OCC---  NO.  NO. MSG
AQEID     AQE TYPE DDMMMYY HHMMSS DDMMMYY HHMMSS OCC. FRU IND REFERENCE CODE


00000282T FRUREPL  13AUG90 170351 13AUG90 170351 001   4   Y  0000000000000000

Action            Location     Part Number Type       FEID  Inst Date - How
NONE RECOMMENDED  01FA1            73F4455 BOARD      1200    07AUG90 - EC
POTENTIAL REPLACE 01H_D2G          89X2430 CABLE      2A03    28JUL90 - MFG
POTENTIAL REPLACE 01H_D2B          89X2430 CABLE      2A03    28JUL90 - MFG
REPLACE           01FA1F2          73F4073 CARD       2A03    28JUL90 - MFG


     A= ACTION
       1. Display Messages

     R= Call OR RETURN TO                                  AQEID => 0000282T
       1. Maint. Proc. Index     3. Mgmt. Op. - AQE
       2. Mgmt. Op. - AQ         4. Mgmt. Op. - FRU

COMMAND ==>

I  2A   A:a MODE            S ()               PA
```

Visual 4-11. AQEGEN With AQEID Selected

- Now you can see what FRUs if any are called for replacement and by using the "A1" option you can alternate between Message information and FRU information.
- Not all AQEs will have FRU information or messages. One or the other however will be available and sometimes both. An "X" will be next to the "A" options if it is not available.
- This Frame can be selected by entering "F AQEGEN" at the command line of any Service Console Frame.

Topic 4.4. 9121 FRU Replacement and Verification

4.4.1. FRU Replacement

Learning Objective

After completing this activity, you should be able to replace FRUs using the Maintenance Procedures.

Supporting Activities

- We will reference on-site documentation for FRU replacement Philosophy.
- This learning Activity will be supported by TAs in the Lab.

Fru Replacement

Vol. B01 has information on the philosophy of FRU replacement. It can be a reference for the Lab activity.

- SERVMODE must be ON to perform FRU Replacement
- FRU Replacement is selected from the MPINDX frame

- *B01 9121 Service Information: Service Guide*, SY27-2609;

FRU Replacement Selection

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE        MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027             A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
      1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
      2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
      3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
      4. Open FRU Replacement (OPENREP)
      5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => 0000286P


COMMAND ==> B2


I  2A   A:a MODE              S ()                PA
```

Visual 4-12. FRU Replace Selection

- FRU Replacement selection will consist of several more screens that will guide you through replacing the indicated FRUs.

Field FRU Replacement Strategy

In order to meet the Field's requirement for "Single FRU Replacement" it is important to remember that when ever more than one FRU is called out for replacement the Support Center must be contacted for assistance.

The Support Center will:

- Search History files based on CERF panel input from the field and other sources to determine a single FRU call related to the error indicated.
- Recommend specific diagnostics that may further isolate to a single FRU.
- If time permits test each FRU one at a time.
- Each situation can be unique requiring you and the Support Center to come up with another action related to multiple FRU replacements.

Visual 4-13. FRU Replacement Strategy.

Student Notes

4.4.2. Validate Repairs

Learning Objective

After completing this activity, you should be able to validate repairs using the maintenance procedures for repair validation.

Supporting Activities

- We will use the on-site documentation to review the philosophy of FRU Validation.
- You will use FRU Validation in the Lab.

FRU Validation

1. Validation Tests identify solid failures in a functional element.
2. VTs are a group of tests that are selected by the VT Monitor program depending upon the part of the machine to be tested.
3. The verification tests use scan facilities to test the functional element. Therefore, they do not run at machine speed.
4. In most cases, the VTs are scheduled to run automatically as part of maintenance procedures called by repair validation or fault isolation.

- Validation is run after a FRU or a group of FRUs is replaced.
- Power/Thermal repair is verified by powering on the complex.
- If validation is not successful, call the next level of support.

- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 4

Topic 4.5. Open FRU Replacement and FRU Table Update

4.5.1. Open FRU Replacement

Learning Objective

After completing this activity, you should be able to invoke maintenance procedures for open FRU replacement when directed by RSC.

Supporting Activities

- We will discuss Open FRU Replacement philosophy.
- You will use Open FRU Replacement procedures in the Lab.

Open FRU Replacement

- The open FRU replace procedure is intended for the use of LSSC trained people.
- CE's will use it only under the direction of the LSSC.
- Open FRU replace allows the user to select any set of FRUs in the system for replacement or validation.
- This procedure is normally used for the long call situation when the NORMAL maintenance procedures and diagnostic paths have been exhausted.
- This function creates an AQE containing the FRUs that the user has selected.
- Either FRU replacement or repair validation can be invoked.
- This function permits the user to replace or validate FRUs which are not contained in an existing AQE, or in an AQE which is not usable because of a maintenance package escape.
- The user selects the FRU's to be replaced via one or more displayed lists of FRUs.
- These FRUs are then added to a NEW AQE which was reserved by the panel initialization code.

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Chapter 1

Open FRU Replacement Selected

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027            A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
      1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
      2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
      3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
      4. Open FRU Replacement (OPENREP)
      5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => _______


COMMAND ==> B4


I  2A   A:a MODE            S ()              PA
```

Visual 4-14. Open FRU Replacement selected

- Selecting Open FRU Replacement will generate a new AQE and consist of several more screens that you will indicate what FRU you are going to replace and more screens similar to FRU Replacement and FRU Validation.

4.5.2. Alter/Display FRU Table

Learning Objective

After completing this activity, you should be able to alter/display FRU table entries.

Supporting Activities

- We will discuss the Alter/Display FRU functions.
- You will use this procedure in the Lab.

Alter/Display FRUs

The ALTER/DISPLAY FRU frame can be used for parts exception data such as substitute part numbers or text information regarding the reason for FRU exchange such as an engineering activity.

The Display function is the default option and no changes are allowed (only in Alter).

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Chapter 1

FRU Data Selection

```
                                                          15 AUG 90  11:23:41
                    Maintenance Procedures Index                      <MPINDX>

      MACHINE TYPE        MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320           20027             A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
      1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
      2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
      3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
      4. Open FRU Replacement (OPENREP)
      5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => ________


COMMAND ==> A3


I  2A   A:a MODE            S ()              PA
```

Visual 4-15. FRU Data Selection

- Location
- Part Number
- FEID

Topic Checkpoint Activity

Exercise. 4.5.1: Display FRU Information

What This Exercise is About

This exercise familiarizes you with the FRU tables available on the service console.

What You Should Be Able to Do

After completing this exercise, you should be able to use consoles and maintenance documentation to effectively locate FRUs by location, FEID, or P/N.

Introduction

In order to use the maintenance package effectively, it is important to be able to locate FRUs easily. The objective of this exercise is to practice your skills of displaying FRU information.

Required Materials

You will need the following materials to complete this exercise:

- 9121 ET3 Simulator Running
- Vol D01 Service Language Commands
- Vol D02 Processor Complex Frames Manual Part 1
- Vol D03 Processor Complex Frames Manual Part 2

Directions to the Student

Prerequisites: 9121 ET3 Simulator invoked by the Instructor.

Display FRU locations

_ ***Step 1*** Make the correct console entries to select the MPINDX frame.

_ ***Step 2*** Select the correct entry to view FRU data.

A. What selection under Management Operations will display FRU data? A3

_ **Step 3** Make the correct entries to display FRUs by location. For example : if just 01 was entered, all the FRUs for frame 1 would be displayed.

B. What are the part numbers for the FRUs at location:

01EA1B2? 73F5328

01KA1C2? 84F...

_ **Step 4** Select the correct entries to display FRUs by part number. (eg: P/N 57f9840)

C. In how many locations can P/N 73F4073 be found? 24

_ **Step 5** Now make the correct entries to display FRUs by FEID. (eg: EF00)

D. How many FRUS are associated with FEID 0101 (CP1)? 41

_ **Step 6** Now return to Index 0 on both consoles.

Exercise Summary

This exercise gave you an opportunity to practice your FRU location skills, and also see a few new screens and added features of the consoles.

Answers to Questions

A. A3

B. 73F5328
89F7436

C. 24

D. 41

Topic 4.6. Manual Diagnostics/TCM/Storage

4.6.1. Manual Diagnostics

Learning Objective

After completing this activity, you should be able to invoke manual diagnostics by functional element when directed by the maintenance procedures or RSC.

Supporting Activities

- We will discuss Manual Diagnostics that can be run on the 9121 Processor.
- The Service Guide Vol. B01 will be used to overview the Processor Complex Exerciser load/run procedure.
- You will run PCX and manual diagnostics in the Lab.

Manual Diagnostics

- Part or all of the configuration is required to run manual diags, (SERVPART for chpids, SERVMODE for the rest of the CPC).
- Manual Diagnostics should be run under the direction of the LSSC.
- Manual diagnostics are called from the MPINDX or MANFE frames.
- Manual diagnostic routines are used to troubleshoot :
  - Central Processor Complex- Processor Complex Exerciser (PCX)
  - Storage- Processor Memory Array Diagnostics (PMAD)
  - Card-on-board areas of the channels- Channel Exerciser (CHEXER)
  - Single CHPID- Channel Diagnostics (CHDIAG).

Processor Complex Exerciser

- The Processor Complex Exerciser tests are used to:
  - validate an installation or discontinuance
  - supplement the directed maintenance procedures in problem determination

- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 3
- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ ; Section x-x

Manual Diagnostics Selections

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027             A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
      1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
      2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
      3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
      4. Open FRU Replacement (OPENREP)
      5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                          AQEID => _______


COMMAND ==> DX


I  2A   A:a MODE            S ()              PA
```

Visual 4-1. Manual Diagnostics Selections

Several Manual Diagnostics can be selected

- PMAD
- CHEXER
- CHDIAG
- MANFE
- PCX

4.6.2. Storage Diagnostics

Learning Objective

After completing this activity, you should be able to invoke diagnostics for Storage.

Supporting Activities

We will reference on-site documentation for information on running storage diagnostics

You will run these diagnostics in the Lab.

- *D03 9121 Service Information: Frames, Part 2*, SY27-2622

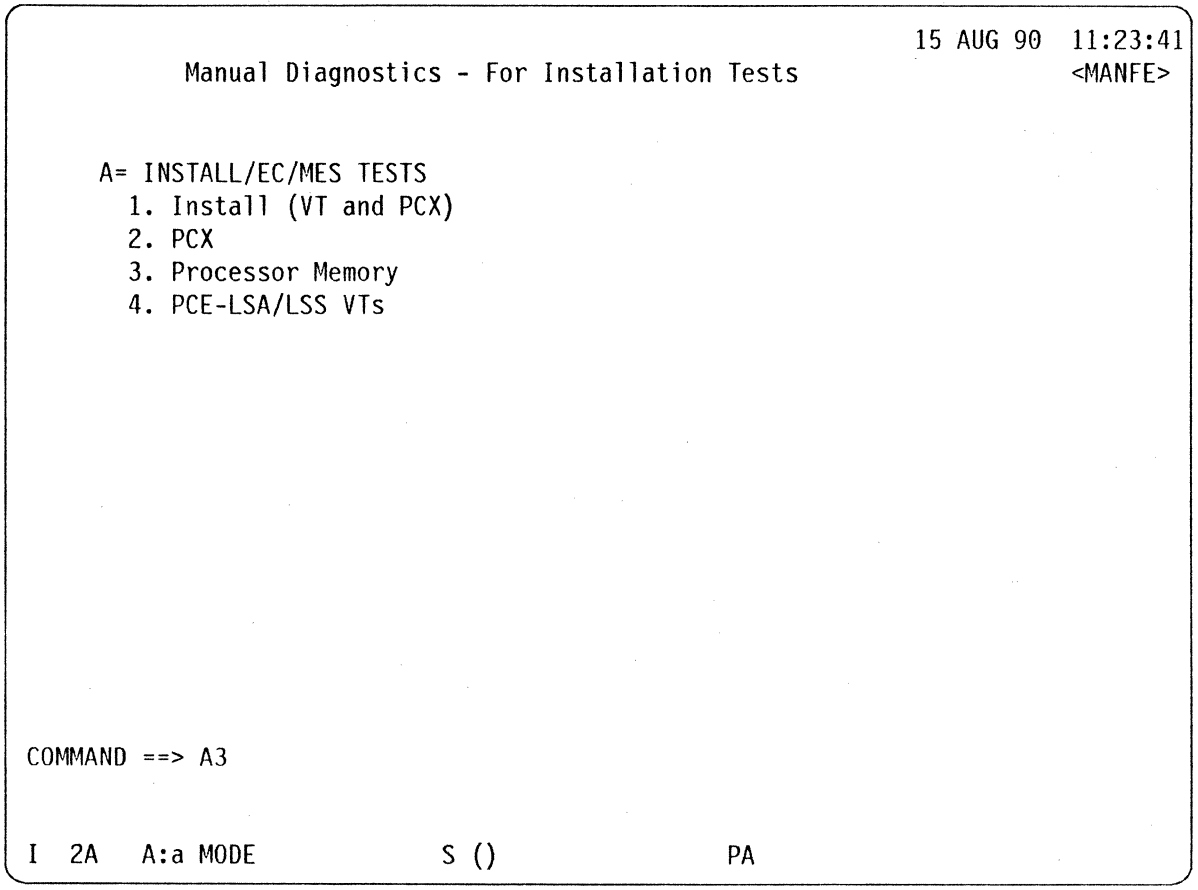
MANFE selected

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027            A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
      1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
      2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
      3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
      4. Open FRU Replacement (OPENREP)
      5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                        AQEID => _______
 Specify an AQEID, or Select A1 to review list of all AQEs             (59001)

COMMAND ==> D4


I  2A   A:a MODE            S ()              PA
```

Visual 4-2. MANFE selected

- When this frame is selected you can access Storage Diagnostics from the MANFE frame.

Processor Memory Selected



Visual 4-3. Processor Memory Selected

- When this frame is selected you can select Storage Diagnostics with the A3 selection.

Installation Tests Monitor

```
                                                        15 AUG 90  11:23:41
                          Installation Tests - Monitor List             <MANFE>

     The following monitors will be called. Run times will vary based on the
     number and types of errors found. Total estimated run time is 0027 minutes.

     A= MANAGEMENT OPERATIONS
                 RUN
     MONITOR     TIME
     xxxxxxxx    0002
     xxxxxxxx    0025









     A= ACTION                                 Functional Element: PME0
       1. Begin Test
       2. Return To Installation Test List
       3. Cancel And Return To Maint. Proc. Index

COMMAND ==> A1


I  2A   A:a MODE              S ()                  PA
```

Visual 4-4. Installation Tests Monitor

- This frame will let you start the tests and show the progress of the diagnostic monitors that are running.
- You do not have any control over the type of storage tests that are running.

PMAD Selection

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
     ES/9000 - 320          20027             A72355B             L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
      1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
      2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
      3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
      4. Open FRU Replacement (OPENREP)
      5. Resolve Fiber-Ext Channel AQEs (FECREP)

                                                        AQEID => _______
 Specify an AQEID, or Select A1 to review list of all AQEs             (59001)

COMMAND ==> D1


I  2A   A:a MODE            S ()              PA
```

Visual 4-5. PMAD selected

- Selecting this frame will allow you to run specific storage diagnostics.

PMAD

```
PME: _ 0 1                                          15 AUG 90  11:23:41
                        PMA Diagnostic Control                    <PMAD>

 A= PROCESSOR MEMORY ARRAY                C= ADDRESS FOR UE REPRODUCTION
   1. X                                     1. UEs from MULTIERR file
   2. Y                                     2. Phsical Addr(   ):________

 B= TEST SELECTIONS                       D= RUN OPTIONS
   1. Basic                                 1. Stop On Error
   2. Single-Bit Failures                   2. Loop On Test
   3. UE Reproduction                       3. Bypass Error Messages
   4. Fetch (HAMT Scrub)
                                          E= EXECUTION CONTROL
                                            1. Start
                                            2. Restart
                                            3. Terminate
                                            4. Display Results
                                            5. File Management

COMMAND ==> A1

I  2A   A:a MODE              S ()                PA
```

Visual 4-6. PMAD

- From this frame you can select a specific diagnostic and display logs containing storage failure indications and diagnostic results.

Topic 4.7. 9121 System Tests

4.7.1. System Level Tests

Learning Objective

After completing this activity, you should be able to invoke system level test for verification.

Supporting Activities

- Be familiar with PCX and how it is used with the 9121.
- Be familiar with CSX and how it is used with the 9121.

- *B01 9121 Service Information: Service Guide*, SY27-2609

Processor Complex Exerciser.

PCX is used to run CPC diagnostics at a machine speed simulating customer usage of the CPC elements. This diagnostic is run automatically when validating CPC repairs using the Maintenance Procedures.

It can also be run manually allowing you to control what type of CPC tests you want to run.

Volume *B01 9121 Service Information: Service Guide*, SY27-2609 chapter 3 contains the procedure for running PCX.

Channel Subsystem Exerciser.

CSX is run by IPLing a tape from a channel attached tape drive. The purpose for CSX is to check out channel operations to all attached I/O. Test options provide READ ONLY and READ WRITE capabilities to the I/O so care should be taken not to destroy customer data on DASD and Tape devices.

The CSX tape along with the user guide must be ordered using local branch office procedures. It does not come with the 9121.

- Student Notes

Unit Checkpoint Activity

You should be able to recognize the procedures for maintaining the 9121 and where to find information related to the procedures.

Unit 5. 9121 Channel Subsystem

What This Unit is About

The I/O configuration program (IOCP) provides a way to define I/O channel paths, control units, and I/O devices that are physically attached to the processor complex.

This unit introduces the functions of the IOCP and then teaches you how to use it to define a customer's I/O configuration, how to modify and verify data on the IOCDS, and how to print reports.

The major purpose of this unit is to teach the necessary information that is required to load the customers IOCDS tape during installation. Also; teach the information that is needed to debug an IOCDS file.

Items addressed in this unit are:

- Running the Stand Alone IOCP Program.
- Edit IOCD statements. (Adding Deleting or Modifying)
- Interpret customer IOPD frames
- Assist customer in defining I/O problems
- Use I/O Interface Trace
- Use IOP Trace
- Attach CHIM and SCAM
- Relate channel and I/O errors to channel, path or link
- Isolate internal or external Interface Control Checks (IFCC)
- Isolate channel interface problems to one channel
- Isolate failing device for IFCC
- Configure channel for Single Channel Service (SCS)
- Invoke channel exerciser concurrently with customer operation
- Perform a dynamic channel swap
- Verify channel path connect
- Invoke channel diagnostics and follow recommend service actions
- Introduce PR/SM - LPAR

What You Should Be Able to Do

After completing this unit, you should be able to

Use the available tools and documentation, to assist the customer in identifying, and solving I/O problems which are impacting the system operation. Some of the problems may be acted upon con-

currently with the customer operation, The skills for accomplishing this should also be covered in this topic.

The student should also be able to install a customer supplied IOCDS tape, on the Processor Controller File, in a selected data set, when initially installing the system.

Topic 5.1. Hardware Overview

5.1.1. Channel Hardware Overview

Learning Objective

After completing this activity, you should be able to identify the major components in the Channel Subsystem.

Supporting Activities

- The major components of the Channel Control Element will be explained and located.
- Channel Subsystem Power Supplies will be identified.
- A layout of the Parallel Channel Board will be explained.
- Logic Support Connections for a Channel Element and data flow will be overviewed.
- The Fiber Optic Channel Board layout will be discussed.
- Channel Board combinations (Parallel/Fiber mix) are identified.
- A Lab Project will allow a locations review of the Channel Hardware.

- *B04 9121 Service Information: Processor Service Guide Part 3, Input/Output*, SY27-2612; Chapter 2
- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 4

General Information About 9121 Channels

The 9121 will generate two types of channel failures:

- Channel Control Check (CCC)
- Interface Control Check (IFCC)

CCCs are usually accompanied by an AQE and normal 9121 maintenance procedures are used to repair the fault.

- Channel Control Checks (CCCs) are an indication of an inboard 9121 failure (failure within the 9121 channel hardware).

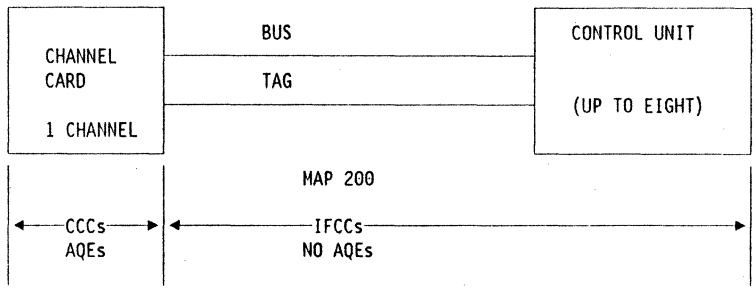
IFCCs are usually accompanied by channel error logs with information indicating the IFCC reason. No AQE will be generated.

- Interface Control Checks (IFCCs) are an indication of an outboard failure (failure outside the 9121 channel hardware).

Note: Problems with the Driver/Receiver circuits in the channel card and cables to the channel I/O tailgate can be the cause of IFCCs and no AQE will be generated even though 9121 channel hardware is at fault. Channel Wraps will isolate problems in this area.

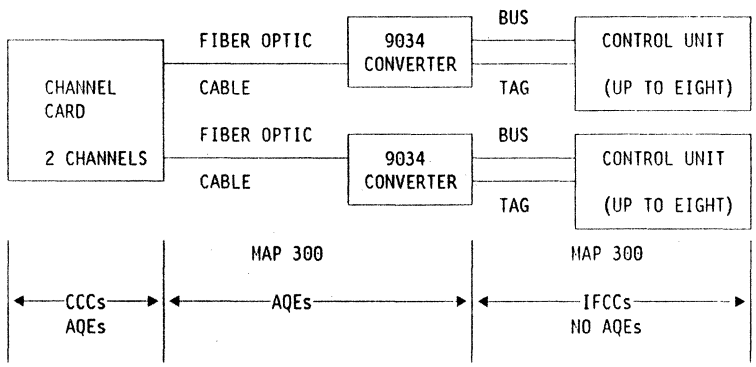
Channel Types Are Shown on the Following Page.

PARALLEL CHANNEL - BUS and TAG - COPPER

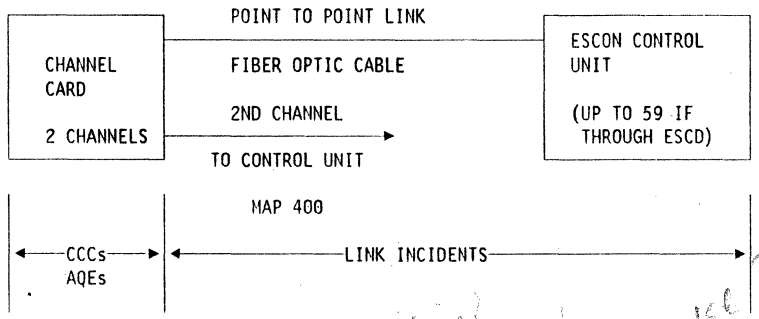


SERIAL CHANNEL - ESCON - FIBER OPTIC - GLASS - PLASTIC

ESCON CONVERSION CHANNEL (CVC)



ESCON CONNECTION CHANNEL (CNC)



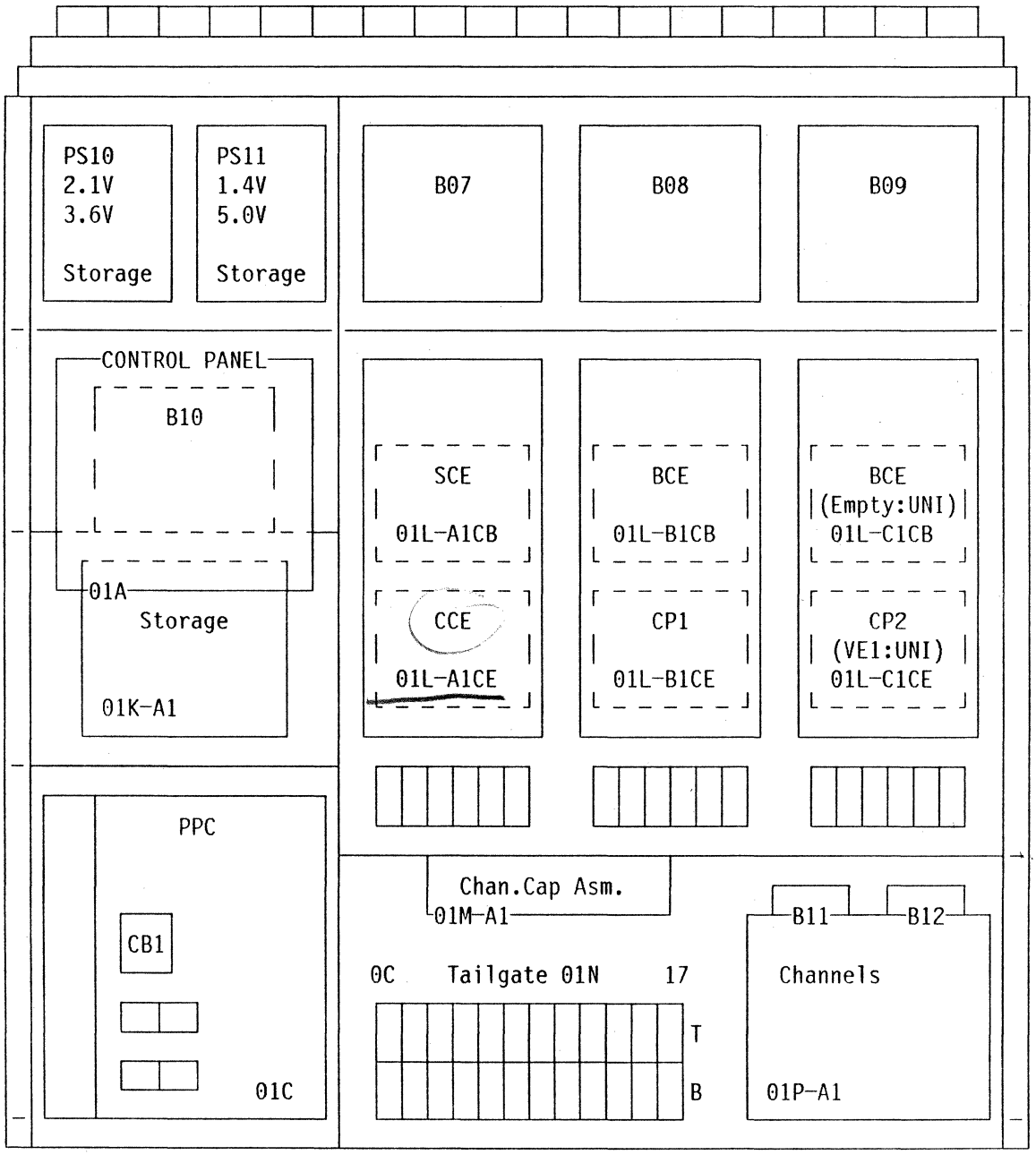
Visual 5-1. Channel Types

Channel Types.

Way to tie 2 Systems Together

A Channel To Channel (CTC) is not shown. It is an ESCON Connection channel from one CPC or Partition to another.

Channel Hardware Locations Front View

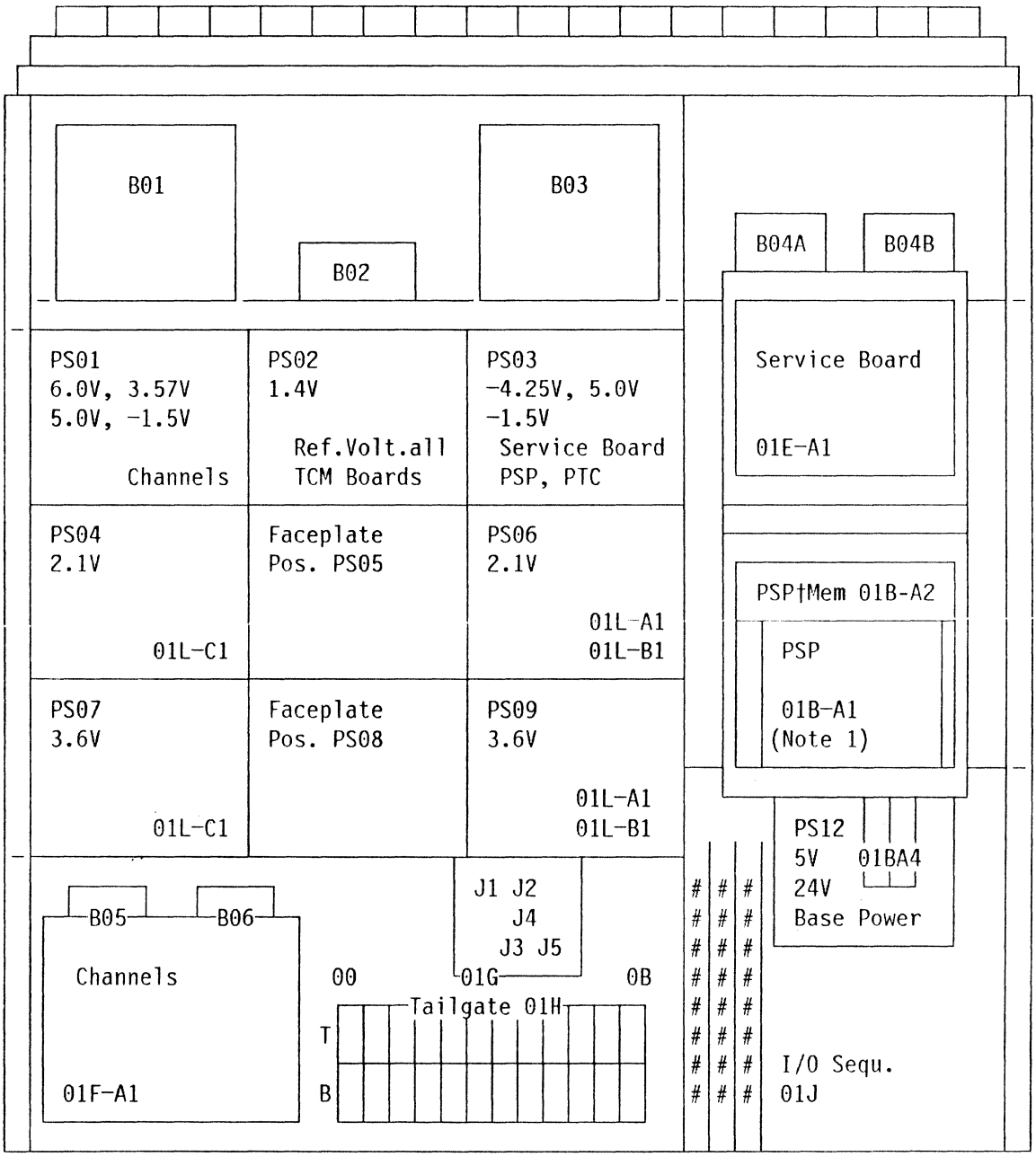


Visual 5-2. Channel Locations

CCI - handles all channel activity

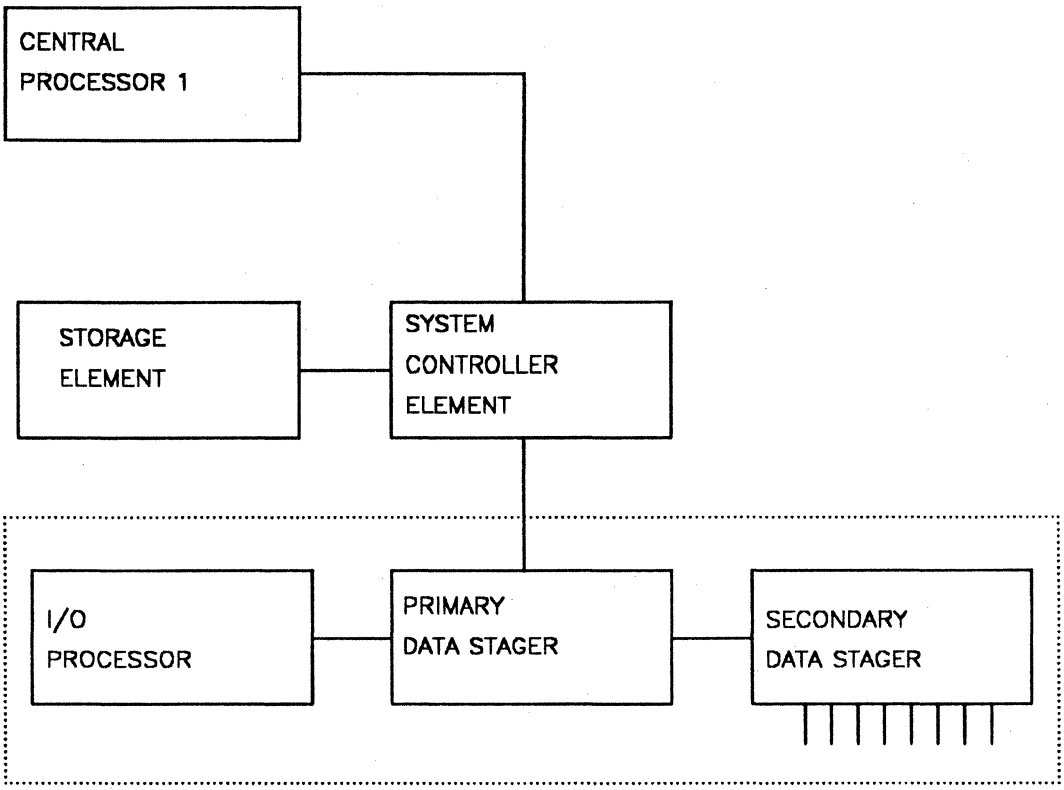
CHI - adapter and 4 channel cards

Channel Hardware Locations Rear View



Note 1) 01B-A3 IPC Planar Board, behind 01B-A1 (same Gate).
01E-A2 PTC Planar Board, behind 01B Gate.

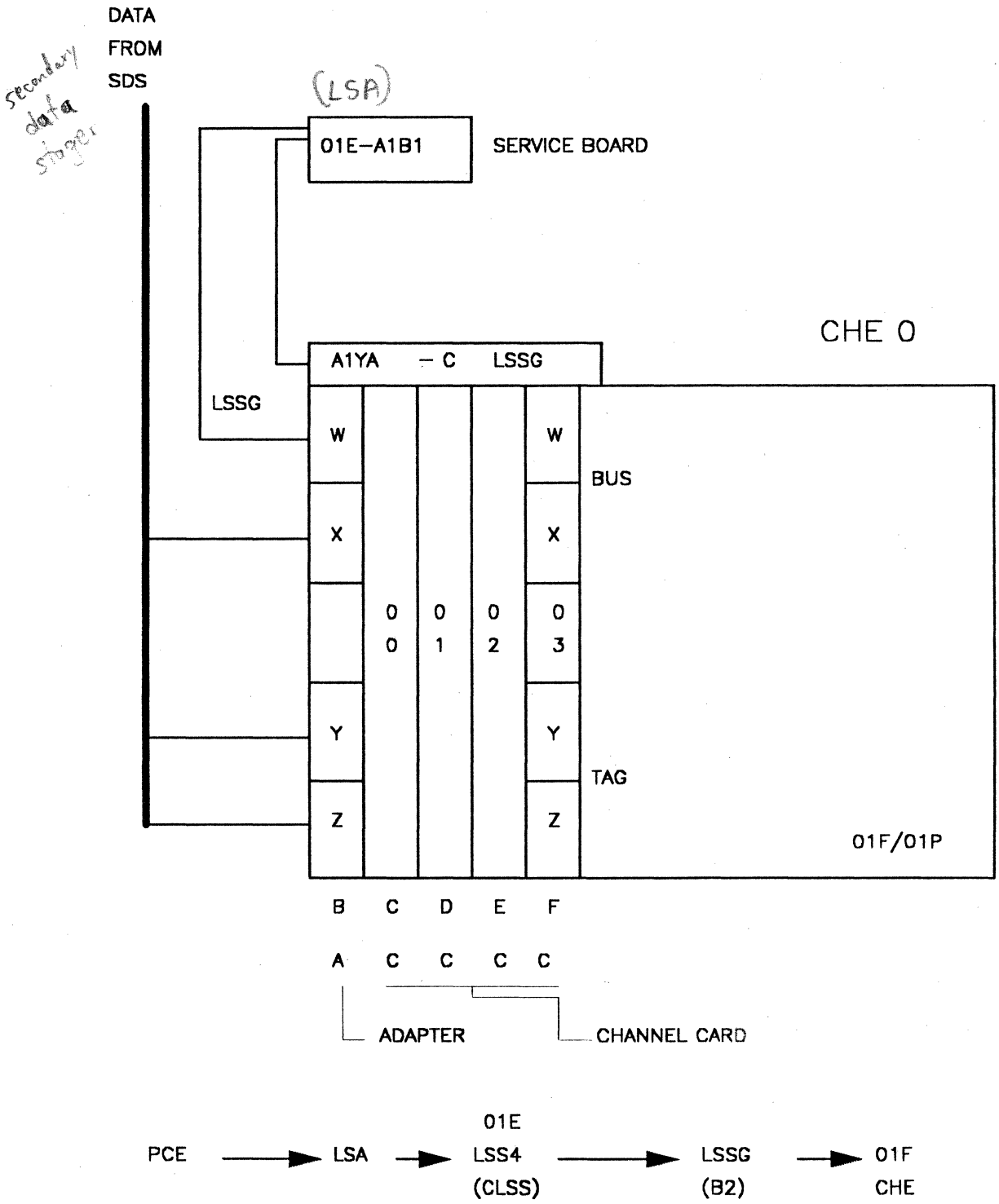
Visual 5-3. Channel Locations



CHANNEL CONTROL ELEMENT
TCM 01L–A1CE

Visual 5-4. CCE

Channel Control Element



Visual 5-5. Channel Board

Channel Board Notes

- Channel Element 0 (Chn 0-3)
- Channel Adapter 0 (01F A1B2)
- See B04 Locations for Cables

Topic 5.2. Channel Service Facilities

5.2.1. Channel Service Facilities

Learning Objective

After completing this activity, you should be able to identify the different channel service facilities that are available by access levels and service modes.

Supporting Activities

- The Channel Service Facilities available in the 9121 Complex will be overviewed using *Vol. B04 I/O Service Guide, Service Aids*
- Access levels needed to use Channel Service Facilities will be defined during this objective referencing *Vol. D02 Frames*.
- Customer, Servmode, and Servpart configurations will be summarized.
- Implementation of the Channel Service Facilities will be exercised in the lab on your 9121 Complex.

Table 5-1. Channel Service Facility

FRAME NAME	ACCESS LEVEL	CONSOLE	NORMAL MODE	PARTIAL SERVICE	SERVICE MODE	CP MODE
ACCESS	1 or 2	Both	yes	yes	yes	ESA or LPAR
CHDIAG	1 or 2	Service	no	yes	yes	ESA or LPAR
CHERLG	1 or 2	Service	yes	yes	yes	ESA or LPAR
CHEVNT	1 or 2	Service	no	yes	yes	ESA or LPAR
CHEXER	1 or 2	Service	no	yes	yes	ESA or LPAR
CHNCFA	1 or 2	System	yes	no	no	ESA or LPAR
		Service	no	yes	yes	ESA or LPAR
CHSVC	1 or 2	Service	no	yes	yes	ESA or LPAR
CHUCW	1 or 2	Service	no	yes	yes	ESA or LPAR
CONFIG	1 or 2	System	yes	no	no	ESA or LPAR
		Service	no	no	yes	ESA or LPAR
IOCDS	1 only	System	yes	yes	yes	ESA or LPAR
IOCDSM	1 or 2	System	yes	yes	no	ESA or LPAR
IOPD	1 or 2	System	yes	no	no	both
		Service	no	no	yes	ESA or LPAR
IOPTDP	1 or 2	System	no	no	yes	ESA or LPAR
IOPTRC	1 or 2	System	no	no	yes	ESA or LPAR
LPCHNA	1 or 2	System	yes	yes	no	LPAR
		Service	no	no	yes	LPAR
LPCHND	1 or 2	System	yes	no	no	LPAR
		Service	no	no	yes	LPAR
MANFE	1 or 2	Service	no	no	yes	ESA or LPAR
SAD	1 or 2	System	yes	yes	no	ESA or LPAR
		Service	no	no	yes	ESA or LPAR

Channel Service Facilities:

- The Service Guide along with the Maintenance Procedures assist the Customer Engineer with Console Access, Service Language Commands, and configurations associated with using the Channel Service Facilities.
- Control of Channel Service Facilities is accomplished by the proper utilization of the many display frames relating to channels.
- The Access Control Frame is used to enable additional frames that allow additional channel service functions and commands to be performed.
- In some cases, all or part of the customers' configuration is required to invoke a specific channel facility. The proper configuration is established by using Service Language Commands and Access Control.

- Student Notes

5.2.2. I/O Service Guide Vol. B04

Learning Objective

After completing this activity, you should be able to enter the I/O Service Guide to begin I/O problem analysis.

Supporting Activities

- The I/O Service Guide, Vol. B04, will be used in the classroom to familiarize the student with the Maintenance Analysis Procedures used for I/O problem analysis in the 9121 Processor Complex.
- An overview of Vol. B04 structure will be presented in class.
- A problem with a Parallel Channel will be used as an example entry into the I/O Service Guide.

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

```
                                                          dd mmm yy  hh:mm:ss
                  Channel Summary Status (ESA/370 Mode) (1 of 2)  (IOPD)-11

  CHP  PHY  CHN
  ID   ADR  TYP  SW  LINK  CUADD  UA   STATE      STATUS
  00   ..   BYT  ..  ..      .   12   ........   ..........
  01   ..   BLK  ..  ..      .   03   ........   LOG
  02   03   BLK  ..  ..      .   45   ........   ..........
  03   02   BLK  ..  ..      .   ..   ........   ..........
  04   ..   BYT  ..  ..      .   ..   ........   PERM ERROR
  05   ..   BLK  ..  ..      .   ..   ........   ..........
  06   ..   BLK  ..  ..      .   ..   ........   CHECK STOP
  07   ..   BLK  ..  ..      .   ..   RESERVED   SERVICE
  08   ..   BLK  ..  ..      .   1B   ........   ..........
  09   ..   BLK  ..  ..      .   ..   ........   TEST
  0A   ..   BLK  ..  ..      .   ..   STANDBY    ..........
  0B   ..   BLK  ..  ..      .   ..   ........   ..........
  0C   ..   BLK  ..  ..      .   ..   RESERVED   UNDEFINED
  0D   ..   BLK  ..  ..      .   ..   ........   ..........
  0E   ..   BLK  ..  ..      .   ..   ........   ..........
  0F   ..   BLK  ..  ..      .   67   ........   IFCC

COMMAND ==>
```

Visual 5-6. (IOPD)-11 Channel Summary Status Frame

(IOPD)-11 Channel Summary Status Frame

I/O Service Guide

- Always begin problem analysis with the B01 Start MAPS
- The channel start MAPS will have you select the IOPD Channel Summary Status frame to determine the type of channel.
- Student Notes

5.2.3. Channel Error Logs

Learning Objective

After completing this activity, you should be able to interpret the various logs available for analyzing Channel related problems by correctly using the Channel Error Log Frames.

Supporting Activities

- The Channel Error Log Frames (CHERLG) will be examined using a Parallel Chpid as an example Channel problem.
- Define the Channel problem as being internal or external to the 9121 Processor Complex by analyzing the logs.
- Channel Control Check Maintenance Procedures will be discussed.
- Interface Control Check analysis procedures will be overviewed using example logs and the I/O Service Guide.
- Channel logs will be analyzed in the lab.

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617;
- *B04 9121 Service Information: Processor Service Guide Part 3, Input/Output*, SY27-2612; Section 1-55

```
                                                        dd mmm yy  hh:mm:ss
                          Channel Error Log Index                 <CHERLG>

 A= SELECT LOG (1-34)                          B= DISPLAY
   1. 08 July 90 23:19:03.22 CH00
   2. 08 July 90 18:01:01.29 CH00
   3. 08 July 90 05:11:01.15 CH03
   4. 08 July 90 03:15:06.49 CH00
   5. 07 July 90 18:39:01.06 CH05
   6. 07 July 90 13:21:01.15 CH01
   7. 07 July 90 11:10:15.23 CH05
   8. 06 July 90 21:10:15.01 CH00
   9. 06 July 90 13:27:10.33 CH00
  10. 06 July 90 00:01:01.22 CH05

 C= SELECT                                     D= ERROR TYPE
-> 1. All Channels                            -> 1. I/O Interface Errors
  X2. All Channel Adapters                       2. Channel Control Checks
   3. Specific Channels
  X4. Specific Channel Adapter

 More data below: Press FWD.                                    (  148)
COMMAND ==>D2
```

Visual 5-7. CHANNEL ERROR LOG Frame Index (initial entry)

<CHERLGL> Log Index

- This is the frame displayed when entering F CHERLG on the Command line or when invoked on the INDEX0 frame.
- The C1 option has been selected on this frame to display a list of all the Channel Error logs.
- By default, the D1 selection is active when first displaying CHERLG.
- Student Notes

```
                                                    dd mmm yy  hh:mm:ss
                          Channel Error Log Index                <CHERLG>

 A= SELECT LOG (1)                          B= DISPLAY
-> 1. 08 July 90 05:11:01.15 CH03            1. CHPID Log
                                             2. Interface Trace
                                            X3. Formatted Logs









 C= SELECT                                  D= ERROR TYPE
-> 1. All Channels                            1. I/O Interface Errors
  X2. All Channel Adapters                 -> 2. Channel Control Checks
   3. Specific Channels
  X4. Specific Channel Adapter

 Press REFRESH to reslect A-Group.                                 (58504)
COMMAND ==>B1
```

Visual 5-8. CHANNEL ERROR LOG Frame Index (Parallel log selected)

<CHERLGL> Parallel Log Selected

- This is the frame display after a log for a parallel Channel has been selected.
- The B option shows the logs available for this selection.
- Channel Control Check log present, Chpid Log available (B1 entry)
- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                              CHPID Log                             <CHERLG>

Date: 08 JUL 90        Channel: CHCX03          CHPID: 03
Time: 05:11:01.15      Log ID: D0               Channel Location: 01F-A1-F

CHANNEL ERRORS          0     SUBCHANNEL STATE              CONFIGURATION DATA
Multi Intag             0     PSB/STATS          C4 60      Dynamic Pathing      1
Bus-In Parity Err       0     CUCW Status           50      Enable Sim IO        1
Invalid Interface Act   0                                   Enable Time-O        1
Invalid Adr-In Change   0     ERROR REPORT DATA             Enable Dev Trace     0
Invalid Sta-In Change   0     Unit Address           A0     Streaming/4.5 meg   10
Invalid Svc-In Change   0     Sequence Code           n     IOCP Configured      1
Invalid Dat-In Change   0     Termination Code = SEL RST    Byte Mpx             0
I/O Driver Short        1     Opl,Adr,Sel Out       000     CU Field            10
Invalid Sel-In Change   0     Cmd,Sup Out            00
Invalid Dis-In          0     Svc,Dat Out            00
Invalid Opl-In          0     Opl,Sta,Sel In        000
Interface Time-Out      0     Adr,Req,Svc/Dat In    001
Injected Error          0     Dat/Mark/Dis-In       010
PROG Detected Err ID   80     Bus-In                 F0


COMMAND ==>
```

Visual 5-9. CHIPID Log Frame (Parallel log selected)

<CHERLGL> CHPID Log

- This is the frame displayed after a specific log with a Channel Control Check, CHPID Log present has been selected.
- CHPID Log Analysis reference is in the I/O Service Guide pg.1-14.
- Student Notes

```
                                                    dd mmm yy  hh:mm:ss
                          Channel Error Log Index                <CHERLG>

 A= SELECT LOG (1-34)                    B= DISPLAY (1-2)
-> 1. 08 July 90 23:19:03.22 CH00         1. CHPID Log
   2. 08 July 90 18:01:01.29 CH00         2. Interface Trace
   3. 08 July 90 05:11:01.15 CH03        X3. Formatted Logs
   4. 08 July 90 03:15:06.49 CH00
   5. 07 July 90 18:39:01.06 CH10
   6. 07 July 90 13:21:01.15 CH01
   7. 07 July 90 11:10:15.23 CH05
   8. 06 July 90 21:10:15.01 CH00
   9. 06 July 90 13:27:10.33 CH00
  10. 06 July 90 00:01:01.22 CH05

 C= SELECT                               D= ERROR TYPE
-> 1. All Channels                      -> 1. I/O Interface Errors
  X2. All Channel Adapters                 2. Channel Control Checks
   3. Specific Channels
  X4. Specific Channel Adapter

 Press REFRESH to reslect A-Group.                                (58504)
COMMAND ==>B2
```

Visual 5-10. CHANNEL ERROR LOG Frame Index (I/F Errors present)

<CHERLGL> Log Index (log A1 selected, Interface errors present)

- To display the associated interface trace for this log the B2 selection must be entered on the command line.
- Student Notes

```
                                                          dd mmm yy  hh:mm:ss
                              I/O Interface Trace (1 of 2)          <CHERLG>

     EVENT NR 60------69 70------79 80------89 90------99 100----109 110----119
  1   OPL-OUT 1111111111 1111111111 1111111111 1111111111 1111111111 1111111111

  2   SUP-OUT ---------- ---------- ---------- ---------- ---------- -1111-----
  3   ADR-OUT -11------- 11-------1 1-------11 -------11- ------11-- ---11-----
  4   SEL-OUT --111111-- -111111--- 111111---1 11111---11 1111---111 1---111111
  5    OPL-IN --1111111- -1111111-- 1111111--1 111111--11 11111--111 11--111111
  6    ADR-IN ---11----- --111----- -11------- 11-------1 1-------11 -----11---
  7   CMD-OUT ----1----- ---1------ --1------- -1-------- 1--------1 ------1---
  8    STA-IN -----1111- ----1111-- ---1111--- --1111---- -1111----- 11-----111
  9   SRV-OUT 1-----1-11 -----1-11- ----1-11-- ---1-11--- --1-11---- -11-----1-
 10    REQ-IN ---------- ---------- ---------- ---------- ---------- ----------
 11    SEL-IN ---------- ---------- ---------- ---------- ---------- ----------
 12  B-OUT 0-3 0FFF000000 FFFFFF000F FF000000FF F000000FFF FFF000FFF0 000FFF0000
 13  B-OUT 4-7 3000777000 0007770000 0044440000 0777000000 7770000003 3000006666
 14  BUSIN 0-3 000FF00000 00FF000000 0FF0000000 FF0000000F F0000000FF 00000FF000
 15  BUSIN 4-7 CCC0000CCC CC0000CCCC C0000CCCCC 0000CCCCC0 000CCCCC00 CCCCC0000E
 LOG: 06 Jun 90 15:14:47.45                                 Channel: CHCX07
  Swap line __     with line __

COMMAND ==>
```

Visual 5-11. I/O INTERFACE TRACE (1 of 2)

<CHERLGL> I/O Interface Trace (1 of 2)

- I/F Trace Analysis reference is in the I/O Service Guide pg.1-31.
- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                          I/O Interface Trace (2 of 2)            <CHERLG>

     EVENT NR 60------69 70------79 80------89 90------99 100----109 110----119
 16    DAT-OUT 1------111 1-------11 11------11 1----1-1-1 1-------11 1------111
 17     DIS-IN ----11--1- -1-1-1-1-1 -1-1-1-1-- -1-1-1-1-- --1-1-1-1- -1111-----
 18  DAT/MK-IN -11-1111-- 111111---1 1111111-11 --1111111- --1111111- -1111-111-
 19 SRV/DAT-IN --111--1-- -111--1--- 1111-----1 11------11 11-1---111 ----1-----
 20       STRM --111--1-- -111--1--- 1111-----1 11------11 11-1---111 ----1-----









 LOG: 06 Jun 90 15:14:47.45                              Channel: CHCX07
  Swap line __     with line __

COMMAND ==>
```

Visual 5-12. I/O INTERFACE TRACE (2 of 2)

<CHERLGL> I/O Interface Trace (2 of 2)

- I/F Trace Analysis reference is in the I/O Service Guide pg.1-31.
- Student Notes

5.2.4. Channel Diagnostics

Learning Objective

After completing this activity, you should be able to invoke channel diagnostics and follow the recommended service actions.

Supporting Activities

- The invocation and use of Channel Diagnostics will be discussed.
- The Maintenance Procedures for the 9121 Processor Complex in diagnosing I/O and channel problems is summarized.
- A failing channel on the 9121 will be diagnosed in the lab.
- The problem will be resolved by using the proper service actions.
- Channel Diagnostic Procedures will be covered in a later topic.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
        XXXX - XX          20027             C64928              L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
    X 1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
    X 2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
    X 3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
    X 4. Open FRU Replacement (OPENREP)
    X 5. Resolve FRU/External Component Channel AQEs (FECREP)

                                                          AQEID => _______
 Specify an AQEID, or Select A1 to review list of all AQEs              (59001)

COMMAND ==>D3


I  2A   A:a MODE            S ()              PA
```

Visual 5-13. MAINTENANCE PROCEDURES INDEX (CHDIAG entry)

<MPINDX> Entry For CHDIAG

- Concurrent Channel Diagnostics are available on the 9121 Complex.
- The Maintenance Procedures Index can be used to invoke the manual channel diagnostics frame CHDIAG.
- The D3 option has been selected on this frame to display the next visual- Channel Diagnostic Monitor Frame.
- The Chpid must be out of the configuration in order to test.
- Service Language is used to allow concurrent Chpid testing.
- Student Notes

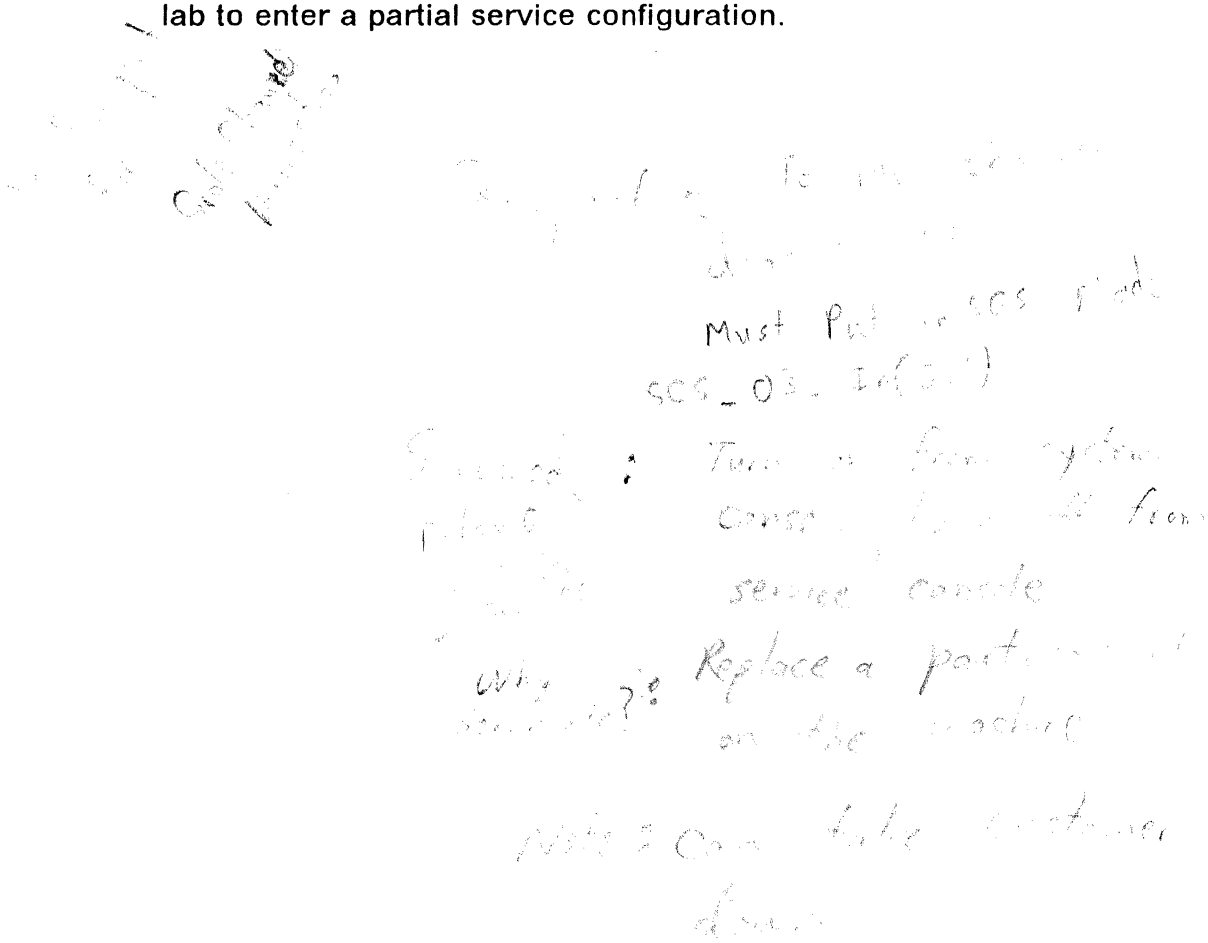
5.2.5. Partial Service Mode

Learning Objective

After completing this activity, you should be able to use the diagnostic tests to isolate a given failure in partial service mode.

Supporting Activities

- Partial Service Mode will be discussed in order to understand the need for a partial service configuration.
- The service language command **SERVPART** will be used in the lab to enter a partial service configuration.



Partial Service Mode

- When the customer is running an operating system, the reconfigurable elements of the complex such as CPs, storage, and CHPIDs are "assigned" to, or "configured " to, that operating system.

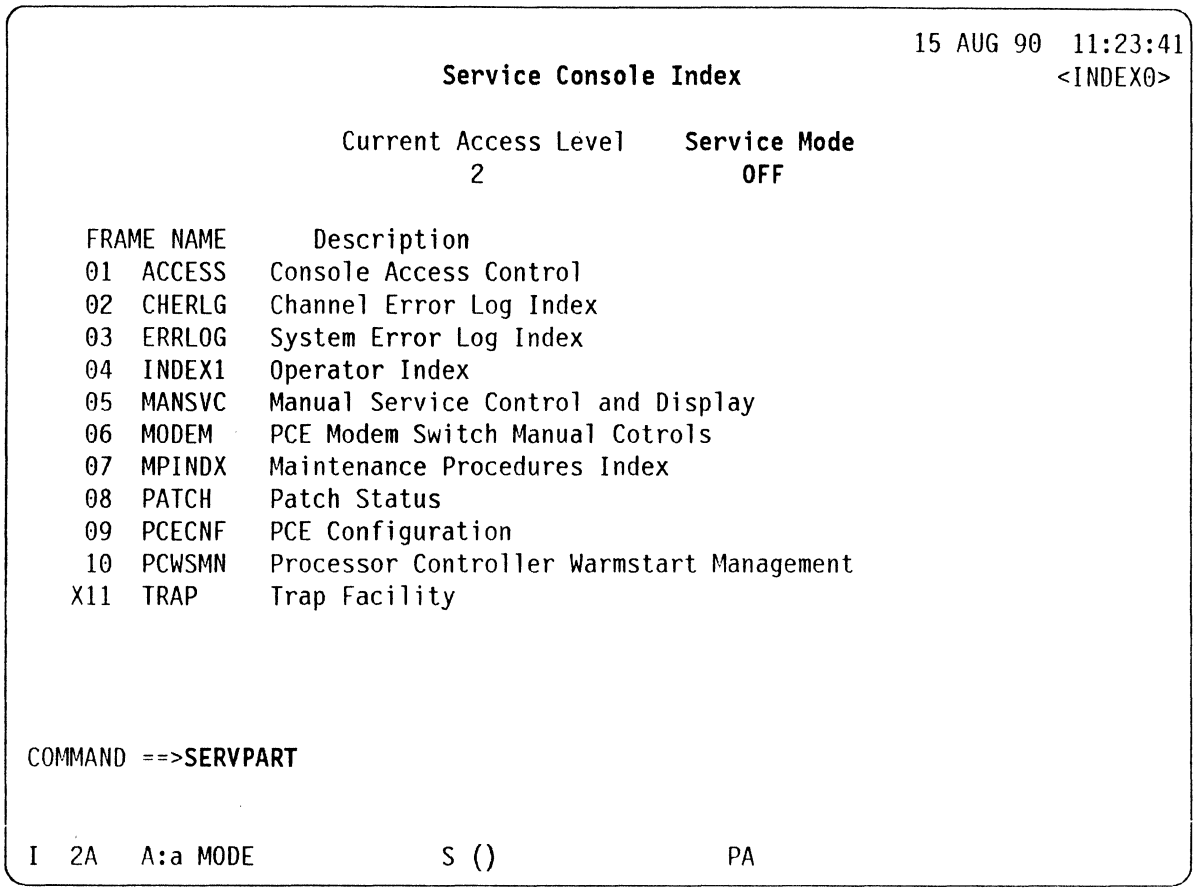
- Attempts to run channel diagnostics to a configured CHPID will result in disaster to the customer; therefore, a service facility has been built into the 9121 that allows one or more of the many CHPIDs to be isolated for testing, with no impact to the customer.

- Partial Service Mode is used specifically to facilitate the concurrent testing of a CHPID. The path is first logically removed from the customer's configuration by the operator varying offline the logical path to devices using CHPID X. If the devices using CHPID X have multiple paths (from other CHPIDS), the CONFIG command can be used to remove the CHPID and path.

- The CHPID can be configured offline by the operator (required if the operating system is running), or by using the Service Language Command (SLC) **CHPID XX OFF** on the logical System Console. Using the SLC informs the Channel Subsystem but the software has no current record of the unavailability of the CHPID.

- The **SERVPART** Service Language Command is entered at the IOSP logical Service Console to "condition" the complex for the removal of a CHPID for testing. **SERVPART** is used only for the partial service mode **required for CHPID testing concurrent with customer operation**. **SERVMODE** should **never** be used for CHPID testing concurrent with customer operations because it releases the **entire configuration** when the CHPID tests start.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x



Visual 5-14. SERVICE CONSOLE INDEX (Entering Servpart)

<INDEX0> Enter Servpart on Service Console

- CHPIDs are part of the 9121's hardware and software configuration.
- The CHPID must be removed from the configuration in order to test.
- Operator Commands are used to isolate the CHPID for testing.
- The Service Language Command **SERVPART** is used to condition the complex enabling *concurrent* CHPID testing.
- Student Notes

```
                                                          15 AUG 90  11:23:41
                          Service Console Index                      <INDEX0>

                      Current Access Level     Service Mode
                              2                    SERVPART

    FRAME NAME      Description
     01   ACCESS    Console Access Control
     02   CHERLG    Channel Error Log Index
     03   ERRLOG    System Error Log Index
     04   INDEX1    Operator Index
     05   MANSVC    Manual Service Control and Display
     06   MODEM     PCE Modem Switch Manual Cotrols
     07   MPINDX    Maintenance Procedures Index
     08   PATCH     Patch Status
     09   PCECNF    PCE Configuration
     10   PCWSMN    Processor Controller Warmstart Management
    X11   TRAP      Trap Facility


Command SERVPART completed successfully

COMMAND ==>


I  2A   A:a MODE              S ()                 PA
```

Visual 5-15. SERVICE CONSOLE INDEX (Servpart On)

<*INDEX0*> *Service Console, Servpart Active*

- Student Notes

5.2.6. Single Channel Service

Learning Objective

After completing this activity, you should be able to use the procedure necessary to place a channel in Single Channel Service in order to run diagnostics concurrent with customer operations.

Supporting Activities

- Referencing Vol. B04 *Service Aids, Single Channel Service*, the following will be covered:
  - Placing a CHPID into Single Channel Service
  - Restoring a CHPID in SCS to Operating Mode
  - Placing a CHPID into SCS from Partial Service Mode
  - Restoring a CHPID in SCS to Operation/ Maintaining Servpart
- Diagnostic Monitor, Results, and FRU Replacement frames will be overviewed.
- Single Channel Service (Service Language Command) will be used by the Customer Engineer to concurrently isolate a CHPID for testing in the lab.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

```
                                                          dd mmm yy  hh:mm:ss
                Channel Summary Status (ESA/370 Mode) (1 of 2)  (IOPD)-11

 CHP  PHY  CHN
 ID   ADR  TYP  SW  LINK  CUADD  UA   STATE      STATUS
 00   ..   BYT  ..  ..      .   12   ........   ..........
 01   ..   BLK  ..  ..      .   03   ........   LOG
 02   03   BLK  ..  ..      .   A2   ........   ..........
 03   02   BLK  ..  ..      .   ..   ........   ..........
 04   ..   BYT  ..  ..      .   ..   ........   PERM ERROR
 05   ..   BLK  ..  ..      .   ..   ........   ..........
 06   ..   BLK  ..  ..      .   ..   RESERVED   SERVICE
 07   ..   BLK  ..  ..      .   ..   ........   CHECK STOP
 08   ..   BLK  ..  ..      .   1B   ........   ..........
 09   ..   BLK  ..  ..      .   ..   ........   TEST
 0A   ..   BLK  ..  ..      .   ..   STANDBY    ..........
 0B   ..   BLK  ..  ..      .   ..   ........   ..........
 0C   ..   BLK  ..  ..      .   ..   RESERVED   UNDEFINED
 0D   ..   BLK  ..  ..      .   ..   ........   ..........
 0E   ..   BLK  ..  ..      .   ..   ........   ..........
 0F   ..   BLK  ..  ..      .   67   ........   IFCC

COMMAND ==>
```

Visual 5-16. Channel Summary Status Frame (IOPD)-11

(IOPD)-11 Single Channel Service Indication

- Chpid 06 is shown to be in SCS (Single Channel Service) Mode.
- A Chpid must be out of the configuration to be placed in SCS.
- Use this frame to see the true Chpid status (availability).
- Student Notes

```
                                                    dd mmm yy hh:mm:ss
              Channel Configuration (ESA/370 Mode)          (CHNCFA)

CHPID       = 0000 0000 0000 0000 1111 1111 1111 1111
              0123 4567 89AB CDEF 0123 4567 89AB CDEF      TYPE
 TYPE       = YYBB YYBB BBBB BBBB BBBB BBBB VVVV VVVV      B = BLOCK
                                                           Y = BYTE
RESERVED    = ---- --S- ---- ---- -E-- ---- ---- S---      V = CV CHANNEL
STANDBY     = ---- ++-- ---- --C+ ---- --+- ---- ----      C = CHAN TO CHAN
ONLINE      = ++++ ---+ ++C+ -+-- *-+* *+-+ ++*+ -+*C      N = CN CHANNEL

CHPID       = 2222 2222 2222 2222                          LEGEND
              0123 4567 89AB CDEF                          + = YES
TYPE        = NNVV CVNN NNCC NNNN                        - = NO
                                                         E = DEF'N ERRO
RESERVED    = ---- ---- ---- SE--                        U = UNDEFINED
STANDBY     = ---- ++-- --+- --C+                        S = SERVICE
ONLINE      = ++++ --++ *+-+ ----                        C = CHECK STOP
                                                         X = ERROR




COMMAND ==> SCS 06 IN (or OUT)
```

Visual 5-17. Channel Configuration Frame

(CHNCFA) Single Channel Service Indication

- Chpid 06 is shown to be in SCS (Single Channel Service) Mode.
- A Chpid must be out of the configuration to be placed in SCS.

- Student Notes

```
                                                    dd mmm yy  hh:mm:ss
                          Channel Diagnostic Monitor                <CHDIAG>

A= HARDWARE SELECTION                      C= RUN OPTIONS
  1. All                                     1. Stop On Error
X 2. Specific CHE (HEX) : __ __ __ __        2. Loop On Test
  3. Specific CHPID(Hex) : __ __ __ __       3. Loop On Error
X 4. CHE Range(HEX) : __ to __               4. Disable Error Reporting
  5. CHPID Range(Hex) : __ to __


B= TEST SELECTION                          D= EXECUTION CONTROLS
  1. Standard Tests                          1. Start
  2. Terminator Wrap                         2. Restart
  3. Test Case Name ________                 3. Terminate
  4. Optical Power Measurement               4. Display Results
  5. ES Conversion Remote Wrap               5. Display Test Configuration


  Note: See CHDIAG in "Service Information: Frames" before using A3 or A5

COMMAND ==>
```

Visual 5-18. Channel Diagnostic Monitor Frame (as first invoked)

<CHDIAG> Channel Diagnostic Monitor Frame

- Student Notes

```
                                                    dd mmm yy  hh:mm:ss
                          Channel Diagnostic Monitor                <CHDIAG>

 A= HARDWARE SELECTION                        C= RUN OPTIONS
   1. All                                       1. Stop On Error
 X 2. Specific CHE (HEX) : __ __ __ __          2. Loop On Test
->3. Specific CHPID(Hex) : 06 __ __ __          3. Loop On Error
 X 4. CHE Range(HEX) : __ to __                 4. Disable Error Reporting
   5. CHPID Range(Hex) : __ to __


 B= TEST SELECTION                            D= EXECUTION CONTROLS
   1. Standard Tests                            1. Start
   2. Terminator Wrap                           2. Restart
   3. Test Case Name ________                   3. Terminate
   4. Optical Power Measurement                 4. Display Results
   5. ES Conversion Remote Wrap                 5. Display Test Configuration


 Note: See CHDIAG in "Service Information: Frames" before using A3 or A5

COMMAND ==> B1 D1
```

Visual 5-19. Channel Diagnostic Monitor Frame (CHPID, TEST, and START)

<CHDIAG> Channel Diagnostic Monitor Frame

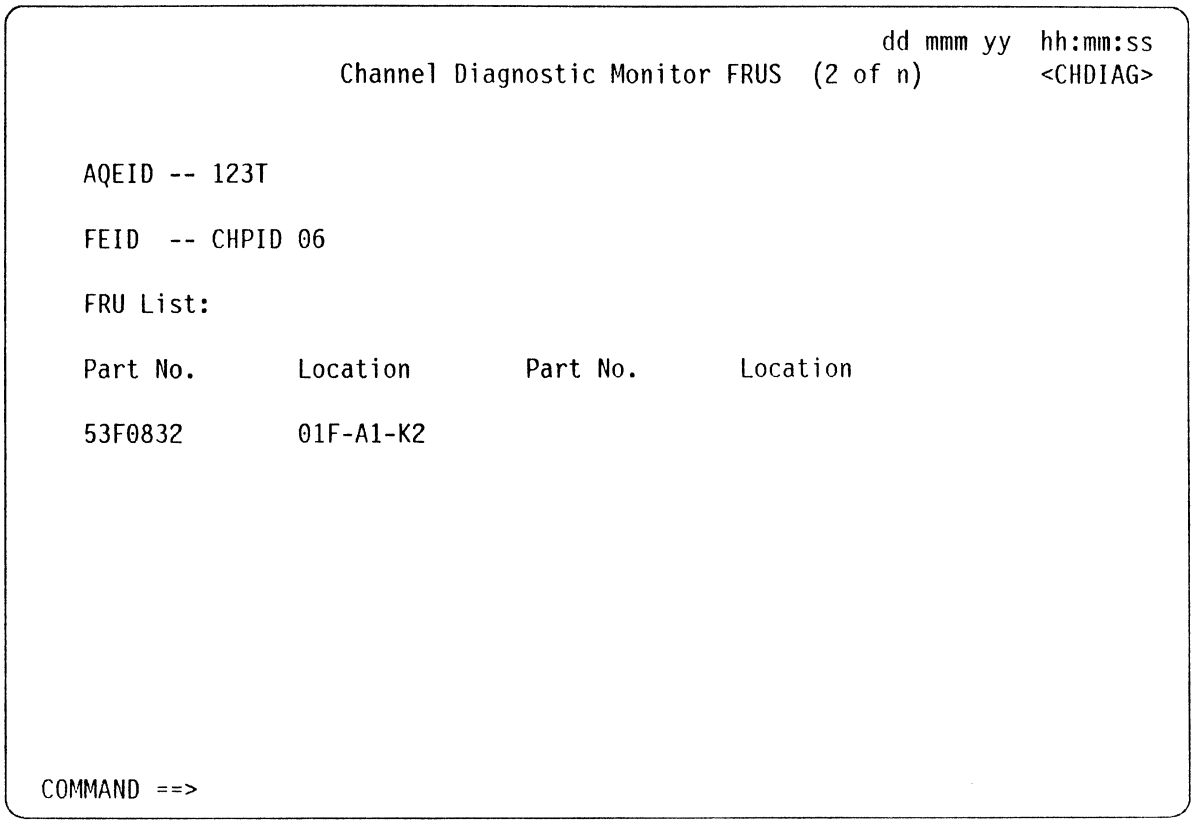
- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                     Channel Diagnostic Monitor Results (1 of n)    <CHDIAG>
Stop On Error Data: Program ID nnn, Error ID xxx, CHE xx or CHPID xx

   CHE            CHPID       CHPID       CHPID       CHPID
   00             00          01          02          03
   01             04          05          06 ERROR    07
   02             08          09          0A          0B
   03             0C          0D          0E          0F
   04             10          11          12          13
   05             14          15          16          17
   06             18          19          1A          1B
   07             1C          1D          1E          1F









COMMAND ==>
```

Visual 5-20. Channel Diagnostic Monitor Results Frame

<CHDIAG> Channel Diagnostic Monitor Results Frame

- Student Notes



Visual 5-21. Channel Diagnostic Monitor FRUS Frame

<CHDIAG> Channel Diagnostic Monitor FRUS Frame

- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                          Channel Test Configuration                <CHDIAG>
                            Service  Configuration



  CHPID  =   0000 0000 0000 0000 1111 1111       1111 1111
             0123 4567 89AB CDEF 0123 4567       89AB CDEF
  STATUS =   UUUU UUSU UUUU UUUU UUUU UUUU       UUUU UUUU

                                                      LEGEND

                                                      A = Available For Test
  CHPID  =   2222 2222 2222 2222                      S = Selected  For Test
             0123 4567 89AB CDEF                      U = Unavailable
  STATUS =   UUUU UUUU UUUU UUUU



COMMAND ==>
```

Visual 5-22. Channel Test Configuration Frame (Service Config.)

<CHDIAG> Channel Test Configuration Frame (Service Config.)

- This frame is displayed with **SERVPART** on.
- The "U" indicates that the channel **is not** in **SCS** mode.
- The "A" indicates that the channel **is** in **SCS** mode.
- The "S" indicates that the channel has been selected for test on the "CHDIAG" frame A3 option.
- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                          Channel Test Configuration                <CHDIAG>
                           Operating  Configuration

CHE    =   00   01   02   03   04   05        06   07
STATUS =   A    U    A    A    A    A         A    A

CHPID  =   0000 0000 0000 0000 1111 1111      1111 1111
           0123 4567 89AB CDEF 0123 4567      89AB CDEF
STATUS =   AAAA AAUA AAAA AAAA AAAA AAAA      AAAA AAAA


CHE    =   08   09   0A   0B                        LEGEND
STATUS =   A    S    A    A
                                                  A = Available For Test
CHPID  =   2222 2222 2222 2222                    S = Selected  For Test
           0123 4567 89AB CDEF                    U = Unavailable
STATUS =   AAAA SSSS AAAA AAAA




COMMAND ==>
```

Visual 5-23. Channel Test Configuration Frame (Operating Config.)

<CHDIAG> Channel Test Configuration Frame (Operating Config.)

- This frame is displayed with **SERVMODE** on.
- The "CHE's" (channel element) are also available for testing when SERVMODE is on.

  Note: Remeber that with SERVMODE ON these diagnostics are **NOT CONCURRENT**
- The "U" indicates that the channel **is** in **SCS** mode and not available for test with SERVMODE ON.
- The "A" indicates that the channel **is not** in **SCS** mode and available for testing.
- The "S" indicates that the channel has been selected for test on the "CHDIAG" frame.
- Student Notes

Topic 5.3. Channel Service Aids

5.3.1. Channel Exerciser

Learning Objective

After completing this activity, you should be able to use the channel exerciser to exercise a tape drive.

Supporting Activities

- The Frames Vol. D02 will be used to introduce the invocation and use of the Channel Exerciser tests.
- In the lab, a CHPID will be selected for use in running the Channel Exerciser tests on the 9121.

Channel Exerciser Introduction

- Entry to **CHEXER** frame is from the **MPINDX** frame
- **SERVPART** and **SCS** is the required configuration
- Testing can be concurrent with customer operation
- The Channel Exerciser can be used for localizing outbound I/O interface errors
- The Maintenance Packages requests Channel Exercisers if no failure occurs after Standard and Wrap Tests are run.

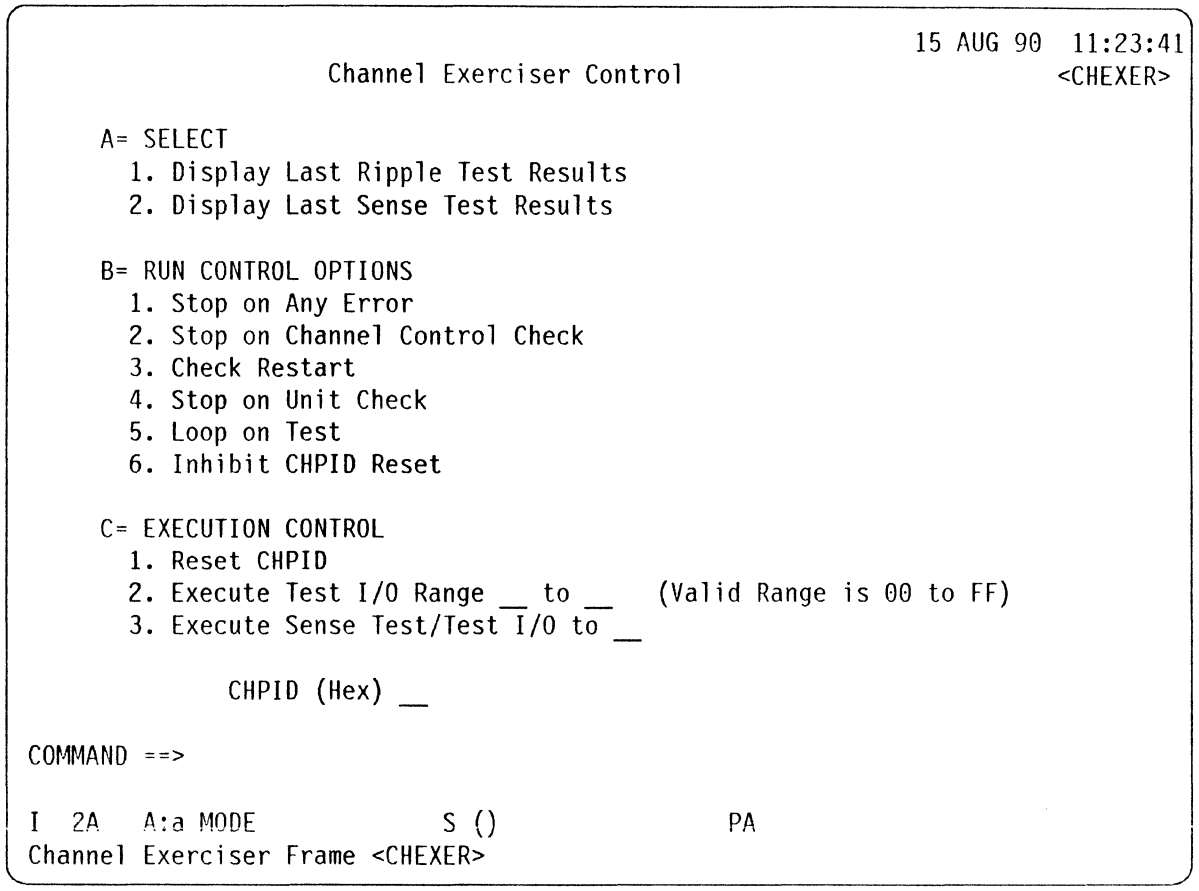
• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

```
                                                        15 AUG 90  11:23:41
                    Maintenance Procedures Index                    <MPINDX>

      MACHINE TYPE       MACHINE S/N      SYSTEM EC LEVEL      VERSION ID
        XXXX - XX          20027             C64928              L300

    A= MANAGEMENT OPERATIONS                C= REPAIR CONFIGURATION
      1. Action Queue (AQ)                    1. Display for an AQE (AQECNF)
      2. Single Action Queue Entry (AQE)
      3. FRU Data (FRU)
                                            D= MANUAL DIAGNOSTICS
                                              1. For Storage (PMAD)
    B= REPAIR ACTION                          2. For Channel Exerciser (CHEXER)
    X 1. Fault Isolation (PTTASK)             3. For Channels (CHDIAG)
    X 2. FRU Replacement (FRUREP)             4. For Installation (MANFE)
    X 3. Replacement Validation (VAL)         5. For Processor Complex (PCX)
    X 4. Open FRU Replacement (OPENREP)
    X 5. Resolve FRU/External Component Channel AQEs (FECREP)

                                                          AQEID => _______
 Specify an AQEID, or Select A1 to review list of all AQEs              (59001)

COMMAND ==>D2


I  2A   A:a MODE            S ()              PA
```

Visual 5-24. Maintenance Procedures Index (CHEXER entry)

<MPINDX> Entry For CHEXER

- Student Notes



Visual 5-25. *** No Title Specified ***

<CHEXER> Frame

- Student Notes

5.3.2. Channel Swap

Learning Objective

After completing this activity, you should be able to perform the necessary steps to accomplish a channel swap.

Supporting Activities

- The Channel Swap Service Aid will be explained using *Vol. B04, I/O Service Guide, Service Aids* section.
- You will be given an opportunity to implement the Channel Swap Service Aid on your 9121 Complex in the lab.

Channel Swap Service Aid Overview:

- The Channel Swap Service Language Command **(CHSWAP)** can be used for three reasons:
  - to isolate internal channel path hardware problems
  - to isolate external interface hardware problems
  - to permit the customer to quickly use a spare CHPID.
- The procedure is accomplished by use of Service Language Commands as directed in *Vol. B04 I/O Service Guide*
- **NOTE:** The operator should use the config command to remove CHPID xx and yy if the system is running. The CHPID xx OFF SLC does not inform the software channel control blocks of the CHPID removal.
- After the logical CHPID swap, ***remember to turn off SERVMODE... or you WILL take the system DOWN !!***
- If you run diagnostics on the broken CHPID, Use **SERVPART**.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

```
                                                          dd mmm yy  hh:mm:ss
                  Channel Summary Status (ESA/370 Mode) (1 of 2)  (IOPD)-11

 CHP  PHY  CHN
 ID   ADR  TYP  SW  LINK  CUADD  UA   STATE      STATUS
 00   ..   BYT  ..  ..      .   12   ........   ..........
 01   ..   BLK  ..  ..      .   03   ........   ..........
 02   03   BLK  ..  ..      .   ..   ........   ..........
 03   02   BLK  ..  ..      .   ..   ........   ..........
 04   ..   BYT  ..  ..      .   ..   ........   ..........
 05   ..   BLK  ..  ..      .   ..   ........   ..........
 06   ..   BLK  ..  ..      .   ..   RESERVED   SERVICE
 07   ..   BLK  ..  ..      .   ..   ........   ..........
 08   ..   BLK  ..  ..      .   1B   ........   TEST
 09   ..   BLK  ..  ..      .   ..   STANDBY    ..........
 0A   ..   BLK  ..  ..      .   ..   ........   ..........
 0B   ..   BLK  ..  ..      .   ..   RESERVED   UNDEFINED
 0C   ..   BLK  ..  ..      .   ..   ........   ..........
 0D   ..   BLK  ..  ..      .   ..   ........   ..........
 0E   ..   BLK  ..  ..      .   ..   ........   IFCC
 0F   ..   BLK  ..  ..      .   67   ........   ..........

COMMAND ==>CHSWAP <RESET> 02 03
```

Visual 5-26. Channel Summary Status (Channel Swap Shown)

Channel Summary Status (IOPD)

- Student Notes

5.3.3. CHIM/SCAM

Learning Objective

After completing this activity, you should be able to setup and connect the Channel Monitor Expanded (CHEX) and Serial Channel Adapter Monitor (SCAM).

Supporting Activities

- The PT-3 and CMEX Hardware will be introduced.
- You will be directed by the next level of support on what options will be used when tracing channel activity.
- *B04 9121 Service Information: Processor Service Guide Part 3, Input/Output*, SY27-2612 chapter 4 contains information on setting up the PT-3/CMEX and SCAM.

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

Topic 5.4. IOCDS Overview

5.4.1. START/END/RESTART Stand-Alone IOCP

Learning Objective

After completing this activity, you should be able to make the proper entries to START, END, or RESTART the stand-alone version of IOCP.

Supporting Activities

This procedure will be used later in the lab to build an initial IOCDS which will allow you to read in a card image CDS tape.

Student Information.

- Before you start this learning activity you should be familiar with IOCDS or Input Output Configuration Data Set. You should Know things about it such as:
  - what it is
  - where it resides
  - how it is activated
  - what it's purpose is.
- This section covers the Stand-Alone program that is used to Read, Write, Create, Edit, Store, and Print reports of the IOCDS.

- *Planning for Installation: Installation Manual-Physical Planning*, GA23-0382 ; Section x-x

IOCDS Introduction

The Input/Output Configuration Data Set (IOCDS) defines all the

- I/O devices
- control units
- CHPIDs

to the channel subsystem hardware.

The IOCDS is given a name and assigned an ID.

- "A2" "Basic1" (example)

IOCDS is written to and resides on the PCE DASD.

The Customer is responsible for creating their IOCDS and putting it on to tape.

You are responsible for loading the customers tape at install time. To load the customers IOCDS tape you can

- modify the "Starter Set" IOCDS (A0)

  - or -

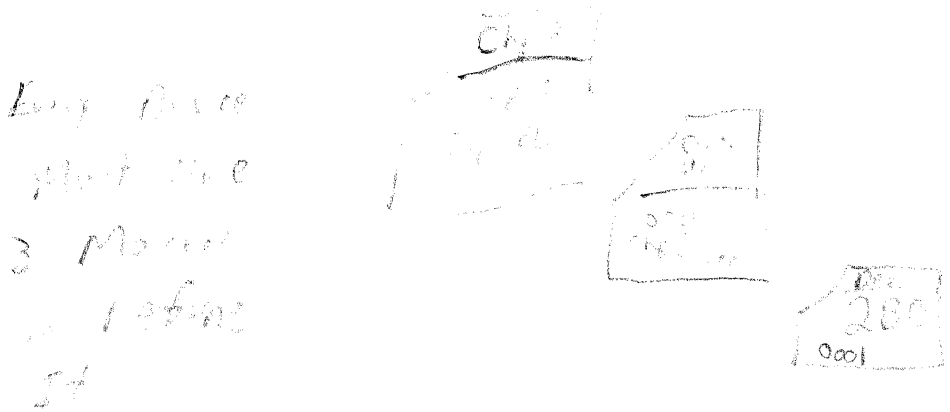
- create a "Minimum" IOCDS (A1)

that will define the tape drive needed to load the customers tape.

The customer can create IOCDS using the IOCP Program running under MVS or VM. The customer also has the ability to update and store new IOCDS files directly to the PCE DASD. This, however, requires that the customer has at least one usable IOCDS already stored on the PCE DASD to complete a POR and IPL from. **You** will use the

- Stand Alone version IOCP program

to load the customers initial IOCDS.



Starting the Stand Alone IOCP Program

The IOCP program will utilize the CPC functional elements (CP, Main Storage, etc.) just as the customers operating system (MVS, VM, etc.).

The Stand Alone IOCP program can be started using one of two methods.

Servmode off:

- Use the System Console in access level 1.
- The A0 (starter) IOCDS selected and power on reset complete
- Enter on the command line "IOCP CP1" (SLC)

- or -

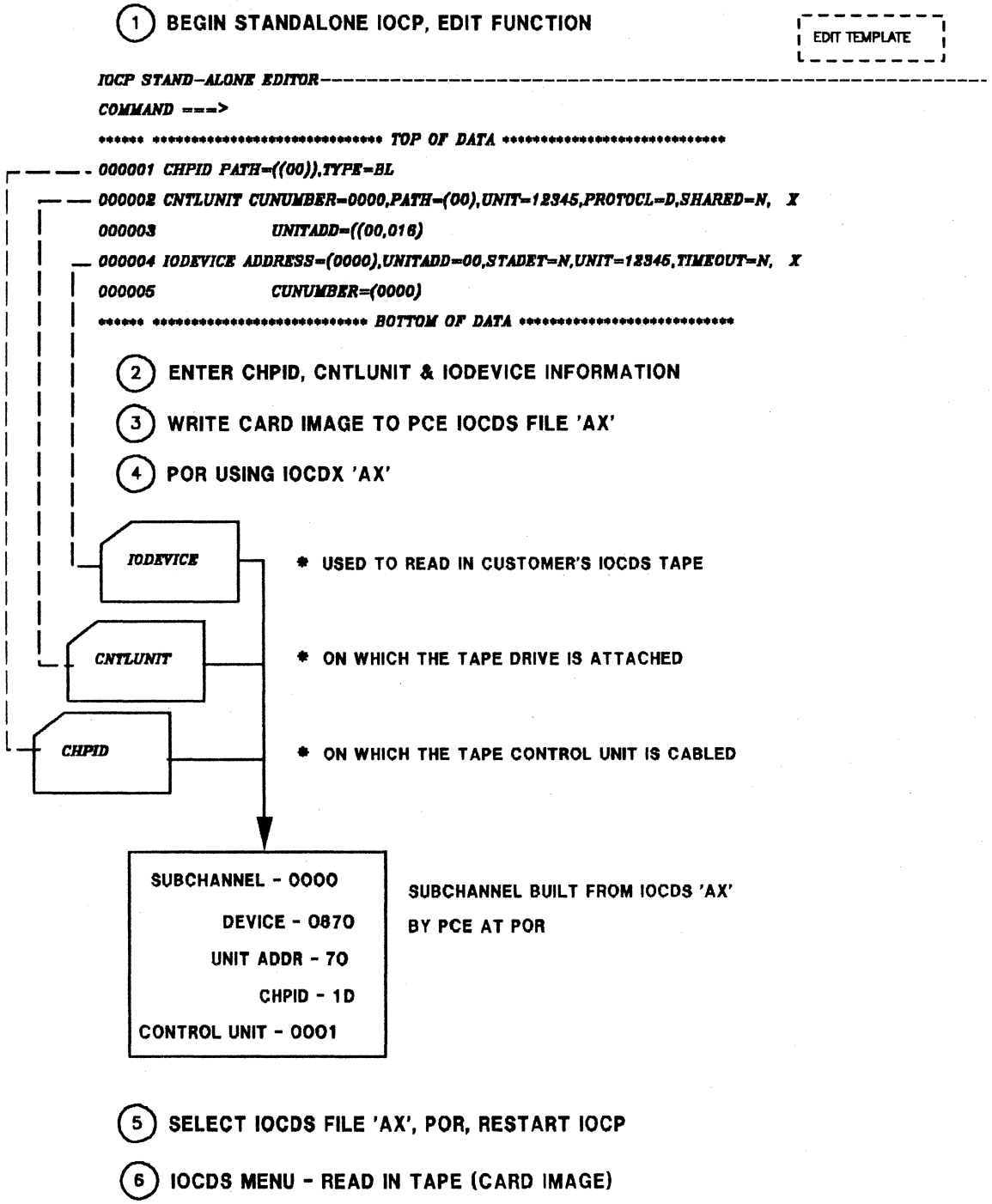
Servmode On

- Use the Service Console (access level 1 not required)
- The A0 (starter) or the D0 (diagnostic) IOCDS selected and power on reset complete.
- Enter on the command line "IOCP CP1" (SLC)

The service language command "IOCP CP1" will initiate the program load from the PCE DASD where the Stand Alone version IOCP resides.

The IOCP will require a "Program Mode Console" The Program Mode console provides all the frames needed to perform IOCP functions.

(This page skipped to align the following page.)



Visual 5-27. IOCDS to UCW relationship

IOCDS to UCW relationship

```
                                                   dd mmm yy   hh mm ss
                         Console assignment

                       PHYSICAL DEVICE PORT : C

     A= ASSIGN CONSOLE                Port
     -> 1. System .................. C
        2. Service ................
     -> 3. Program Mode ............ C
        4. System-Monitor ..........
        5. Service-Monitor .........
        6. Data Bank Access ........
        7. URSF Console ............
        8. Remote Console ..........


    To activate the     Program     console, press END.
    To switch between assigned consoles, press SWAP CONS.

  COMMAND ==>
  sys name
```

Visual 5-28. CONASGN

Vol. A04

Option 1

ASSIGN CONSOLE

- A priority message will indicate that the Program Mode console is required. Make the appropriate entry to activate the console.
- Student Notes

I/O Device Macro

2A0

CNTLUnit Macro

CUNumber= arbitrary number

Path= chpid

Unit Add= beginning unit address

File # 1

Mode Set Card 03

```
                I/O configuration program
                      PRIMARY MENU

Select Menu Number And Enter Below:
     1. Build IOCDS from cards.
     2. Print IOCDS configuration report.
     3. Read IOCDS from the processor controller file.
     4. Write IOCDS to the processor controler file.
     5. Edit IOCDS card image data in storage.



Enter Menu Number  ==>> __




END      RESHOW


 Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-29. PRIMARY MENU

IOCDS Primary Menu

- The Primary Menu will be displayed when the Program Mode Console is activated. The IOCP program is now **UP**!
- 5 menus are available to perform various functions.
- The menu selection entry area is for menu selection only.
- The frame commands allowed, END and RESHOW are entered on the frame command line (bottom left of display).
- Student Notes

```
                  I/O configuration program
                        END IOCP

            ****************************************
            *               ATTENTION              *
            * card images exist in the editor. if  *
            * you exit IOCP the card images and any *
            * IOCDS in storage will be destroyed   *
            ****************************************

   Select command and enter on bottom line:
        -- To Exit IOCP and destroy the card images, enter End.
        -- to continue with IOCP operation, enter Menu.
        -- to bring up the write IOCDS menu, enter Write.




   END      RESHOW     WRITE
   MENU


 Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-30. END IOCDS

END IOCDS

- This frame is displayed if "END" is entered on the command with the Primary Menu displayed.
- This frame only shows if IOCDS has been read into storage.
- There are four (4) frame commands allowed on this frame.
  - END - Terminates IOCP
  - RESHOW - Restores previous IOCP menu
  - Write - Selects the Write IOCDS menu
  - MENU - Selects the Primary Menu
- Student Notes

Study Questions

1. Is a Power On Reset necessary before running stand-alone IOCP ?

   ANSWER : _____

2. What is the command you must enter to start Stand-alone IOCP ?

   ANSWER : _____

3. What console must be assigned to run the stand-alone IOCP ?

   ANSWER : _____

4. What frame commands are allowed on the stand-alone IOCP PRIMARY MENU ?

   ANSWER : _____ AND _____

5.4.2. EDIT IOCDS Records

Learning Objective

After completing this activity, you should be able to use the edit function of the Stand-Alone IOCP Program to Add, Alter or Delete an IOCDS entry.

Supporting Activities

In this activity, the student should become familiar with the editing of the IOCDS RECORDS using the edit function of the IOCP.

USING THE EDIT FUNCTION of IOCP.

- In this activity, you should become familiar with the edit function of IOCP. If you have had any experience with other editors such as XEDIT, you will find that many of the functions are similar.
- You will also be introduced to the record format in the editor records, and the various fields within these records.
- At the completion of this activity you should be able to make entries in a selected IOCDS data set, that will allow you to read in from cards or tape, the customer's initial CDS. The purpose of this is to configure the channel subsystem to allow the customer to IPL their operating system.
- There is a practice question at the end of this activity to create the necessary entries to allow the reading in of a new IOCDS tape.

- *ES/9000, ES/3090 Input/Output Configuration Program User's Guide*, SC38-0097
- *D02 9121 Service Information: Frames, Part 1*, SY27-2617

SELECTING THE EDIT FUNCTION

```
                  I/O configuration program
                        PRIMARY MENU

   Select Menu Number And Enter Below:
        1. Build IOCDS from cards.
        2. Print IOCDS configuration report.
        3. Read IOCDS from the processor controller file.
        4. Write IOCDS to the processor controler file.
        5. Edit IOCDS card image data in storage.



   Enter Menu Number  ==>> _5









   END      RESHOW


  Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-31. PRIMARY MENU

IOCDS Primary Menu

- From this frame we will select option 5 Edit IOCDS.
- Option 5 EDIT IOCDS is new with this level of Stand-Alone IOCP.
- Student Notes

The Basic Edit IOCDS Frame

When the edit option (option 5) is selected from the IOCP Primary Menu and there has been no previous IOCDS read into storage, this is the screen that will appear.

Notice that there is one of each macro instruction that is set up in core. You may now modify (edit) these macroinstructions to reflect the I/O attached to your system, that will be necessary to get you started.

Remember that after you build this IOCDS in storage, you will have to write it to the Processor Controller file, and then do a Power On Reset using the newly created IOCDS, in order to activate it.

```
EDIT IOCDS SCREEN
IOCP STAND-ALONE EDITOR-----------------------------------------------------
COMMAND==>_                                              SCROLL ==> HALF
******************************** TOP OF DATA ********************************
0001 ID msg1='IOCDS name goes in first eight bytes                          X
0002             ',                                                         X
0003             msg2='extra information can be placed here                 X
0004              '
0005 chpid path=((00)),type=BL
0006 cntlunit cunumber=0000,path=(00),unit=12345,protocol=D,shared= Y,      X
0007             unitadd=((00,016))
0008 Iodevice address=(0000),unitadd=00,stadet=N,unit=12345,timeout=Y,      X
0009             cunumber=(0000)
****************************** BOTTOM OF DATA ******************************
```

Visual 5-32. EDIT IOCDS Screen.

EDIT IOCDS Frame

- This is an IOCDS EDIT screen for a basic MVS system.
- Use this frame as a template to create your "Minimum" IOCDS.
- IOCDS is in an 80 column punch card format.
- The words "ID, chpid, cntlunit, and iodevice" are MACROS and **MUST** start two spaces to the right of the prefix numbers.
- The "X" in the far right hand column signifies a line continuation. The X **MUST** be in this column for a continuation.
- Use the "TEST" command to check your entries for errors.

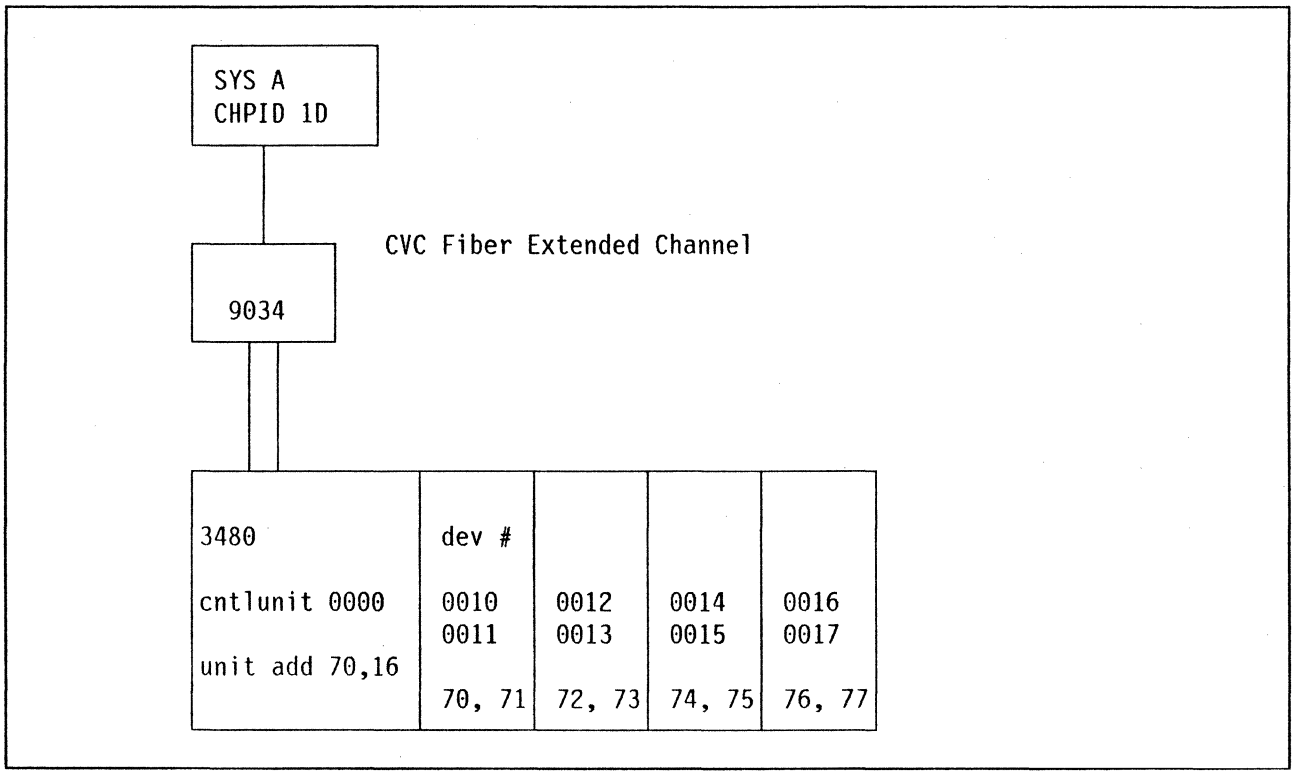
```
EDIT IOCDS SCREEN
IOCP STAND-ALONE EDITOR-----------------------------------------------------
COMMAND==>_                                                  SCROLL ==> HALF
******************************** TOP OF DATA ********************************
0001 ID msg1='MY IOCDSme goes in first eight bytes                          X
0002             ',                                                         X
0003             msg2='extra information can be placed here                 X
0004              '
0005 chpid path=((1D)),type=FX
0006 cntlunit cunumber=0000,path=(1D),unit=3480,protocol=s,shared=N,        X
0007             unitadd=((70,016))
0008 Iodevice address=(0010,16),unitadd=70,stadet=N,unit=3480,timeout=Y,    X
0009             cunumber=(0000)
****************************** BOTTOM OF DATA ******************************
```

Visual 5-33. EDITED IOCDS Screen.

EDIT IOCDS Frame

- The template has been edited to define a 3480
- CHPID 10 and 1D are CVC (Conversion) chpids.
- The protocol is 3 meg streaming.
- The unit address of the control unit is 70 with a range of 16.
- The device numbers will be 0010 to 001f for the tape drives.
  - The device number is what software uses to communicate to I/O. If you wanted to use a tape drive to IPL from in this example you would use 0010 as the load device on the "OPRCTL" frame.
  - The channel subsystem will use 70 to communicate to I/O.
  - Customers will normally keep these numbers the same to eliminate confusion but it is not required. The IOPD frames can be used to display how a device is defined (device number/unit address).
- Student Notes

Example Tape Drive Configuration (Lab Configuration)



Visual 5-34. Tape Drive Configuration

Example Tape drive Configuration

- This is the configuration we have in the lab.
- When doing your configuration at the customer account be sure to configure the CHPID according to the type it is! (BL, CVC, CNC)
- Student Notes

AFTER THE EDITING IS COMPLETE.

- It is a good idea to issue the primary command 'TEST' after any alterations or additions have been made in the edit function. This will check for validity of the cards.
- Be sure that after you have ended the editor, you perform the write IOCDS to the processor controller file. If you do not, the IOCDS in storage will be lost when you exit the IOCP program.
- The altered IOCDS will not become active until a Power On Reset is performed using the altered IOCDS data set.

Study Questions

5.

Fill in the entries that would be required to allow you to read in an initial IOCDS tape on a new installation.

The tape is a 3480 cartridge.
There is a 3480 tape drive address 180 on channel path 3.
There is a 1403 attached to a 2821 on channel path 0 the address is 000E.
The IOCDS information for the printer is OK.

1. First entry Type:

   - CHPID:

2. Information for entry:

   a. _____
   b. _____

3. Second Entry Type:

   - _____

4. Information for entry:

   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____

5. Third Entry Type:

   - _____

6. Information for entry:

   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

5.4.3. WRITE MENU OPTIONS

Learning Objective

After completing this activity, you should be able to match selected entries on the "Primary Menu frame", to their functions, you should also understand the various frame commands, and how to use them in the IOCP program.

Supporting Activities

This procedure will be used later in the lab to build an initial IOCDS, which will allow you to read in a card image CDS tape. This is a procedure that may also be used on an installation.

Student Information

- Before starting the IOCDS program, You should view the IOCDS management frame. (IOCDSM)
- You may want to copy the information on this frame for future reference while you are running the IOCP program.

- *Planning for Installation: Installation Manual-Physical Planning*, GA23-0382; Stand Alone IOCP
- *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Frames

```
                I/O configuration program
                      PRIMARY MENU

Select Menu Number And Enter Below:
     1. Build IOCDS from cards.
     2. Print IOCDS configuration report.
     3. Read IOCDS from the processor controller file.
     4. Write IOCDS to the processor controller file.
     5. Edit IOCDS card image data in storage.



Enter Menu Number  ==>> _4









END      RESHOW



Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-35. PRIMARY MENU

Primary Menu Select write

- The menu selection number 4 is entered on the menu selection line.
- Student Notes

```
WRITE IOCDS 2
                    I/O configuration program
            Write IOCDS To the Processor Controller File

    Enter Required Information
          Write IOCDS ..............(N,A0-A5,B0-B5,AB0,AB5) ==> A3_
          LPAR mode ? ................................(Y/N) ==>  N
          Time (Hour.Mimute) .........................(HH.MM) ==> 00.00
          Date (Year.Day (julian)) ..................(YY.DDD) ==> 00.000

   IOCDS Read/Write Status:

         Read/Write in Progress for record  nnnn









    END      RESHOW
    MENU     EDIT

   IXP509I Entries being processed.
   Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-36. WRITE IOCDS In Progress

WRITE IOCDS

- The Frame Command line.
- The Read/write status line.
- Student Notes

Study Questions

6.

Fill in the steps necessary to write an IOCDS from storage to the Processor Controller File, and return to the Primary Menu.

- Conditions for the Question.

  1. Starting at Primary Menu.
  2. IOCDS has already been read into storage.
  3. Write to IOCDS A0.
  4. This is a BASIC mode IOCDS.
  5. Use the default Time.
  6. Use the default Date.
  7. the write completes successfully

1. Type in: ____ on the: _____ - _____ line
2. Press ENTER.
3. Type in: _____ on the: _____ - _____ line
4. Press ENTER.
5. Type in: ____ on the: _____ - _____ line
6. Press ENTER.
7. Type in: _____ on the: _____ - _____ line
8. Press ENTER

5.4.4. Build IOCDS from cards or card image tape.

Learning Objective

After completing this activity, you should be able to

Read into storage an initial IOCDS from a customer supplied tape or card deck. This is the procedure that may be necessary to allow the customer to initially IPL his MVS system.

Supporting Activities

- In previous sections you learned how to enter the IOCDS that were necessary to allow you to read into storage a customers IOCDS.
- This section will cover the BUILD IOCDS FROM CARDS frame.
- These procedures will be used later in the lab when you will read in an initial IOCDS from tape.

Student Information.

- The BUILD IOCDS FROM CARDS is used to read card-image macroinstructions from a card reader or magnetic tape unit (in card image format), to generate an IOCDS in storage, and to produce reports from the generated IOCDS.
- The one time that this would be most often used is on an initial installation, which would allow the CE to set up the channel element to the customers I/O configuration.
- You must remember that after the IOCDS has been read into storage it must be written to the Processor Controller File in the selected Data Set, and then a Power On Reset executed using that data set, in order for the IOCDS to be active.
- Writing the IOCDS to the processor controller file was covered in a previous Topic.
- Be sure that the data set that you are going to write the IOCDS to is not Write Protected.

• *Planning for Installation: Installation Manual-Physical Planning*, GA23-0382; Stand Alone IOCP
• *D02 9121 Service Information: Frames, Part 1*, SY27-2617; Frames

```
                I/O configuration program
                      PRIMARY MENU

Select Menu Number And Enter Below:
     1. Build IOCDS from cards.
     2. Print IOCDS configuration report.
     3. Read IOCDS from the processor controller file.
     4. Write IOCDS to the processor controler file.
     5. Edit IOCDS card image data in storage.



Enter Menu Number  ==>> _1









END     RESHOW



Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-37. PRIMARY MENU

PRIMARY MENU SELECT 1

- Using Primary Menu Selection No# 1
- Student Notes

```
BUILD IOCDS
                    I/O configuration program
                     BUILD IOCDS FROM CARDS

    ENTER REQUIRED INFORMATION:
         Input Device Address/Number.............(3,4 HEX) ==>
         Input Device Type.....................(C=Card Reader)
                                               (T=Tape Drive ) ==>
         Ignore Unknown Card Statements?.............(Y,N) ==>
         Output Printer Addr/Number.............(3,4 HEX,NA) ==>
         Lpar Mode.....................................(Y,N) ==>
    ENTER IF THE  'INPUT DEVICE TYPE IS A TAPE DRIVE:
         File Number.......................(1 or 2 Decimal) ==>
         Mode Set Command.................(Default=03 (HEX)) ==>
    ENTER IF YOU SPECIFY AN 'OUTPUT PRINTER ADDRESS'
          Block Printer Data Checks ?............( Y,N,N/A ) ==>
          Lines Per Page ............(Default =55 (Decimal)) ==>
          Time (Hour.Minute).........................(HH.MM) ==> 00.00
          Date (Year.Day (julian)) .................(YY.DDD) ==> 00.000

    END      RESHOW
    MENU     EDIT


   Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-38. BUILD IOCDS

BUILD IOCDS FROM CARDS

- Printer address line 9 is optional and may be left blank
- If the input is from tape, you must enter physical record number of the IOCDS data set on tape, in decimal (1 to 99). The header records are counted.
- Lines 13, 14, and 15 are optional.
- If the printer address is entered the IOCDS report will be printed as the Card images are read into storage.
- Student Notes

Study Questions

7. Where must the IOCDS data set be located on the Customer's IOCDS tape ? (record number)

   - ANSWER :

     _____

8. After the IOCDS has been read into storage, what must be done to make this IOCDS active.

   1. ANSWER:

      _____

   2. ANSWER:

      _____

5.4.5. IOPD Frames

Learning Objective

After completing this activity, you should be able to collect configuration and status information from the IOPD Frames for use in I/O problem analysis.

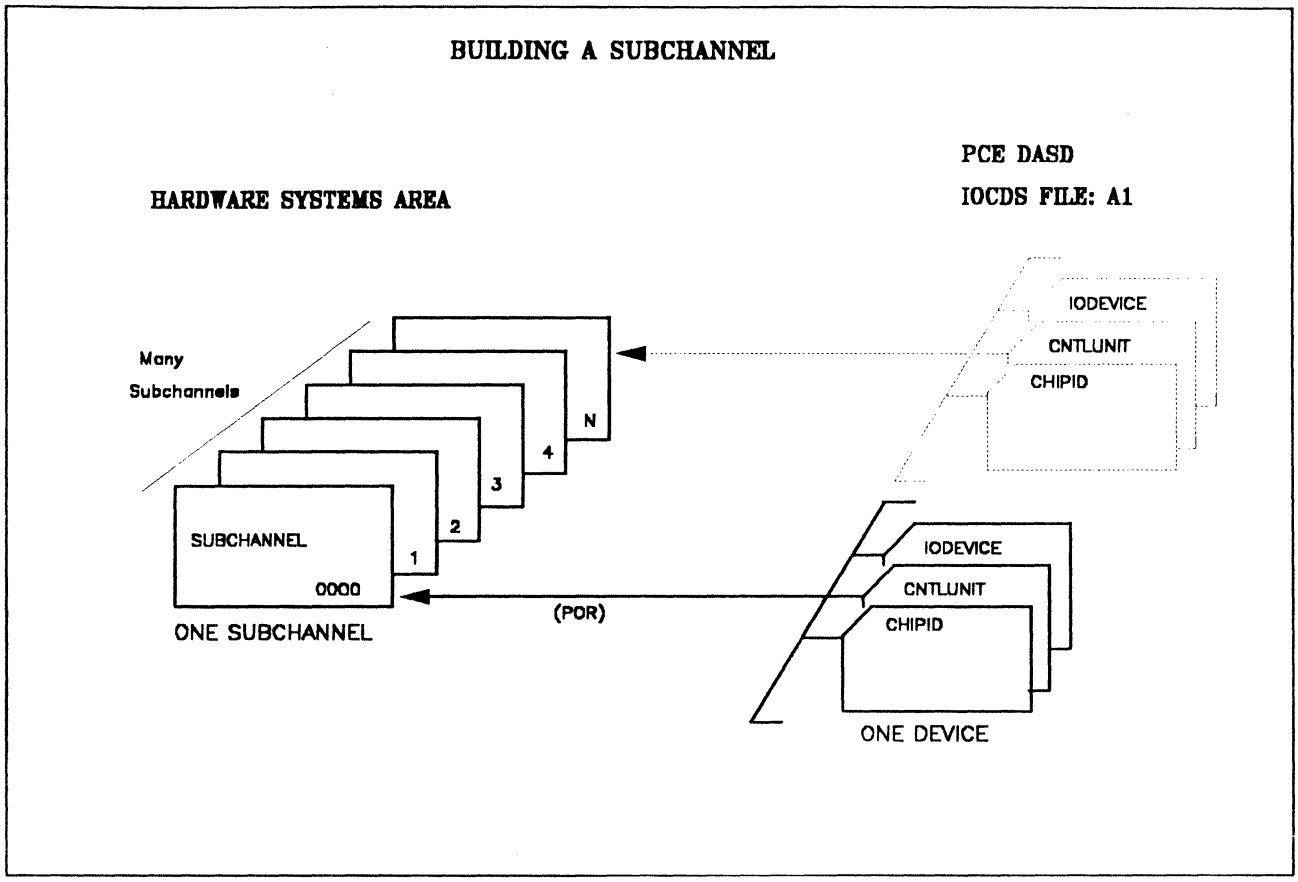
Supporting Activities

- The I/O Problem Determination Frames will be introduced in class using Vol. D02, Frames as directed by the MAPS.
- The *System/370 Extended Architecture Reference Summary* (blue card) and the *IBM System/370 XA Principles of Operation* are sources used to discuss selected IOPD Frame fields.
- Key fields will be pointed out on the following IOPD Frames:
  - Channel Summary Status
  - Device Status
  - Subchannel Status
  - Control Unit Header Status
  - Device Configuration
  - Channel Path Status
  - Connection/Conversion Link Status
- Additional clarification of IOPD Frames usage will be covered during Lab Projects.
- The IOPD Frames will be invoked for I/O problem determination on the 9121 Complex by resolving TAs.

• *D02 9121 Service Information: Frames, Part 1*, SY27-2617

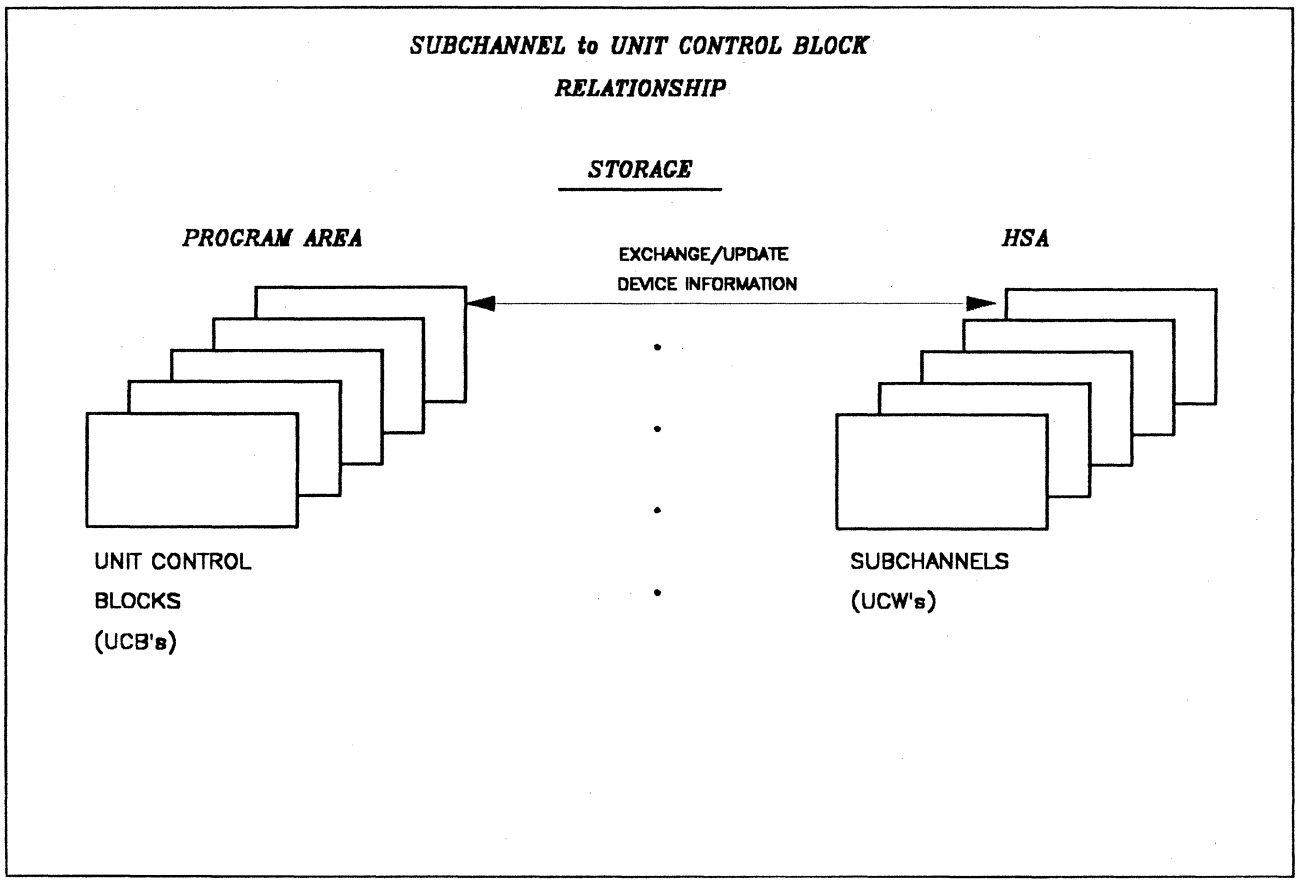
IOPD Frames Functional Overview:

In order to utilize the IOPD Frames successfully, an understanding of where the displayed information comes from is required. I/O operations rely upon the exchange of control and status words between the hardware and the software to begin, sustain, and end operations. Images exsist within storage that are used by the Operating System software and the Channel Subsystem hardware to pass control and status back and forth. These images are created from the customers' IOCDS data and I/O GEN. The IOPD Frames display the images on formatted panels for analysis by the customer and the CE.



Visual 5-39. Building a Subchannel

- Built from IOCDS active file at POR
- PCE assembles IOCDS data provided by the MacroInstructions - CHPID, CNTLUNIT and IODEVICE
- One Subchannel for each Device IOCDS
- Quantity of Subchannels equals quantity of Devices in IOCDS
- Student Notes



Visual 5-40. Subchannel to Unit Control Block Relationship

- UCB's- Built from IOGEN at ***IPL***
- Device Images used by the Software
- Viewed by displaying storage

- UCW's- Built from Active IOCDS at ***POR***
- Device Images used by the Hardware
- Viewed on IOPD Frames

- UCWs are compared with UCBs at IPL
- If both exist, the UCW is **Enabled** and the UCB is **Connected** for the Device
- The existence of that I/O Device is now established
- Student Notes

```
                                                    dd mmm yy  hh:mm:ss
              I/O Problem Determination (ESA/370 Mode)          (IOPD)-00

A= DISPLAY                          Enter one of the following(Hex):
  1. Channel Summary Status          Device Number       => ____
  2. Device Status                   CHPID and UA        => __ __
->3. Subchannel Status                 Link Address      => __
  4. Control Unit Header Status        CUADD             => _
  5. Device Configuration            Subchannel Number   => ____
  6. Channel Path Status             Absolute Address    => ________
  7. ES Connection Link Status

COMMAND ==>
```

Visual 5-41. (IOPD)-00 I/O Problem Determination Frame (initial entry)

(IOPD)-00 I/O Problem Determination Frame

- Student Notes

```
                                                          dd mmm yy  hh:mm:ss
                Channel Summary Status (ESA/370 Mode) (1 of 2)  (IOPD)-11

 CHP  PHY  CHN
 ID   ADR  TYP  SW  LINK  CUADD  UA   STATE      STATUS
 00   ..   BYT  ..  ..      .   12   ........   ..........
 01   ..   BLK  ..  ..      .   03   ........   LOG
 02   03   BLK  ..  ..      .   45   ........   ..........
 03   02   BLK  ..  ..      .   ..   ........   ..........
 04   ..   BYT  ..  ..      .   ..   ........   PERM ERROR
 05   ..   BLK  ..  ..      .   ..   ........   ..........
 06   ..   BLK  ..  ..      .   ..   ........   CHECK STOP
 07   ..   BLK  ..  ..      .   ..   RESERVED   SERVICE
 08   ..   BLK  ..  ..      .   1B   ........   ..........
 09   ..   BLK  ..  ..      .   ..   ........   TEST
 0A   ..   BLK  ..  ..      .   ..   STANDBY    ..........
 0B   ..   BLK  ..  ..      .   ..   ........   ..........
 0C   ..   BLK  ..  ..      .   ..   RESERVED   UNDEFINED
 0D   ..   BLK  ..  ..      .   ..   ........   ..........
 0E   ..   BLK  ..  ..      .   ..   ........   ..........
 0F   ..   BLK  ..  ..      .   67   ........   IFCC

COMMAND ==>
```

Visual 5-42. (IOPD)-11 Channel Summary Status Frame

(IOPD)-11 Channel Summary Status Frame

- Student Notes

```
                                                          dd mmm yy  hh:mm:ss
                          Display Subchannel (1 of 2)          (IOPD)-32
                                    CP/IOP
 Absolute Addr    Irpt Parm  00FD4360  CHPID0     0D  CU-Header Ptr 03FF8D80
       03FF1080   ISC       R5         CHPID1     0E  SCH Chain Ptr 03FD9980
 Subch  No. 0021  Enabled    1         CHPID2     02  Initial CA    00FEC830
 Device No. 02B0  Limit Cntl 00        CHPID3     03  Fnct Pnd Time 00000000
 Unit Addr  B0    Meas Cntl  11                      Candidates    00110000
                  Multipath  1                       Dev Bsy Mask  00000000
                  Timing     1                       Key           0
 Subchannel       D No. Val  1                       S,L,DCC       0000
  CU Def'd     1  LPM        00110000  Last OTT   03  Format        1
  Subch Def'd  1  PNOM       00000000  PCI Irpt   0   P,I,A         000
                  LPUM       00010000  Allegiance 0   U,Z,E,N       0000
 Path             PIM        11110000                  Function Ctl  000
  Pref Def'd   0  Meas Indx  0021      Cntl Flg1  00  Activity Ctl  0000000
  Pref Path   R0  POM        00110000  Cntl Flg2  10  Status Ctl    00000
  Next Path   R3  PAM        11110000  Locks           Dev Bsy Time  00000520
                                        Current    00  CU Bsy Time   00000000
                  IPNOM      00000000   Previous  90  Bsy Time Stp  0F9167BF


COMMAND ==>
```

Visual 5-43. (IOPD)-32 Display Subchannel (1 of 2)

(IOPD)-32 Display Subchannel (1 of 2)

- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                          Display Subchannel (2 of 2)          (IOPD)-33
                              IOP/CHE
 Absolute Addr     Current Lock     00          Allegiance          11111111
       03FF1080    Previous Lock    82          Addr Limit          0000
 Subch  No. 0021                               Limit Mode Cntl     00
 Device No. 02B0   PSR0             0          Retry Cmnd Addr     00FF6248
 Unit Addr  B0     PSRA             00          Active CA+8         00FF6250
                   PSRB             00          Cmnd/Dev Status     0C
                   PSRC             000         Flgs/Subch Status   00
 Subchannel        Strg Key         0           Residual Count      0000
  CU Def'd     1   Multipath        1           Dev Connect Time    00200052
  Subch Def'd  b   Subch Enable     1
                   Suspend Cntl     0
                   CCW Format       0           Fixed Log 0         00000000
                                                Fixed Log 1         00000000
                  Enable                        Fixed Log 2         00000000
                   Status Filter    0           Fixed Log 3         00000000
                   Intf Timeout     1           Init Stat Time Stp  A0B980EB
                   UA Cmpr          0           Time Stamp          B981F188


COMMAND ==>
```

Visual 5-44. (IOPD)-33 Display subchannel (2 of 2)

(IOPD)-33 Display Subchannel (2 of 2)

- Student Notes

```
                                                        dd mmm yy  hh:mm:ss
                  Display Control Unit Header                      <IOPD)-41


Absolute Addr      CU-HDR No.          0003       CHPID0          0D
       03FF8D80                                   CHPID1          0E
Subch  No. 0021    Current Lock        00         CHPID2          02
Device No. 02B0    Previous Lock       E0         CHPID3          03
Unit Addr  B0
                   Elements on Queue   0000

Subchannel         Top of Q Ptr        00000000
 CU Def'd     1    Bottom of Q Ptr     00000000
 Subch Def'd  1    CU-HDR Chain Ptr    00000000   CU Busy Mask    00000000

                   Init Q 0            0          Shrd Busy Mask  00000000
                   Init Q 1            0
                   CU Type             10         Queued Sum      00000000
                                                  Queued Count    00000000
                   Multipath           0          Statistic Disp  00000000


COMMAND ==>
```

Visual 5-45. (IOPD)-41 Display Control Unit Header

(IOPD)-41 Display Control Unit Header

- Student Notes

Topic Checkpoint Activity

Exercise. 5.4.1: IOCP Editor

What This Exercise is About

This lab project familiarizes you with the IOCP Editor and its usages.

What You Should Be Able to Do

After completing this exercise, you should be able to create a new IOCDS using the IOCP Editor.

Introduction

The 9121 IOCP Editor differs from the 3090 IOCP Editor, mainly in the area of editing. The DISPLAY, ALTER, DELETE and ADD functions have been replaced by the EDIT function. While in the EDIT function the TEST command allows you to verify your inputs before writing the IOCDS onto the disk.

Required Materials

You will need the following materials to complete this exercise:

- 9121 ET3 Simulator Running
- Vol A04 I/O Configuration Program User Guide

Directions to the student

Prerequisites: 9121 ET3 Simulator invoked by the Instructor.

Scenario:

- Physical installation of the 9121 has been completed.
- IOCDS has been prepared by customer.
- IOCDS tape is available.
- Starter IOCDS does not match the configuration.

There are two possibilities to prepare an IOCDS to allow the reading of the IOCDS tape:

- Change the starter set.

- Create a mini-IOCDS, which describes the path to one tape unit only.

Changing the existing IOCDS starter set can be quite difficult, and may cause more headaches than it is worth. A simpler solution is to create a mini-IOCDS.

How to Use the IOCP Program On An ES/9000 System

Starting the Stand-alone IOCP Program

Because you are using a Simulator, you will get a pseudo Service Console Index menu with all the prerequisites completed. Those pre-requisites are:

POR complete (Basic mode)

CP in stop state

Service Console with SERVMODE on

_ **Step 1** From the Service console enter "IOCP CP1" and press the ENTER key.

_ **Step 2** Press the ASSIGN CONS key.

_ **Step 3** Define your console to Program Mode (A3).

_ **Step 4** Press the END key.

_ **Step 5** The I/O Configuration Program Primary Menu is now displayed.

Edit the IOCDS Data

The goal is to create a mini-IOCDS that will support one tape unit that will be used to load the customer's IOCDS tape.

To describe a path to one tape unit, the minimum to be defined is:

- One channel path id
- One control unit
- One device

_ **Step 1** Select option 5 (Edit).

A template is given by the IOCP Editor:

- 3 lines for message information
- 1 line for channel definition
- 2 lines for control unit definition
- 2 lines for device definition

To help make your job easy, the template has already defined a tape drive and a printer. Now all you have to do is modify the existing lines.

```
IOCP STAND-ALONE EDITOR ------------------------------------------------------
COMMAND ==>                                                  SCROLL ===> HALF
****** ***************************** TOP OF DATA ****************************
000001  ID MSG='IOCDS NAME GOES IN FIRST EIGHT BYTES',                       X
000002              MSG2='EXTRA INFORMATION CAN BE PLACED HERE',             X
000003              SYSTEM=(9121,2)
000004  CHPID PATH=((11)),TYPE=BL
000002  CNTLUNIT CUNUMBR=0001,PATH=(11),UNIT=3480,PROTOCL=D,SHARED=N,        X
000003               UNITADD=((80,016))
000004  IODEVICE ADDRESS=(0180,016),UNITADD=80,STADET=N,UNIT=3480,TIMEOUT=N, X
000005               CUNUMBR=(0001)
000004  CHPID PATH=((12)),TYPE=BL
000002  CNTLUNIT CUNUMBR=0002,PATH=(11),UNIT=3203,PROTOCL=D,SHARED=N,        X
000003               UNITADD=((0E,001))
000004  IODEVICE ADDRESS=(000E),UNITADD=0E,STADET=N,UNIT=3203,TIMEOUT=N,     X
000005               CUNUMBR=(0002)
****** ************************** BOTTOM OF DATA ****************************
```

Visual 5-1. IOCP Stand-Alone Editor

Any definition, which is continued on the next line, must contain the continuation character **X** in the last position of the line.

There are two types of commands:

- Primary Commands
- Line Commands

Please take some time right now and review these commands. Refer to the I/O Configuration Program User Guide, Chapter 6, topic "Editing the Card-Image File," for copying, repeating or deleting lines.

A. What PF key would move the cursor to the primary command area? _____

B. What command is used to copy a block of lines.

_____

C. Line command **A** is used in conjuction with the block copy command to specify the location to which you want the data to follow for the block copy command, True or False?

_____

_ **Step 2** Enter the following definition:

CHPID = 19

CHPID type = fiber extended channel (CVC)

Control unit and device = 3480

Unit address = 70.

Refer to IOCP User Guide (Volume A04), Appendix D for information on these entries.

_ **Step 3** Before saving the data onto the IOCDS data set (disk), try the TEST command to make sure your entries were correct.

_ **Step 4** If you made a mistake, it would show up as a ***IXP** IOCP message. Use the IOCP User Guide to help you correct any errors.

_ **Step 5** After you have cleaned up all errors, induce an error. Copy the IODEVICE line(s) without altering them and try the TEST command.

D. What is the IOCP message? _____

_ **Step 6** Do not correct the error and try to write the data as IOCDS A3.

E. What is the IOCP message? _____

This demonstrates that an error is also detected during the write operation and that the IOCP program will not let you write an IOCDS that has errors in it.

Ending the IOCDS Editing

When all the data has been correctly entered, do the following:

__ **Step 1** Press the END key (this will now end the editing and invoke the I/O Configuration Program Primary Menu).

__ **Step 2** Write the edited IOCDS onto the DASD by selecting function 4 and:

IOCDS # = A3

LPAR mode = N

__ **Step 3** End the IOCP program by entering "END"

Because you are using a Simulator the ending is different but all functions of the IOCP Editor are 100% the same.

If you were on a real machine, you would of continued by doing the following:

a. Unassign the PROGRAM console.

b. Do a POR with the new IOCDS selected.

c. Display and verify your newly created IOCDS.

Exercise Summary

This exercise was used to introduce the basics of using the IOCP Editor and to create a simple IOCDS to define a CHPID, CU, and a device.

(This page skipped to align the following page.)

Answers to Questions

A. PF12, PF24 key

B. Line command CC

C. True, line command A (after) is used

D. IXP260I

E. IXP506A

Topic 5.5. 9121 PRISM and LPAR

5.5.1. Processor Resource System Management (PR/SM) Overview

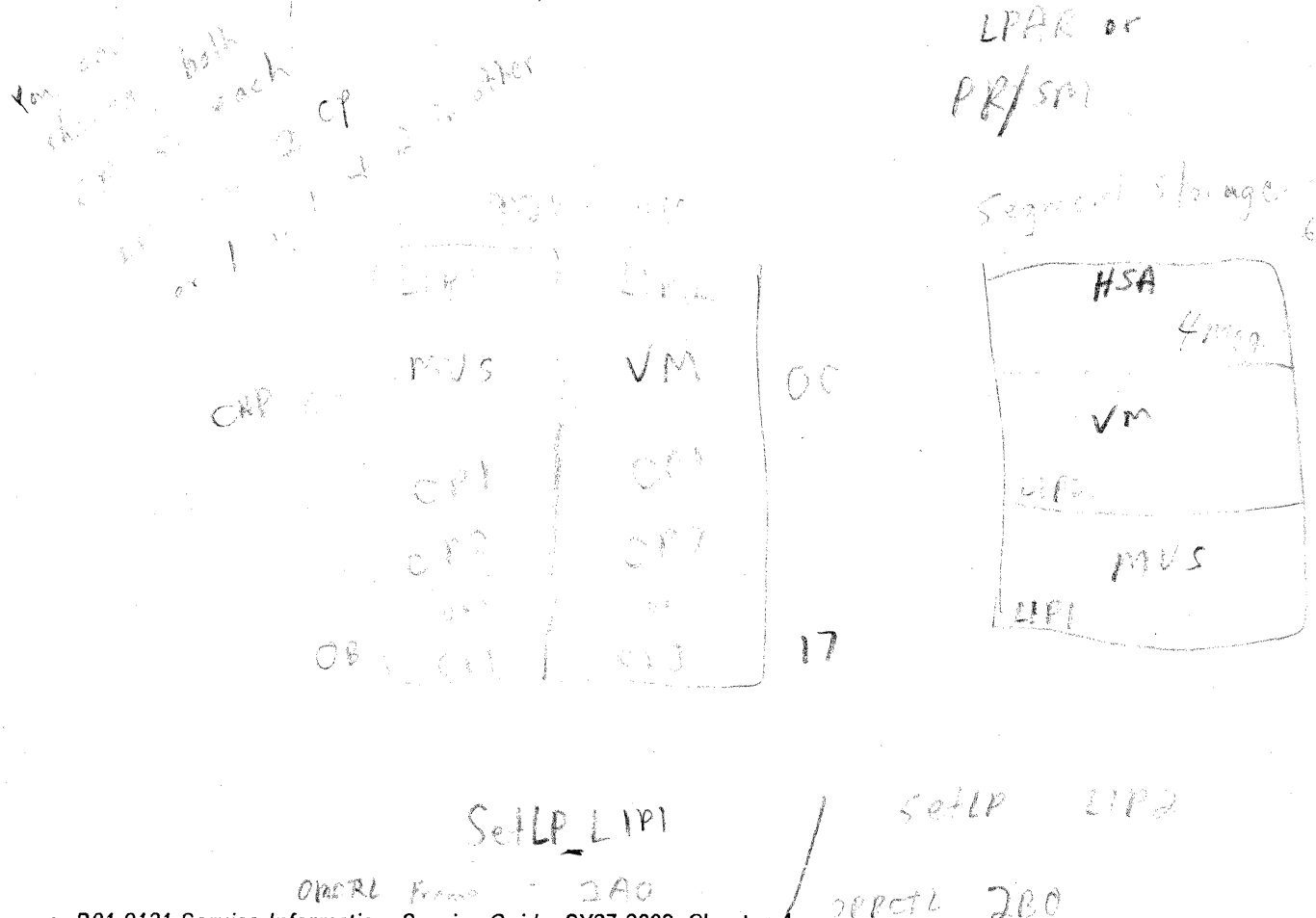
Learning Objective

After completing this activity, you should be able to use the Service Language Commands to access selected logical partitions.

Learning Activity Introduction

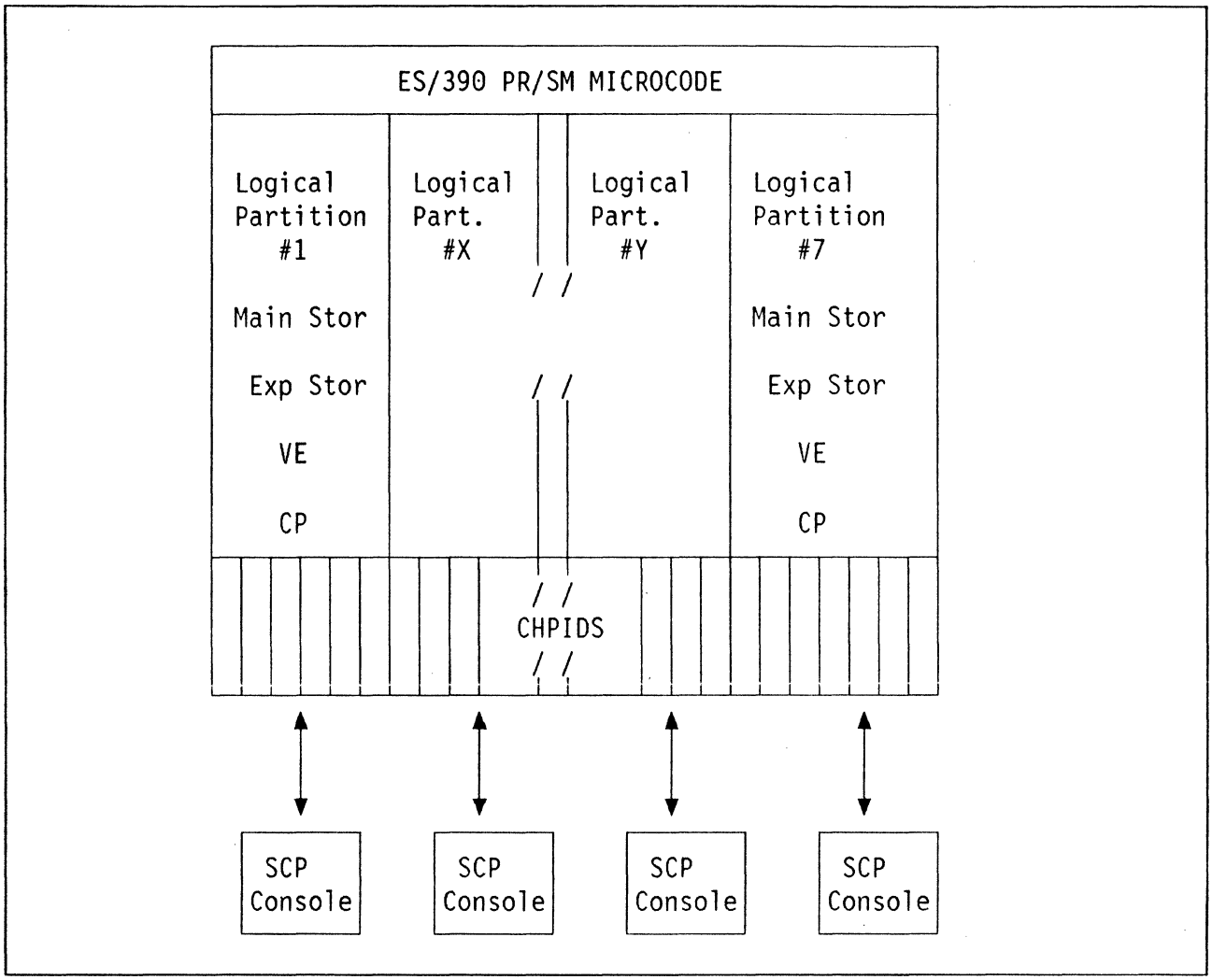
- Introduce the ES/9000™, ES/3090 Processor™ Resource/System Manager (PR/SM™) Feature
- Establish the need for the ES/390 PR/SM Feature
- Introduce resource allocation for a logical partition (LPAR™)
- LPAR
- PR/SM

The PR/SM feature allows the resources of a processor complex to be distributed among multiple system control programs (SCPs), which can run on the same complex simultaneously. Each SCP is independent and has a set of resources called a **logical partition**.



- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 4
- *D01 9121 Service Information: Service Language Commands*, SY27-2615; Chapter 2

Characteristic of Logical Partitions



Visual 5-2. Logical Partition Characteristics

Logical Partition Characteristics

The set of resources that comprise a logical partition includes:

- Processor resource
- Processor storage
- Channel paths
- Optional expanded storage
- Optional vector facility

Logical partitions have the following characteristics:

- Logical partitions may operate in either S/370, 370-XA or ESA/390 mode.
- Logical partitions operate independently of one another.
- The storage (both central and expanded) for the logical partitions can be reallocated once a partition has been activated, but it cannot be shared.
- Central processors may be dedicated to logical partitions or shared by them, but not both (shared & dedicated).
- Logical partitions may vary in the amount of physical resources defined to them.
- A logical partition may be viewed as a processor complex within a processor complex.

Using the Processor Resource/System Manager Feature

The following is an overview of how to use the PR/SM feature. Procedures for using the PR/SM feature will be presented in the following selections.

D02 9121 Service Information: Frames, Part 1, SY27-2617; Chapter 2
D03 9121 Service Information: Frames, Part 2, SY27-2622

```
WRITE IOCDS 1
                    I/O configuration program
            Write IOCDS To the Processor Controller File

    Enter Required Information:
          Write IOCDS ..............(N,A0-A5,B0-B5,AB0,AB5) ==> ___
          LPAR mode ? ................................(Y/N) ==>  N
          Time (Hour.Mimute) .......................(HH.MM) ==> 00.00
          Date (Year.Day (julian)) .................(YY.DDD) ==> 00.000

   IOCDS Read/Write Status:

         No Read/Write in Progress









    END      RESHOW
    MENU     EDIT


   Program Mode Console - IOCP  IXP Version 02 level 00
```

Visual 5-3. Write IOCDS

IOCP Write IOCDS screen

- IOCP only works in Basic Mode
- Select Y for LPAR mode to write a LPAR IOCDS to the disk.
- CHPID macroinstruction has a **PART**ition operand to identify which LPAR partition the CHPID is associated with.

```
                                                    dd mmm yy hh:mm:ss
                          IOCDS Management                    (IOCDSM)

POWER ON RESET                                    ACTIVE IOCDS
   Required                                         AAAAAAAA

                                  ---- I/O CONFIGURATION DATA SETS ----
A= ACTION          I= IOCDS   NAME     TYPE   Status          Timestamp
  1. Select       -> 1.  A0  12345678                     90.128 12:13:14
  2. Write Protect   2.  A1  AAAAAAAA LPAR  Write Protect 90.012 00:10:00
  3. Release Write   3.  A2                 Not Valid
     Protect         4.  A3  CCCCCCCC BASC  Write Protect 90.265 23:59:56
  4. Select Config   5.  A4                 Not Valid
     Frame           6.  A5  CCCCCCCC BASC  Write Protect 90.265 23:59:56









COMMAND ==>
```

Visual 5-4. IOCDSM frame

IOCDSM frame showing a LPAR IOCDS

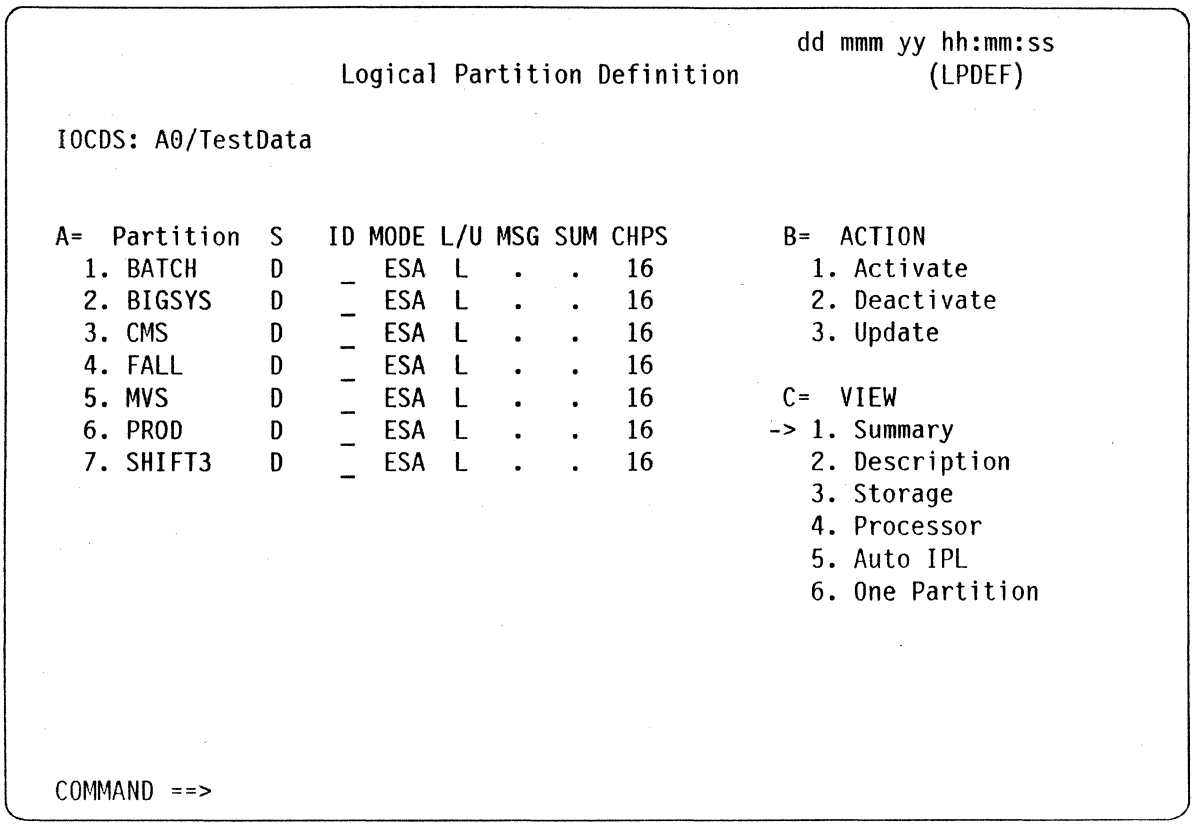
- **TYPE** indicates BASC or LPAR

```
                                                  dd mmm yy hh:mm:ss
                        Configuration                          (CONFIG)

 POWER ON RESET                                  ACTIVE IOCDS
    Required                                      AAAAAAAA

 A= ACTION                  D= PROCESSORS     F= STORAGE (TOTAL=256MB)
   1. Release              -> 1.CP1              CENTRAL    EXPANDED
   2. Power on reset                          1. 32MB       224MB
   3. Maximum Installed                       2. 48MB       208MB
   4. Select IOCDS Mgmt.                      3. 64MB       192MB
 B= CP MODE                                   4. 96MB       160MB
   1. ESA/370                                 5. 128MB      128MB
   2. Not Used               E= VECTORS       6. 192MB      64MB
   3. Not Used              -> 1. VE1        -> 7. 256MB      0MB
-> 4. LPAR

 C= I/O TRACE
   1. Type(hex): _______                      ---- CHPID STATUS ----
      Units: __                              Online: 32 Offline: 0

ESA/370 is a trademark (tm) of the  IBM Corporation.

 COMMAND ==>
```

Visual 5-5. CONFIG frame

CONFIG frame showing LPAR

- Select **B4** for LPAR mode
- Activate the appropriate LPAR IOCDS



Visual 5-6. LPDEF frame

LPDEF frame

- The LPDEF (LPDEF) frame is used to define the resources of the logical partition.
- The LPDEF (LPDEF) frame is also used to activate the logical partition.


```
                                                          dd mmm yy  hh:mm:ss
                Logical Partition Channel Assignments(1 of 2)     (LPCHNA)

IOCDS: A4/DDDDDDDD

CHPID           = 0000 0000 0000 0000 1111 1111 1111 1111   PARTITION #
                  0123 4567 89AB CDEF 0123 4567 89AB CDEF   1 = ONLINE
                                                            2 = TEST
PARTITION #     = 1111 2222 3333 4444 1111 2222 3333 4444   3 = TSO
RECONFIGURABLE  = RRRR .... RRRR .... RRRR .... RRRR ....   4 = FRED


CHPID           = 2222 2222 2222 2222
                  0123 4567 89AB CDEF
                                                            LEGEND
PARTITION #     = 1111 2222 3333 4444                       R = YES
RECONFIGURABLE  = RRRR .... RRRR ....                       . = NO
                                                            * = NOT DEFINED




COMMAND ==>
```

Visual 5-7. LPCHNA frame

LPCHNA frame

- indicates partition name/number
- and if CHPID is reconfigurable

Once the Partitions are activated:

1. The Service Language Command ***SETLP*** is used to assign the hardware system console to a partition. This is called: making the partition the target.

   Use this for any partition specific activity, like partition IPL, or system messages.

2. Once a partition is active and IPL'ed, it is recommended to "LOCK" the partition. This is performed by the ***LOCKLP*** command. This blocks the use of operator functions from the OPRCTL frame.

Display frames and service language commands provide the ability to examine the software in the logical partitions, in essentially the same way that frames and service language commands are used when the processor complex is in S/370 or ESA/370 (native/basic) mode.

System Console Functions Not Available in LPAR Mode

The following function keys are not available in LPAR mode:

- ISTEP
- TOD.

The following display frames are not available in LPAR mode:

- CP Address Compare (ADRCP)
- SCE Address Compare (ADRSC)
- Alter/Display Vector (ALTVE).

The following service language commands are not available in LPAR mode:

- IOCP
- ISTEP
- SETIAR
- SYSIML
- TOD.

Summary of PartitionSensitive System Console Functions

Partition Sensitive Display Frames

- OPRCTL
- ALTCP
- SCPMSG
- IOPD
- SYSCTL.

Partition Sensitive Function Keys

- INTRPT
- RESTRT
- START
- STOP.

Partition Sensitive SLCs

- ALTSYSF
- CHPID
- DISSYSF
- INTRPT
- LOAD
- RESTART
- START
- STOP
- STORSTAT
- SYSRESET
- PSW.

Learning Checkpoint

1. Select the correct statement(s) concerning PR/SM .

   a. The total number of CPs assigned to a partition cannot exceed the total number of physical CPs.
   b. Partition numbers are assigned by the customer.
   c. Partition names are assigned to CHPIDs in the IOCP.
   d. Not all CHPIDs need to be reconfigurable.

      1. a, b, c, d
      2. a, b, d
      3. a, c, d
      4. a, d

Unit Checkpoint Activity

Alot of information has been discussed in this unit. You should be able to recognize and describe what is needed to cause the I/O to operate on the 9121 system.

Unit 6. Complex Systems Environment

What This Unit is About

This unit identifies various customer impacts, such as unscheduled IPLs and unnecessary system outages. Also contained in this unit is an introduction to MVS commands and their use to help reduce the the number of unscheduled outages as well as several examples of system recovery procedures. Finally, an overview of a normal MVS IPL and is its major checkpoints are covered.

What You Should Be Able to Do

After completing this unit, you should be able to identify problems impacting customer satisfaction, use MVS commands to display hardware status, use recovery procedures to avoid an unscheduled IPL, and identify the major checkpoints of an MVS IPL.

Reference Summary

Topic 6.1. Customer Impacts

What This Topic is About

This topic presents the the concerns of the customer in todays complex system environment, namely, unscheduled IPLs. This topic discusses the reasons for these unscheduled IPLs and how they can be avoided. Also discussed is what Service Education is attempting to do in training Service Operation personnel in the complex system environment.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Define the various recovery impacts and how they relate to system operations.

6.1.1. Environment

Learning Objective

After completing this activity, you should be able to define the various recovery impacts and how they relate to system operations.

Unscheduled IPLs and outages result in customer dissatisfaction. Some of the reasons for these IPLs and outages and subsequent customer dissatisfaction are:

Customer Dissatisfaction

- Slowness of "undefined" problem resolution
  - problem identification
  - problem resolution
- Installation concerns
  - physical installs
  - configurations
- Lack of contact with appropriate skill

Corrective Direction

- ESCON and System Recovery Concepts
  - build the correct skill
  - one level at a time
- Student Notes

Service Situations

- Configuration diagrams
  - system
  - subsystem
- Labels
  - external control unit switches
- Control unit enable/disable switches
  - proper usage
  - impacts when not used properly

Branch Office Support

- System level support
  - should be at branch office level
  - should be with all field CEs
- Student Notes

Knowledge Limitations

- Many system and new architecture unknowns by:
  - CEs
  - operators
  - system programmers
  - SEs
- Decline in:
  - understanding of operating system commands
  - overall system understanding
  - general system support (hardware and software)

IBM CE Education

- 370 architecture products
- ES/390 architecture
  - training approach (system versus box)
- Student Notes

Corrective Direction

- Improve skill level
  - educate using system approach
  - make system support part of the CE mission
- System introduction
  - gradually build system level skills
  - early-appropriate-effective
- Student Notes

Keeping unscheduled IPLs and outages to a minimum, will result in benefits to the customer and IBM.

Customer Satisfaction

- Increase customer confidence in:
  - CE (fewer system impacts due to CE servicing)
  - software support centers
  - hardware support centers

New Education Direction

- ESCON and System Recovery Concepts
- Large system availability configuration
- Enhance existing courses (environment)

Benefits

- IBM Customers
  - help with understanding of new architecture
  - faster problem resolution
  - increased availability with audited configurations
  - fewer system impacts
- IBM
  - increased customer satisfaction
- Student Notes

Topic 6.2. System Level Recovery

What This Topic is About

This topic introduces system level recovery, the facilities used for recovery, how and when they should be used, and how to recognize which facility should be used in a particular situation.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Identify the various types of system level recovery and the tools available to prevent unnecessary IPLs.

2. Recognize a DCCF condition, the reason it was initiated, and take appropriate action to resolve the condition.

6.2.1. Introduction to System Level Recovery

Learning Objective

After completing this activity, you should be able to identify the various types of system level recovery and the tools available to prevent unnecessary IPLs.

Recovery Tools

Most recovery tools in MVS are automatic, however sometimes the system requests your assistance, or takes certain actions that you must understand to avoid unnecessary outages. So that you can plan your actions carefully, and respond to messages correctly, you must know how to interact and respond to the following system functions and conditions.

- ES Connection Manager (ESCM)
- Disabled Console Communication Facility (DCCF)
- Alternate CPU Recovery (ACR)
- Loops and Wait States
- Restart Processing
- Hot I/O Conditions
- Lost Console Conditions
- Student Notes

• *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346;*
• *MVS/ESA Operations/System Commands, GC28-1826;* Chapter 1 and 2

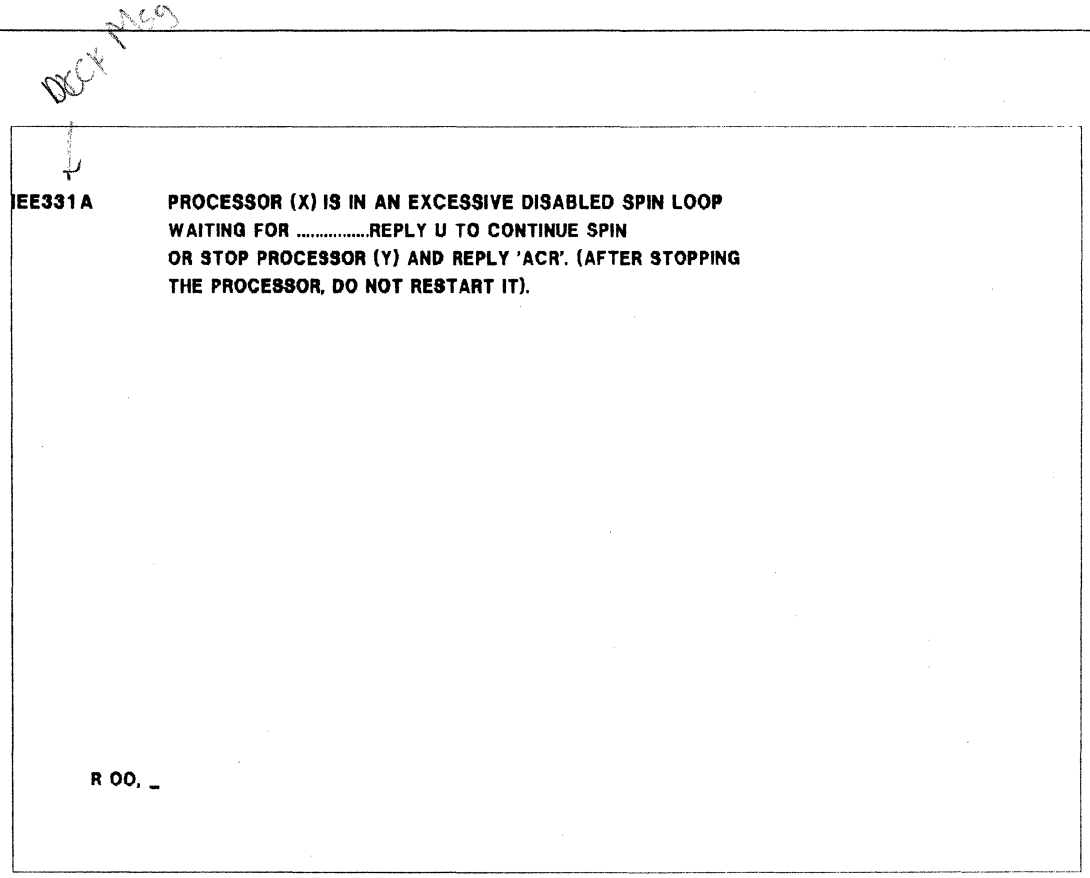
6.2.2. Disabled Console Communication Facility

Learning Objective

After completing this activity, you should be able to recognize a DCCF condition, the reason it was initiated, and take appropriate action to resolve the condition.

Recognizing a DCCF Condition

- Console is cleared (master or first alternate)
- DCCF message is displayed



Visual 6-1. Example of DCCF Message(740v8321)

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Section 8.0
- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 2
- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 4

Reasons for DCCF Initiation and Corrective Action

- Hot I/O recovery
- Spin loop recovery
- Restart processing

DCCF MSG	WAIT STATE	REASON	CORRECTIVE ACTION
IEA490A	093,098 09A,09B 09C,09D	SIGP MALFUNCTION (SPIN LOOP)	LEAVE PROCESSOR OFFLINE
IEE331A	091,092 095,096 097,09E	SOFTWARE ERROR (SPIN LOOP)	CONFIG PROCCESSOR ONLINE CF CPU(N),ON
IOS110A IOS111A IOS112A	110 111 112	HOT I/O NON-DASD HOT I/O NON RESERVED DASD HOT I/O RESERVED DASD	INSTALLATION DEPENDANT
IOS062E IOS113W IOS201E	062 113 114	CHANNEL RECOVERY	
IOS115A IOS116A	115 116 08F	PAGE DATA SET PROBLEM	
IEA500 IEA501		RESTART REASON 0 RESTART REASON 1 REFER TO RESTART TEXT	

Visual 6-2. DCCF Messages and Corrective Action(740v8322)

DCCF Timeout Handling

When the DCCF message is written to the MVS master console, or first alternate, and no response is received within the timeout period (125 seconds), the DCCF message is written to the hardware system console.

The current activity on the hardware system console is not disrupted. A message telling the operator to invoke the SCPMSG frame is sent to the hardware system console. To view the message the operator must invoke the SCPMSG frame by entering "F SCPMSG" on the command line.

NOTE: If unsure if SCPMSG messages are pending, invoke VIEWLOG and look for SCPMSG pending message entries.

- Student Notes

Feedback questions

1. What frame is used to retrieve a DCCF message after DCCF has timed out? F SCPMSG.

2. Disabled Console Communication Facility will be initiated for which of the following:

   a. Lost Console Conditions
   b. Software Spin Loops
   c. IPL Failures
   d. Channel Recovery
   e. RESTART Facility from SYSCTL Frame

Topic 6.3. Recovering From Spin Loops

What This Topic is About

How to recognize when a system is in a spin loop, what causes a spin loop, and how to recover a from a spin loop are presented in this topic.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Recognize when the system is in a spin loop, and use ACR to recover.

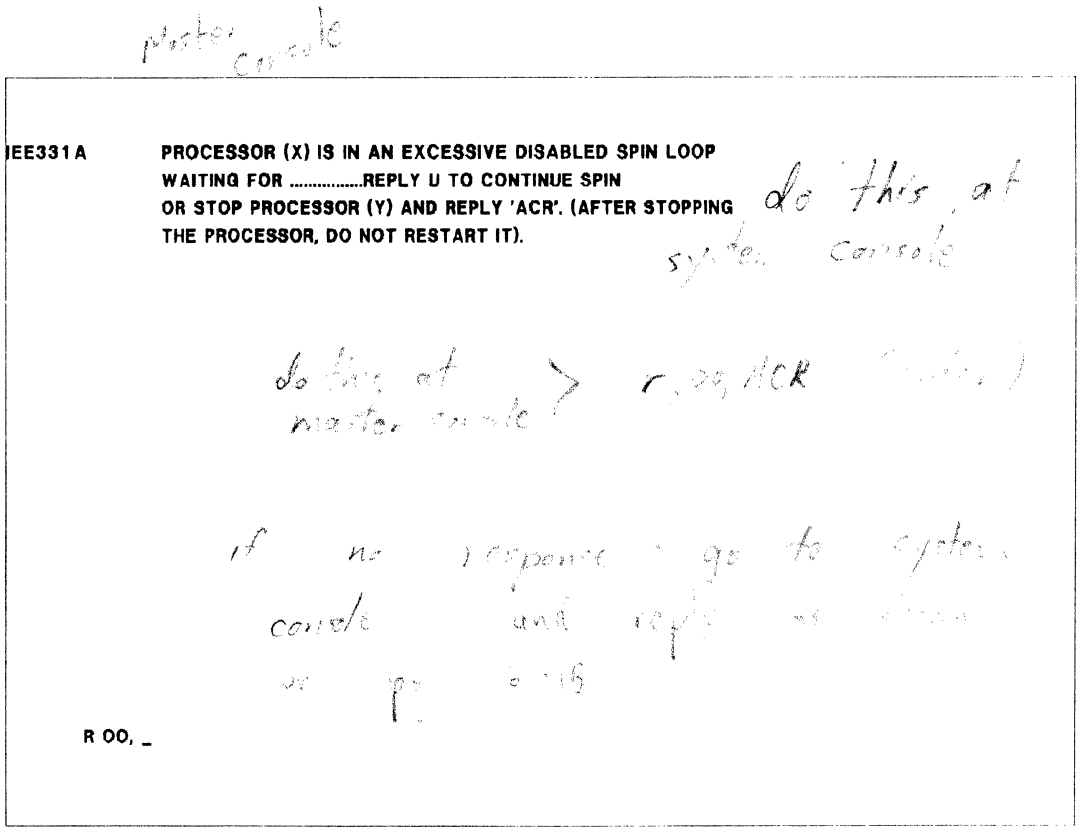
6.3.1. Spin Loops and ACR

Learning Objective

After completing this activity, you should be able to recognize when the system is in a spin loop, and use ACR to recover.

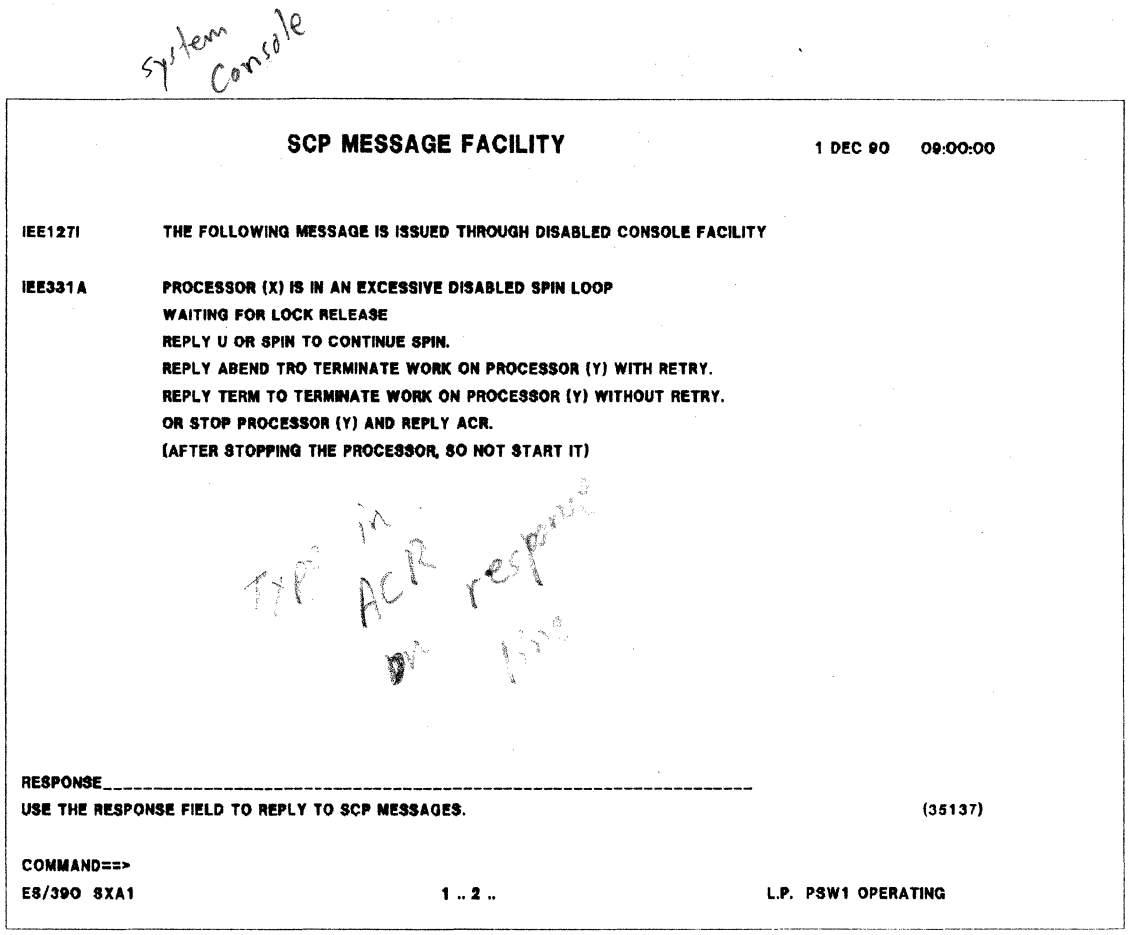
What is a Spin Loop

A spin loop occurs in a multi-processor environment when one of the processors requires a system resource that is in use by the other processor. This is normal and occurs quite frequently, for very short durations. However, if the resource is not released in forty (40) seconds, the detecting processor will go into a "spin loop timeout" and will use DCCF to alert the operator.



Visual 6-3. Spin Loop Timeout DCCF Message V2 (740v8411)

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Section 6.0



Visual 6-4. Spin Loop Timeout DCCF Message V3 (740v8412)

- Student Notes

Reasons for Spin Loops

Message IEE331A will indicate the reason for the spin loop. It can be any one of the following:

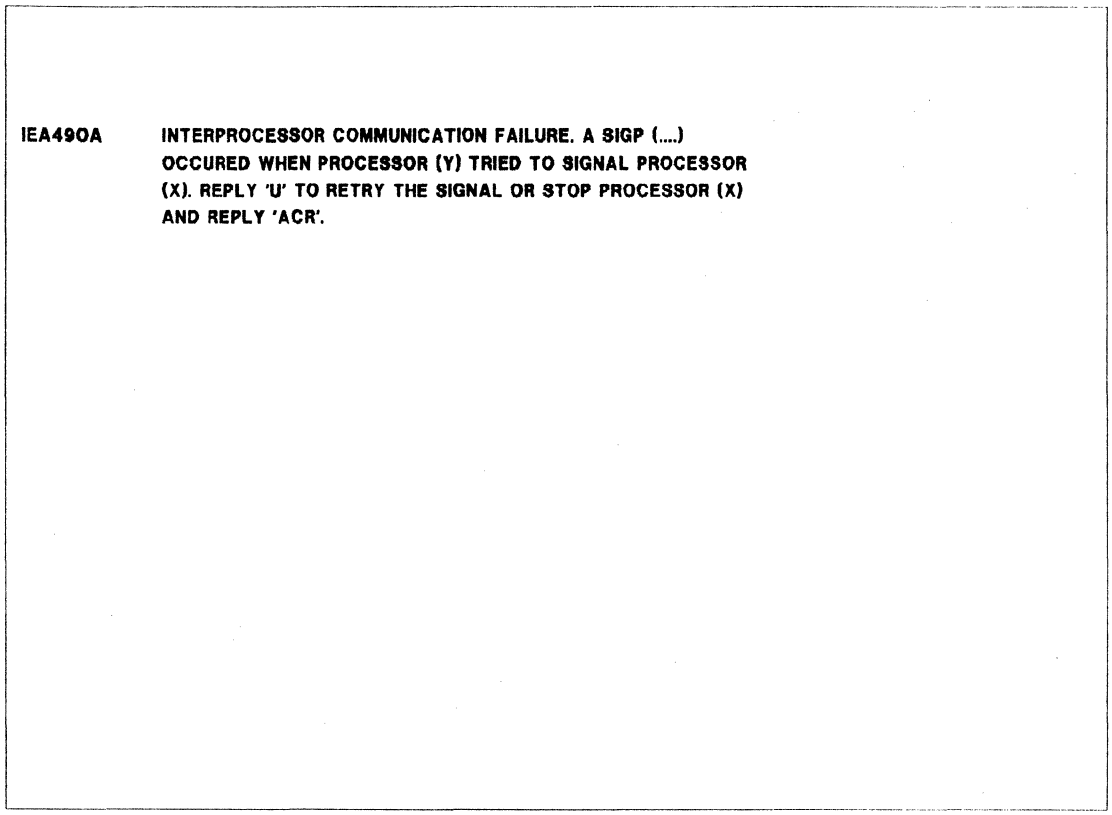
- RISGNL RESPONSE
- LOCK RELEASE
- RESTART RESOURCE
- ADDRESS SPACE TO QUIESCE
- INTERSECT RELEASE
- SUCCESSFUL BIND BREAK RELEASE

Software Type Messages

- Student Notes

SIGP Failure

When an excessive disabled spin loop is detected as a result of a Signal Processor instruction (SIGP) the following message will be issued:



Visual 6-5. SIGP Failure(740v8413)

The reason for the failure can be one of the following:

- NOT OPERATIONAL
- EQUIPMENT CHECK
- OPERATOR INTERVENING
- CHECK STOP
- NOT READY
- BUSY CONDITION
- RECEIVER CHECK

- Student Notes

Recovery from Spin Loops

Alternate CPU Recovery is a function of MVS recovery that can be initiated by the operator on a working processor to resolve a failure on another processor in the complex. ACR has two major functions:

1. configure offline a failing processor
2. initiate release of system resources held by the failing processor

The most common use of ACR is to resolve spin loops. When an excessive spin loop is detected, the operator has the option of invoking ACR to remove the processor causing the spin loop from the system configuration.

ACR initiates the freeing of resources held on the failing processor. ACR allows the operating system to continue it's normal operation on the remaining processor(s) although the task that was interrupted by the error on the failing processor may be terminated.

When ACR is complete, message IEA858E is issued stating that ACR is complete and identifying the processor that was configured offline.

At this point the operator can try to configure the failing processor back on line using the "CONFIG CPU" command. The CONFIG command may or may not be successful depending on the error that caused the processor to be configured offline.

ACR first attempts to recover the task currently active on the processor which will subsequently be configured offline. If the task cannot be recovered, it is terminated with an abend 0F3. No other work will be affected by ACR processing.

Next ACR removes the specified processor from the configuration. Since the cause of the failure is most commonly a software problem, the failing task is either recovered or abended, the processor can be configured back online immediately.

- Student Notes

Feedback questions

1. T F The processor that is in the excessive disabled spin loop is the broken processor, and should be stopped per the DCCF Spin Loop message.

Topic 6.4. Loops and Wait States

What This Topic is About

This topic presents methods of identifying the difference between enabled and disabled wait states and loops. Also introduced are Hot I/O and lost console recovery procedures.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Identify the difference between enabled and disabled waits and loops, and the recovery options available for each.
2. Recognize when the restart function can be used, how to invoke it, and select the appropriate reason code for recovery.
3. Recognize a Hot I/O and take the appropriate recovery actions.
4. Recognize a lost console condition and take appropriate recovery action to avoid an unnecessary IPL.

6.4.1. Enabled/Disabled Waits and Loops

Learning Objective

After completing this activity, you should be able to identify the difference between enabled and disabled waits and loops, and the recovery options available for each.

Enabled Waits

- Student Notes

Disabled Waits

- Student Notes

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Sections 2.0, 4.0, 6.0
- *Student Notebook*; Section 3.3.1

Enabled Loops

- Student Notes

Disabled Loops

- Student Notes

Feedback questions

1. Hitting the GLOBAL STOP key on the hardware system console will display what PSW if the CPU is in a good WAITING FOR WORK state? _____.

2. The best method for determining what application or System function is causing the Loop or Wait State is _____.

6.4.2. Restart Processing

Learning Objective

After completing this activity, you should be able to recognize when the restart function can be used, how to invoke it, and select the appropriate reason code for recovery.

System Restart Function (not valid for VM)

The restart function can be used to restart the system:

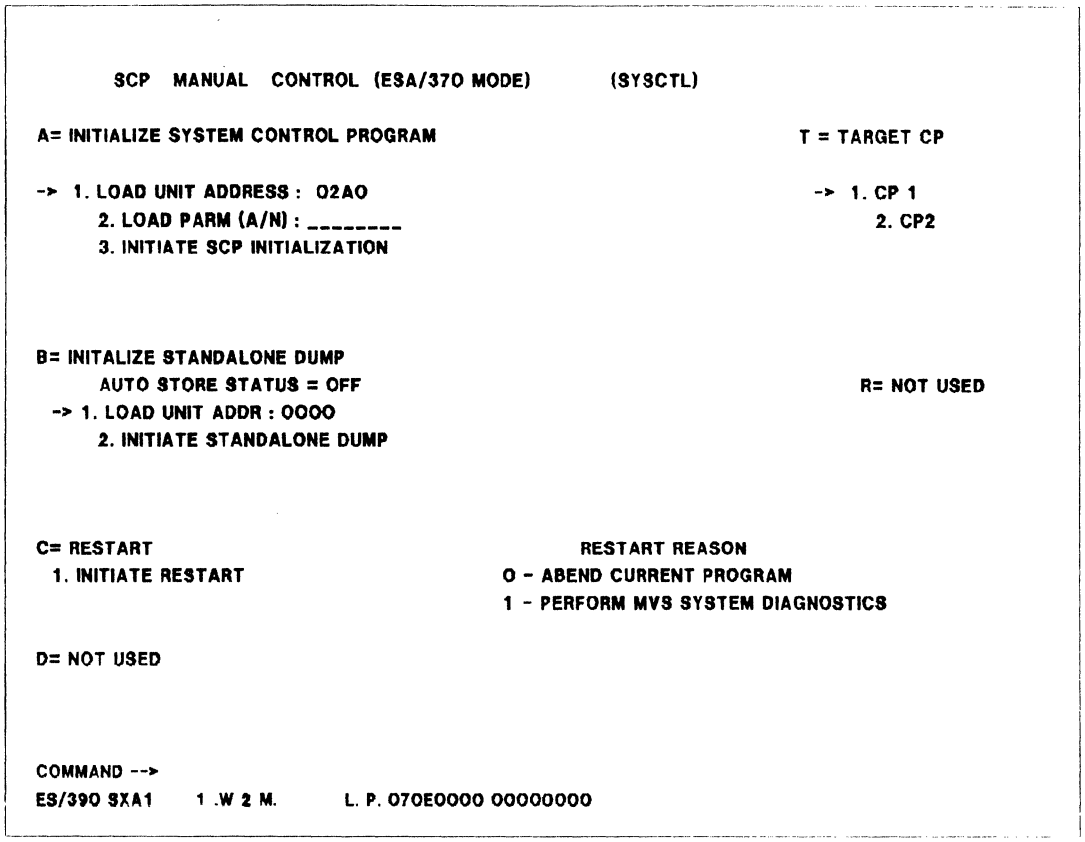
- when it enters an enabled or disabled loop
- when it enters a restartable wait state

How to Invoke System Restart

The restart function can be invoked by:

- pressing the restart key on the system console
- selecting option O2 on the OPRCTL frame (hardware system console)
- selecting option C on the SYSCTL frame (hardware system console)

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Section 6.0
- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 1



Visual 6-6. SYSCTL Frame(740v8521)

- Student Notes

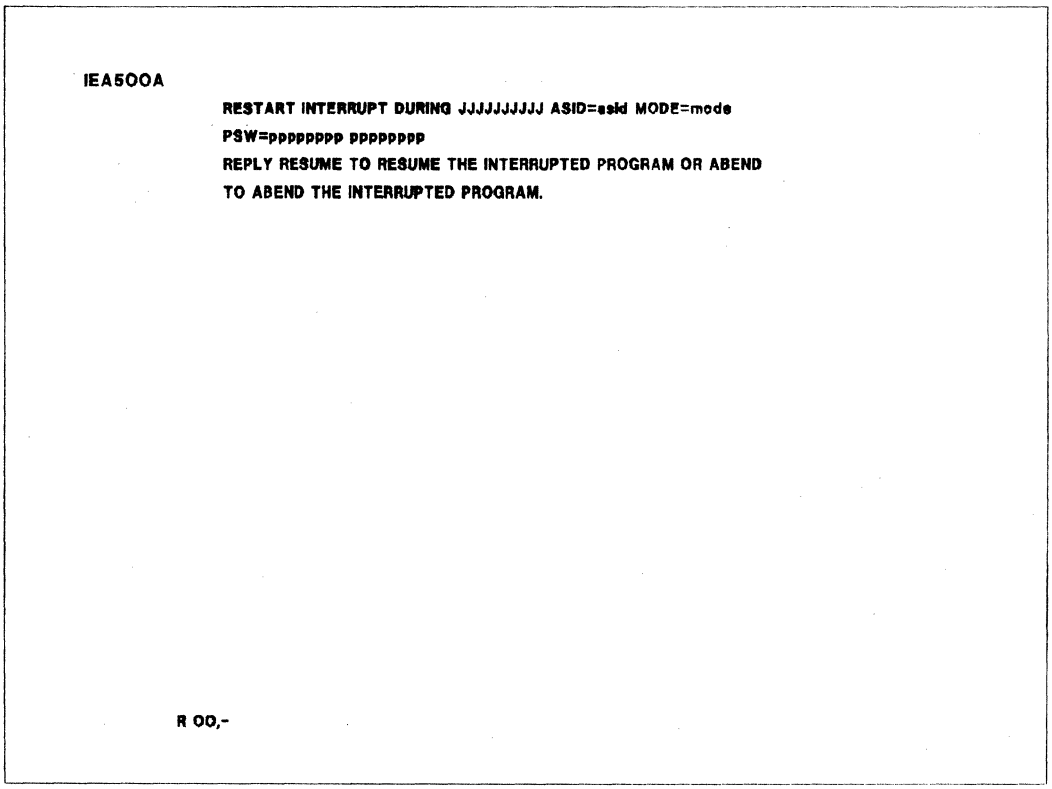
Selecting Reason Code 0 or 1

When the restart function is invoked from the SYSCTL frame, it is possible to specify restart reasons and tailor restart processing to fit other situations.

Restart Reason 0 is used:

- when the system is in a restartable wait state or loop
- to help identify a unit of work suspected of causing a loop

In the latter situation MVS will issue the following DCCF message



Visual 6-7. Restart Reason 0 (740v8522)

If the DCCF message describes the unit of work suspected of causing the problem, the operator should reply "ABEND".

If the DCCF message does not describe the unit of work suspected of having a problem, a reply of "RESUME" will end further restart processing and allow the interrupted work to continue.

The restart function with reason 0 can be invoked repeatedly to help identify and then terminate the work causing the loop.

- Student Notes

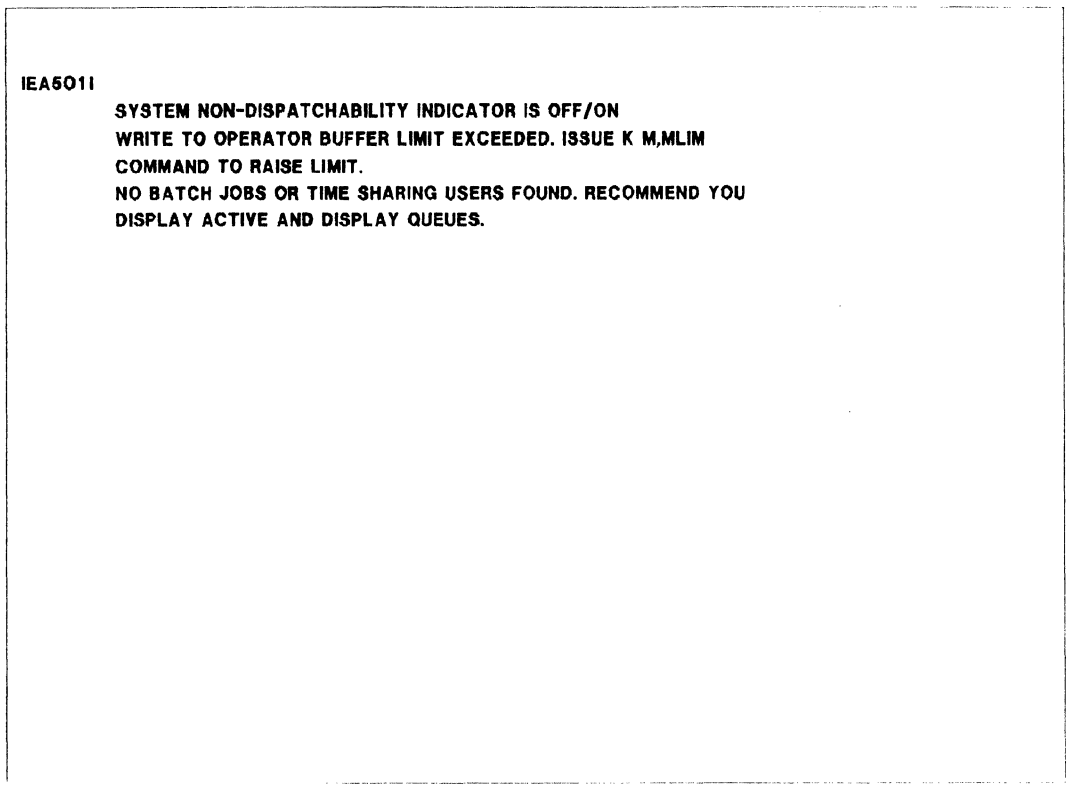
Restart Reason 1

Restart reason 1 can be invoked during a system problem that is not related to the work currently in progress. In response, the operating system diagnoses and attempts to repair some problems that might be causing the system to behave abnormally.

The system:

- checks system dispatchability
  - If the system is non-dispatchable, it makes itself dispatchable
- checks the number of message buffers
  - Notifies the operator if the maximum number has been exceeded.
- checks system activity
  - Notifies the operator if there batch jobs or time sharing users
- restarts I/O on all channel paths

The system notifies the operator of any diagnosis and repair action it performs via the following DCCF message:



Visual 6-8. Restart Reason 1(740v8523)

- Student Notes

Feedback questions

3. After issuing a RESTART REASON=0 from the SYSCTL Frame, the message states that a RESTART INTERRUPT WAS RECEIVED DURING "PAYROLL". Which of the following would be proper steps to prevent an IPL?

   a. Reply "RESUME" to continue

   b. Vary a CP off/on to attempt recovery

   c. Notify customer of problem job and see if it can be abended

   d. Abend the failing job by responding "ABEND" to DCCF message

6.4.3. Hot I/O Processing

Learning Objective

After completing this activity, you should be able to recognize a Hot I/O and take the appropriate recovery actions.

Hot I/O is a term referring to a condition on a device which causes repeated, unsolicited interrupts. The operating system must detect and handle this condition before storage is exhausted.

```
                DEVICE TYPES FOR HOT I/O RECOVERY

DVTHRSH=100

DFLT110=(BOX,BOX)          NON-DASD, NON-DPS TYPE DEVICES

DFLT111=CHPK,BOX)          NOT RESERVED DASD OR DPS TYPE DEVICES

DFLT112=(CHPK,OPER)        RESERVED DASD OR DPS TYPE DEVICES
```

Visual 6-9. Device Types(740v8531)

- Student Notes

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Section 15.0
- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 1

HOT I/O OPTIONS (DESCRIPTIONS)

OPTION	MEANING AND USE
BOX	SPECIFIES THAT THE DEVICE IS TO BE FORCED OFFLINE
CHPF	SPECIFIES THAT THE CHANNEL PATH THAT RECEIVED THE HOT I/O FROM THE DEVICE IS TO BE FORCED OFFLINE
CHPK	SPECIFES THAT CHANNEL PATH RECOVERY IS TO BE INITIATED ON THE PATH THAT RECEIVED THE INTERRUPT, AND REMAIN ONLINE IF SUCCESSFUL.
OPER	WRITES A DCCF MESSAGE FOR THE OPERATOR TO INITIATE THE RECOVERY ACTION.

Visual 6-10. Hot I/O Options(740v8532)

- Student Notes

C30
Chpd/C

```
IOS110A  IOS HAS DETECTED A HOT I/O ON DEVICE XXX (NON DASD).
                THE LAST INTERRUPT FROM THIS DEVICE WAS ON CHANNEL PATH XX.
                THE SCD IS AT ssssssss. THERE ARE XX DEVICES WITH HOT I/O
                ON CHP XX.

                ENTER ONE OF THESE REPLIES TO TELL IOS HOW
                RECOVERY IS TO BE HANDLED.

NONE
                PHYSICALLY REMOVE ANY DEVICE OR CONTROL UNIT (HE MAY
                OR MAY NOT HAVE RESET THE DEVICE) AND (2) IOS SHOULD
                NOT REMOVE ANY DEVICE AND NOT ATTEMPT ANY CHANNEL
                PATH RECOVERY.

DEV             BOX THE DEVICE


CU              OPERATOR PHYSICALLY REMOVED THE CONTROL UNIT


CHP,K           CHANNEL PATH RECOVERY IS TO BE ATTEMPTED.


CHP,F           FORCE THE CHANNEL PATH OFFLINE.
```

Visual 6-11. Message IOS110A(740v8533)

- Student Notes

Feedback questions

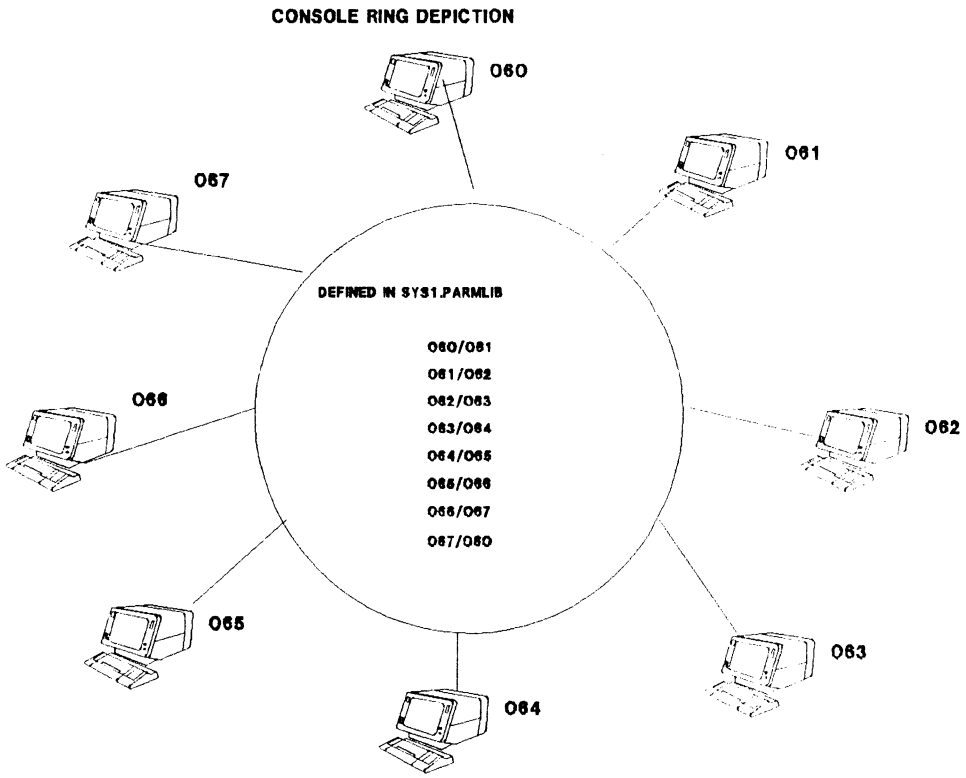
4. A Hot I/O on a shared CU could cause the CU Header to go into a BUSY state. What is the correct way to reset the CU Header, after checking with the customer? CF CHPIDxx off - the CF CHPID ON

6.4.4. Lost Console Recovery

Learning Objective

After completing this activity, you should be able to recognize a lost console condition and take appropriate recovery action to avoid an unnecessary IPL.

A lost console condition exists when you can no longer communicate with the system from the master console or any of the alternate consoles. The jobs that were running will continue to run, however, no new jobs can be started.



Visual 6-12. Console Ring(740v8541)

- Student Notes

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Section 7.0
- *MVS/ESA Operations/System Commands, GC28-1826*; Chapter 2
- *Student Notebook*; Section 3.3.4

LOSS OF MVS CONSOLE RECOVERY

1. Go to Master or any Alternate MVS console and press the RESET then the ENTER key to cause an interrupt.

2. On the H/W SYSTEM console press the ALT/EXT INTRPT keys.

3. If console recovery successful, perform an ALT/CLR function on the console to resume normal operation.

4. If not successful ask customer if you can take the CHPID that the consoles are on to try recovery.

5. If you can perform the following on the H/W SYSTEM console:
CHPID XX OFF
CHPID XX ON

6. This will reset all the control blocks on the chpid

7. If successful, perform the ALT/CLR function on the MVS console to resume normal operation.

Visual 6-13. MVS Console Recovery(740v8542)

- Student Notes

Feedback questions

5. What is the correct MVS command used to display which console is currently the MASTER console on the operating system.?____D C,P____

6. After performing the necessary actions to attempt LOST CONSOLE recovery, what may have to be done to the target MVS console to resume normal operation? ____Vary ____.

7. T(F) Hitting the EXT INTRPT key on the MVS Master console will force MVS to attempt a write operation to that console?

Topic 6.5. IPL Flow

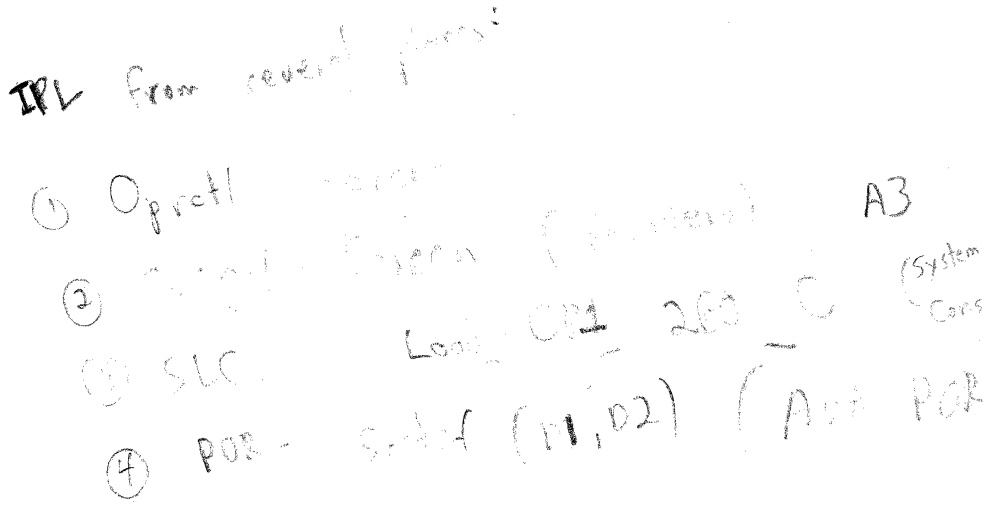
What This Topic is About

This topic addresses the five major "visual" steps of the IPL process. Also discussed are key operations that occur within the IPL process.

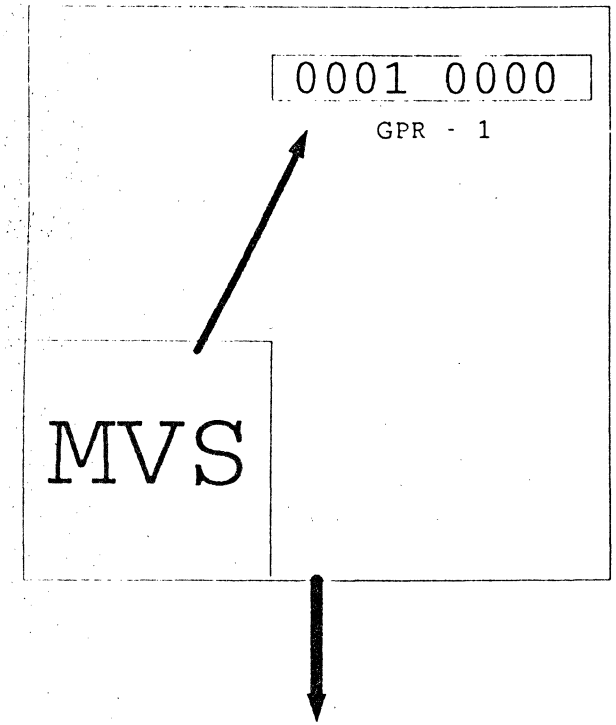
Learning Objectives

Successful completion of activities in this topic should enable you to

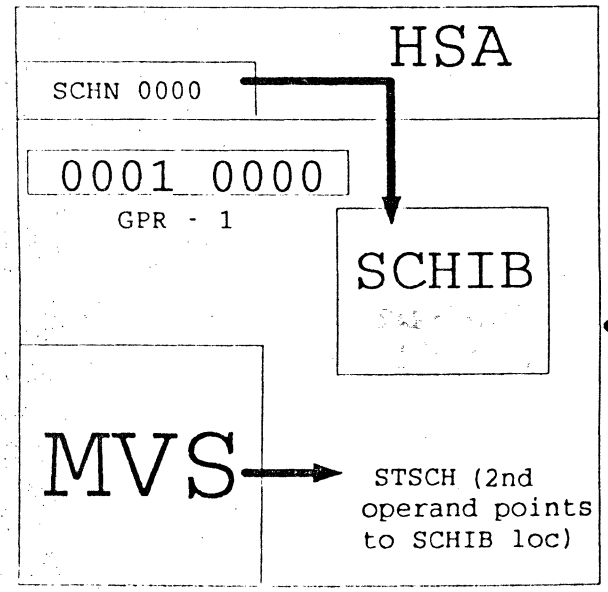
1. Match the five major steps of the IPL process with the indicator of successful completion for that step.



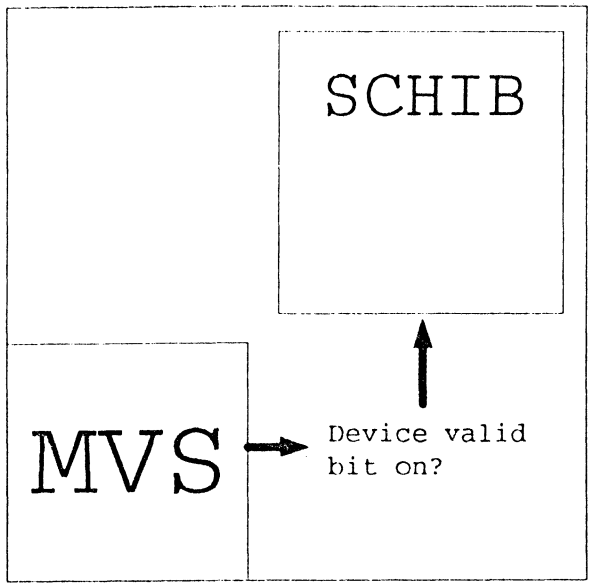
1. MVS loads GPR-1 with 0001 0000



2. MVS issues STSCH to create a SCHIB for schnl 000

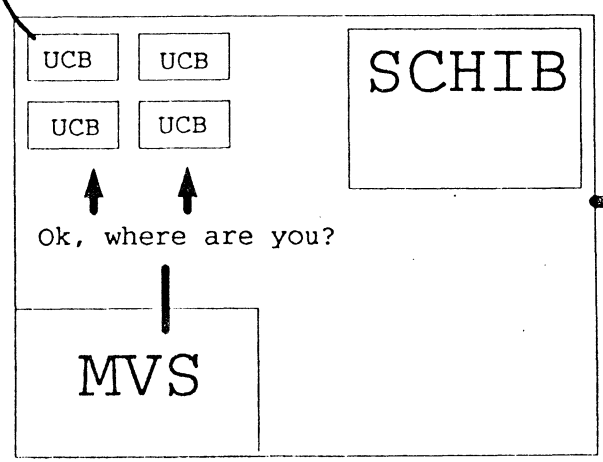


3a MVS examines "dev valid" bit.

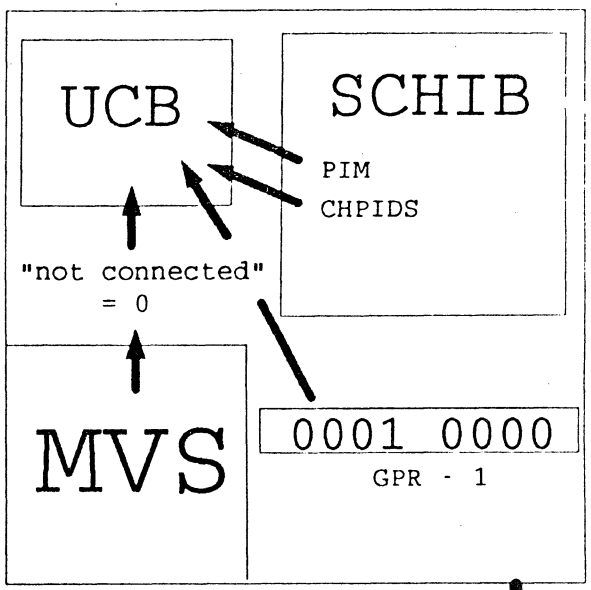


- If not valid, leave UCW in disabled state.
- If valid, scan for UCB with same device number

3b

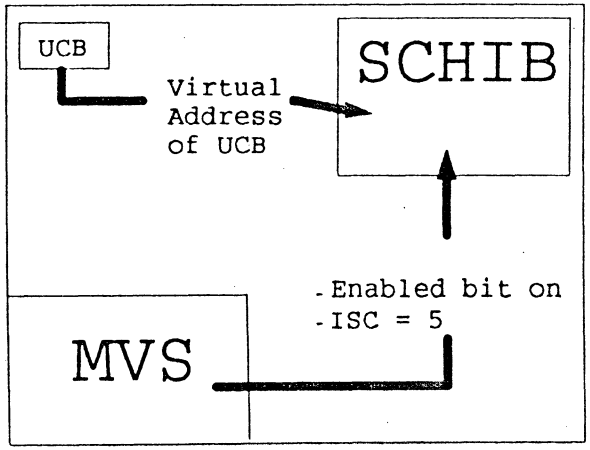


4. If match is found, update the UCB



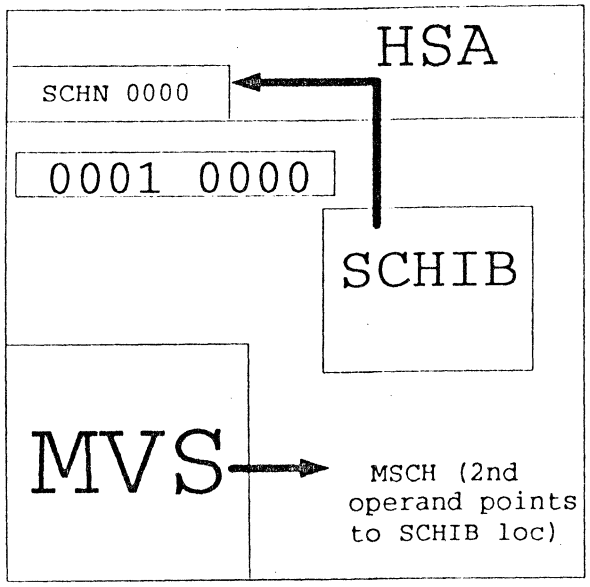
- Turn off not connected bit
- Subchannel # from GPR 1
- PIM & CHPIDS from SCHIB

5. If match is found, update the SCHIB

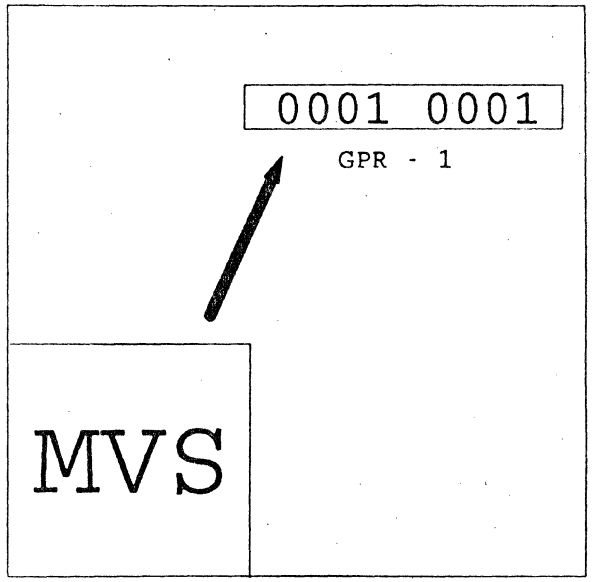


CONTINUED ON BACK...

6. MVS issues MSCH to place modified SCHIB contents in subchannel



7. MVS increments GPR-1 and repeats process.



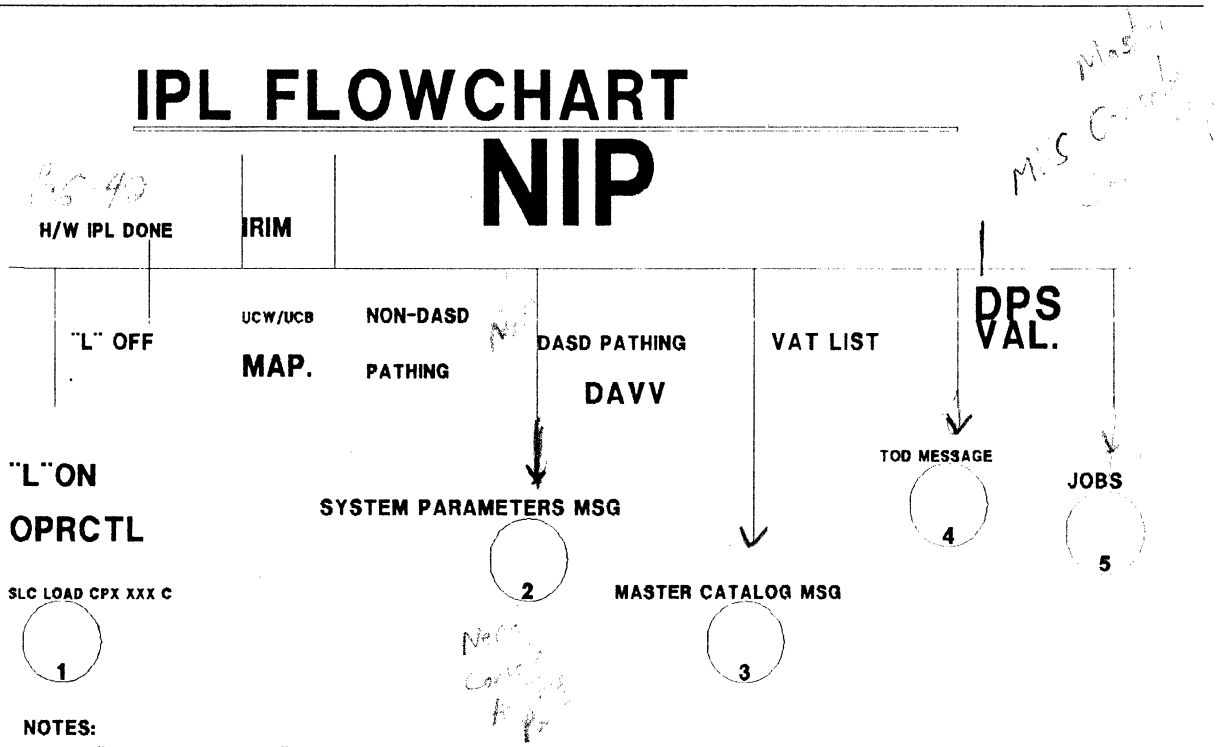
6.5.1. IPL

Learning Objective

After completing this activity, you should be able to match the five major steps of the IPL process with the indicator of successful completion for that step.

IPL Process

Knowing the sequence of events that occur during the IPL process can aid you in isolating the cause of unsuccessful IPLs. This objective covers the five major visual steps that occur during an IPL, and some of the events that happen during those steps.

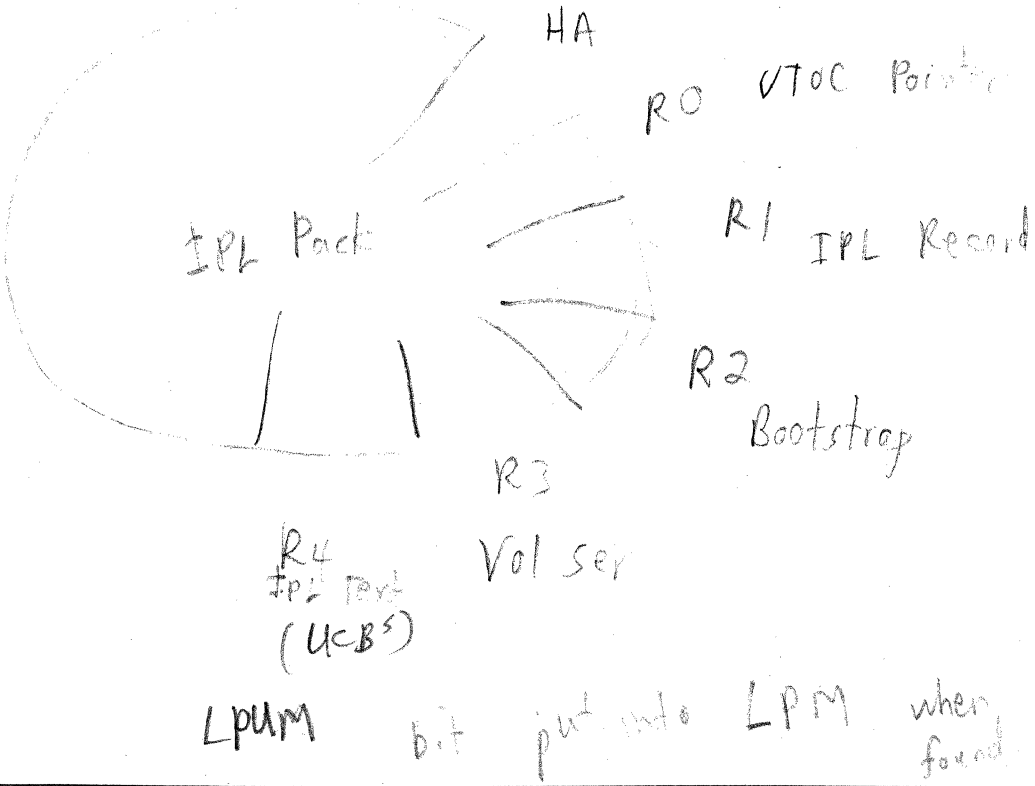


Visual 6-14. IPL Flowchart(740v8611)

- Student Notes

- *Complex Systems Recovery and Availability System Recovery Procedures, GG24-3346*; Section 5.0

MVS IPL Pack Organization



LPUM bit put into LPM when found

Feedback questions

1. The primary reason that DASD Pathing is not done along with NON-DASD Pathing is?_____.

2. The indication that the Hardware IPL is complete is?_____

3. T (F) The TOD clock prompt is a mandatory message in the IPL procedures?

Unit 7. ESCON Environment

What This Unit is About

This unit provides you with an introduction to the various hardware and software products available in the ESCON environment. Included are pathing, initial failure analysis and the proper use of the ESCON Manager command set.

Reference Summary

Manuals You Should Have

- *Student Notebook*
- *MVS/ESA Operations/System Commands Reference Summary*, GX22-0013
- *ESCON Manager Reference Summary*, SX23-0412

Manuals Available in the Classroom

- *ESCON Link Fault Isolation*, SY22-9533
- *MVS/ESA Operations/System Commands*, GC28-1826
- *Using the Enterprise Systems Connection Manager*, SC23-0425

Topic 7.1. Introduction to S/390 ES Connectivity Architecture

What This Topic is About

This topic introduces you to the new ES/390 products and architecture. Items discussed are the products, their purpose in the system environment, and how they can contribute to ease of control and assurance of availability of system resources.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Identify the function of each of the ES Connection Products.
2. Define the characteristics of switched point to point topology and ES connection architecture.
3. Identify the different types of port connections available through an ESCON Director and the purpose of each assignment.

7.1.1. Introduction to ES Connection Products

Learning Objective

After completing this activity, you should be able to identify the function of each of the ES Connection Products.

ES Connection Products and Services

ES connection products and services provide customers with a variety of ways to make their enterprise system more productive and efficient. The ESCON products and services range from processors to cabling products and services.

ES Connection Products

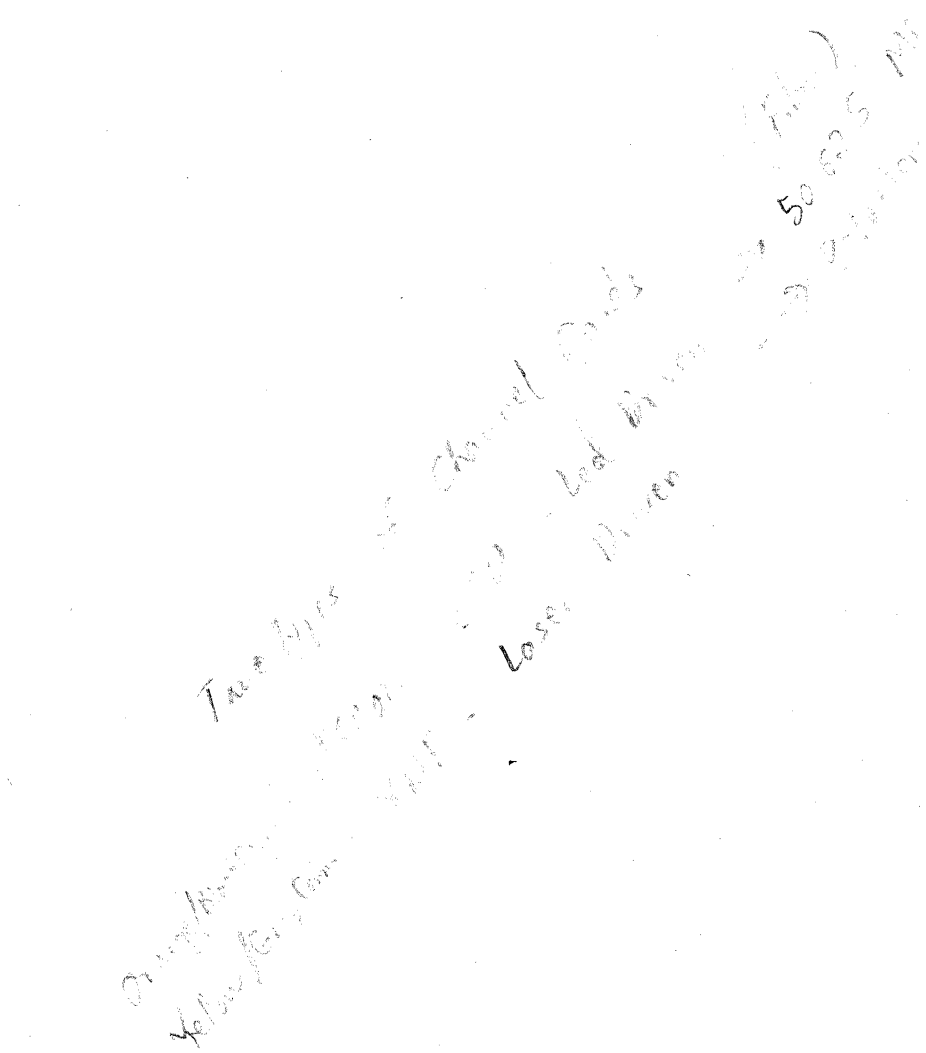
- ES/9000 processors
- Jumper cables and connectors
- Fiber optic cabling services
- ES connection directors (9032/9033)
- Interconnect controller (3172)
- Establishment controller (3174)
- Control units with ESCON interfaces (3174/3490/3990)
- ES connection converters (9034/9035)
- Sysplex timer (9037)
- ES connection monitor system
- Software products
  - System control programs
  - ES connection manager.
- Student Notes

• *Introducing Enterprise Systems Connection, GA23-0383*; Chapter 6

Feedback questions

1. T F The 9034 ES Connection Converter is used to convert parallel protocol from the channel to serial protocol at the control unit.

2. T F The 9032 ESCON Director has the capability of connecting a total of 60 ports to channels and control units.



7.1.2. Switched Point to Point Topology

Learning Objective

After completing this activity, you should be able to define the characteristics of switched point to point topology and ES connection architecture.

Switched Point to Point Topology

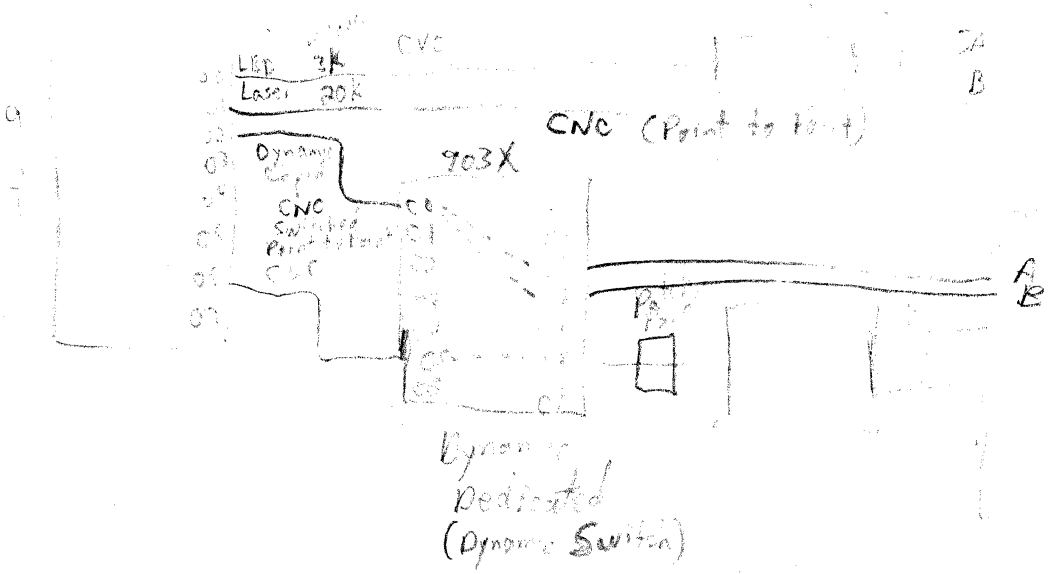
Switched point to point topology provides the ES/390 data center with the ability to remain productive while adding channels and control units to the system. The ability to remain productive is attained with the concept of dynamic connectivity utilizing ESCON fiber optic channels and products.

Switched point to point topology has many benefits over point to point and multidrop topologies. Some of them are:

- quick access to backup hardware
- less physical connections
- nondisruptive addition of systems and control units
- easier isolation of failing channels and control units

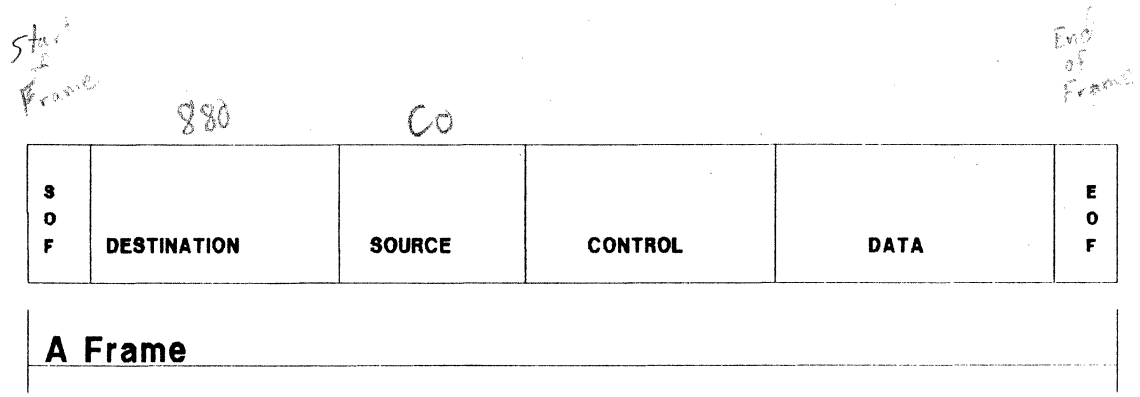
ES Connection Architecture

ES Connection Architecture is the means by which the channels communicate and pass data to and from the control units. Destination, source, control and data are the types of information contained in a frame.



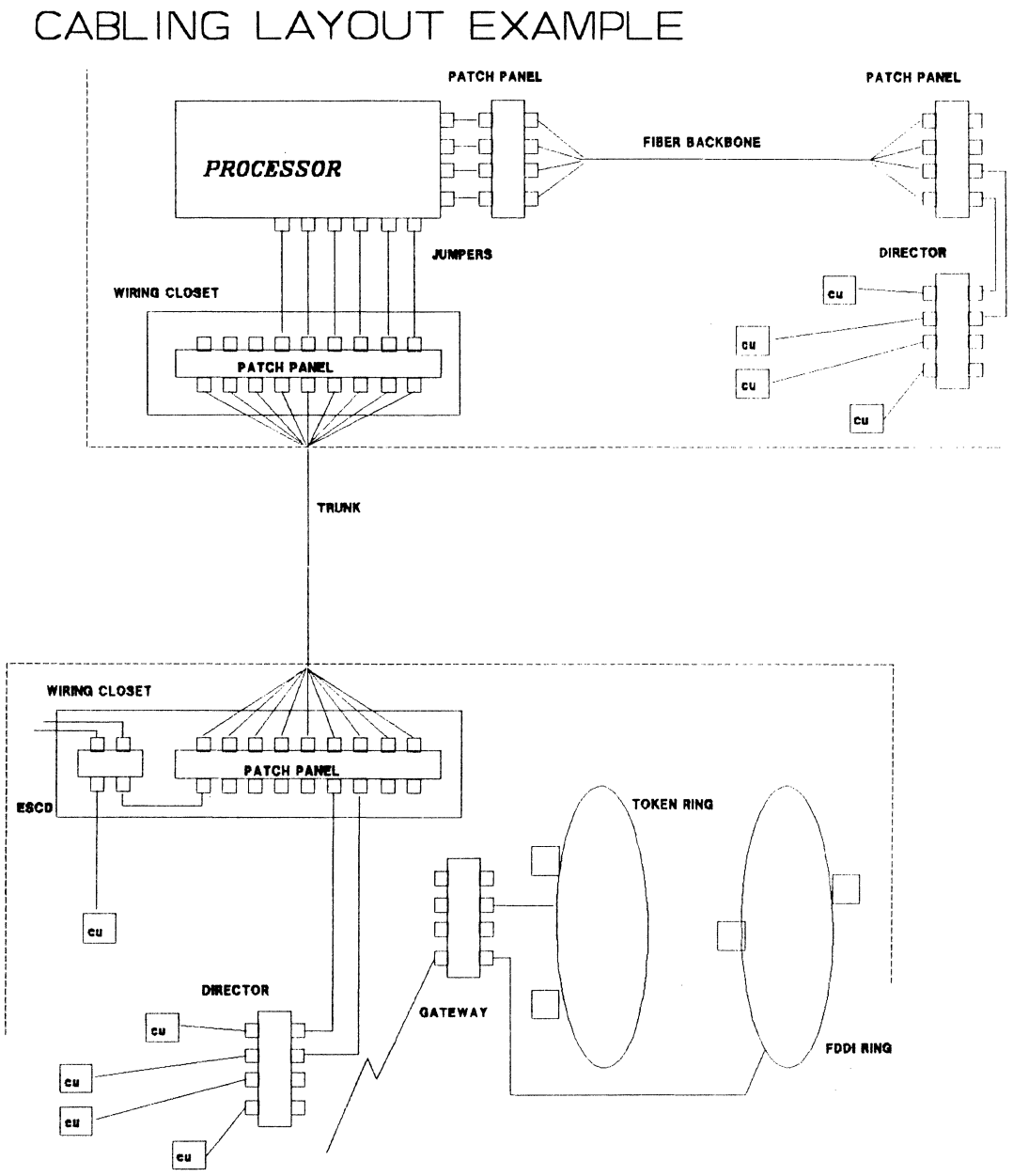
• *Introducing Enterprise Systems Connection, GA23-0383*; Chapter 3

HIGH-LEVEL FRAME LAYOUT



Visual 7-1. Typical Frame Example(740v9121)

- Student Notes



Visual 7-2. ESCON Channel Layout(740v9122)

Feedback questions

3. What are the advantages of switched point to point topology as opposed to todays standard parallel topology?
   a. Ability to add/remove CU's concurrently
   b. Ability to load IOCDS without system disruption
   c. Capability of having more than 8 CU's on a physical port
   d. One CHPID is capable of talking to 59 CU's

7.1.3. Migrating to ES/390 Environment

Learning Objective

After completing this activity, you should be able to identify the different types of port connections available through an ESCON Director and the purpose of each assignment.

An enterprise system can migrate to the ES Connection environment by using existing parallel channels along with fiber optic channels and by connecting parallel channels through an ESCD with the use of 9034 converters. This type of versatility is controlled with different types of port assignments in the ESCD. These port assignments can be controlled from the host or at the ESCD console.

Types of Port Assignments

- Dedicated connection
  - provides a direct path from channel to control unit
  - restricts channel and control unit from other paths
  - required for each 9034 ES Connection Converter
- Dynamic connection
  - ESCD establishes and removes connections dynamically
- Channel to channel connection (multiple hosts)
  - channels can communicate with channels from another host
- Chained connection (multiple directors)
  - provides for distances up to nine (9) kilometers
  - no more than two (2) chained directors
  - at least one ESCD must be a dedicated connection
- Student Notes

• *Introducing Enterprise Systems Connection, GA23-0383*; Chapter 3

Feedback questions

4. Which of the following are configured as true serial connections in IOCDS?
   a. Serial CTC channels
   b. 9034 attached channels
   c. 3174/12L channels
   d. Chained ESCD channels
   e. DASD 4.5 Data Streaming channels

5. T F At least 2 ports through one ESCD in a chained ESCD configuration must be genned as "dedicated".

Topic 7.2. ESCON Failure Analysis

What This Topic is About

This topic shows you the use of the ESCON Link Fault Isolation Document. Items to be discussed are when and how you will be directed to use this document, and when directed, how to flow through the maps contained in the document. The proper use of the ESCON Manager command set will also be utilized to control the active ESCON configuration.

Learning Objectives

Successful completion of activities in this topic should enable you to

1. Use the ESCON Link Fault Isolation document to identify a failing device in a serial environment.

7.2.1. ESCON Failure Analysis

Learning Objective

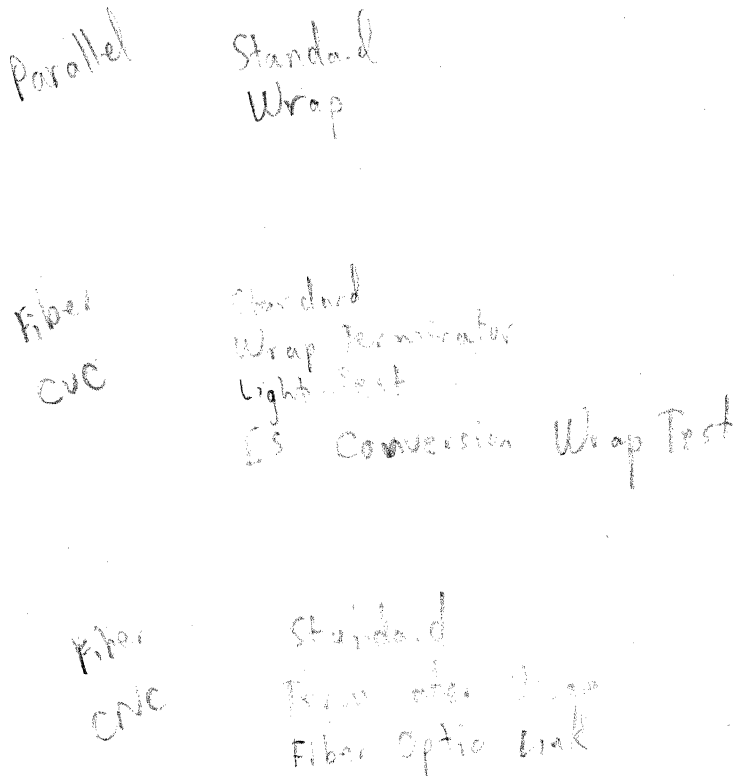
After completing this activity, you should be able to use the ESCON Link Fault Isolation document to identify a failing device in a serial environment.

Using the ESCON Link Fault Isolation Document

The ESCON Link Fault Isolation document is an extension of the I/O Problem Determination manual for the CPU product you are working with. For example, when trouble shooting a channel type problem, always start with the CPU product documentation, and if necessary, that documentation will direct you to the ESCON Link Fault Isolation document.

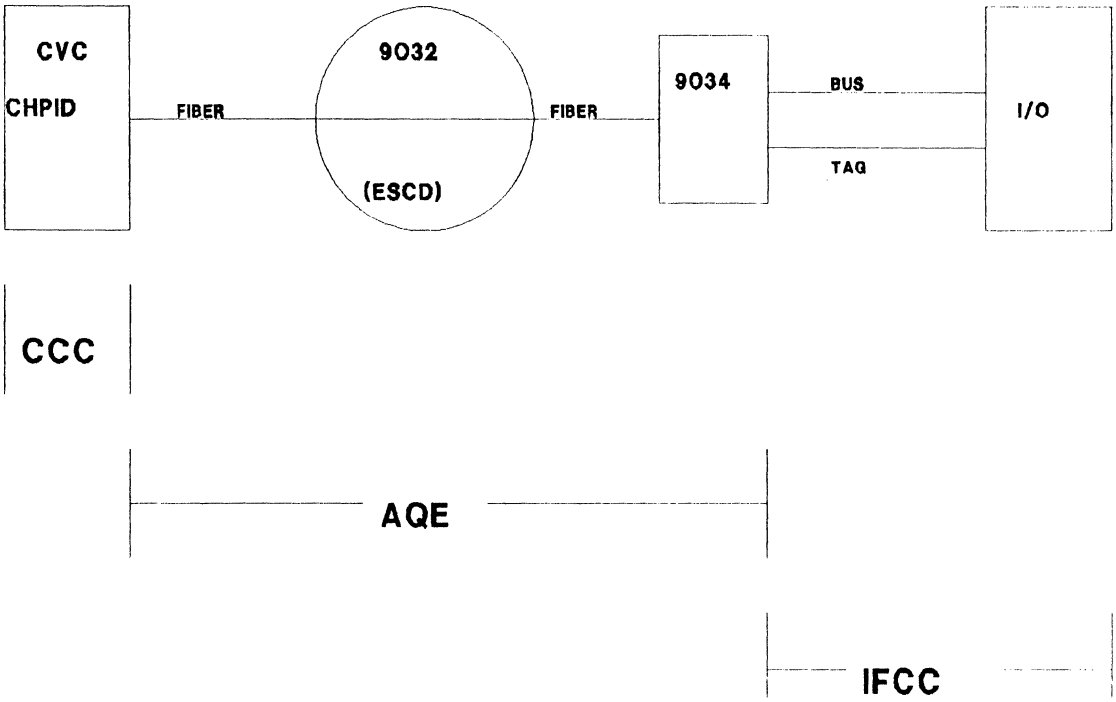
The only situation that you will be directed to use the ESCON Link Fault Isolation document is when the problem is on a Connection Channel (CNC).

If the problem is on a Conversion Channel (CVC), you may be directed, by the CPU product documentation to use the 9034 Converter documentation.



- *ESCON Link Fault Isolation, SY22-9533;*

CVC CHANNEL FAILURE INDICATIONS



Visual 7-3. CVC Failure Indications(740v9211)

- Student Notes

Feedback questions

1. Initial diagnosis of customer reported channel or unknown I/O problems always begins_____.

2. If a failure is detected at the INPUT to a 9034 protocol converter from the channel, the failure indication will be an AQE.

Unit 8. 9121 Power/Thermal

What This Unit is About

This unit familiarizes you with the power distribution and locations of all power components in the processor complex. It shows how these components are powered on and monitored. It is intended to make you as familiar as possible with the available documentation and produce an understanding of operational theory.

Items addressed in this unit are:

- Locate power components
- Identify power components according to its function
- Power on/off any power boundary
- Determine if primary power is within specification
- Available Manuals
- Use of Power/Thermal Diagnostics at RCS direction for fault isolation
- FRU replacement procedure

What You Should Be Able to Do

After completing this unit, you should be able to

- Correct Power/Thermal problems by performing power tasks and/or FRU replacement procedures as guided by the maintenance package.
- Execute Power/Thermal Diagnostics and any other fault analysis steps as directed by RSC.

Topic 8.1. Power/Thermal Introduction

8.1.1. Power Components

Learning Objective

After completing this activity, you should be able to match each power component to its function.

Supporting Activities

Using the documentation, we will look at and discuss the overview of the 9121 power system.

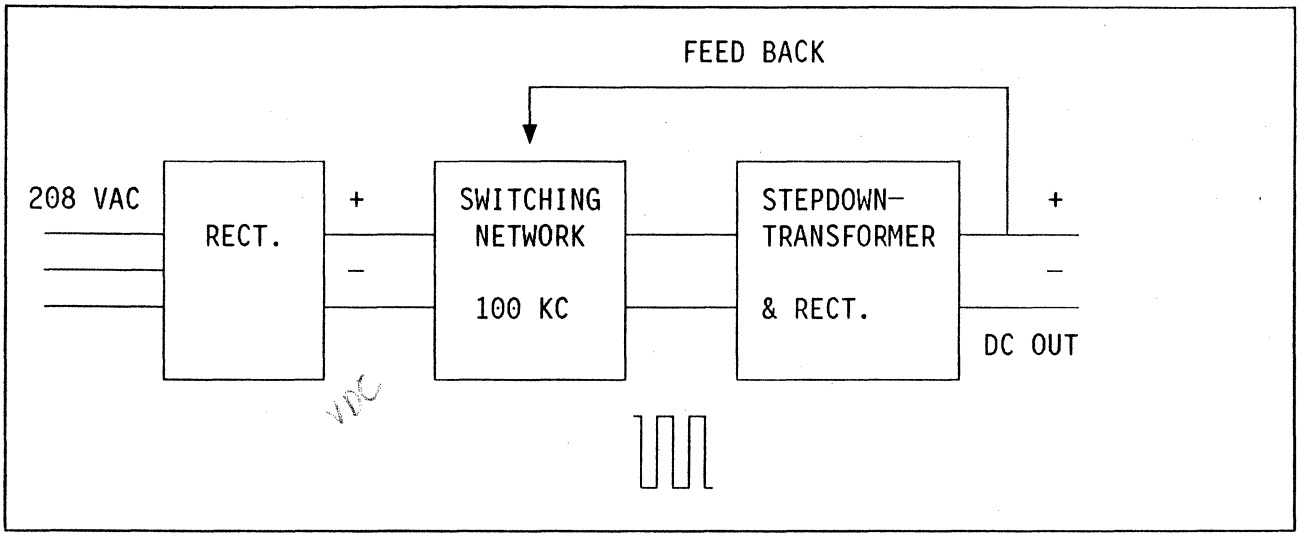
This will include the function of the major power components in the system and the major steps of system power on.

This objective is supported by the subsections:

1. Power Supply Overview.
    - Switching Type Regulators.
    - Power Supply Controls.
2. Power System
    - Power Components.
    - Stacked Power Supplies.
3. 9121 System Bring-up

- *C01 9121 Service Information: Processor Controller Element Service Guide*, SY27-2613; Section 6

Switching Regulator Principle



Visual 8-1. Switching Regulator Principle

Notes

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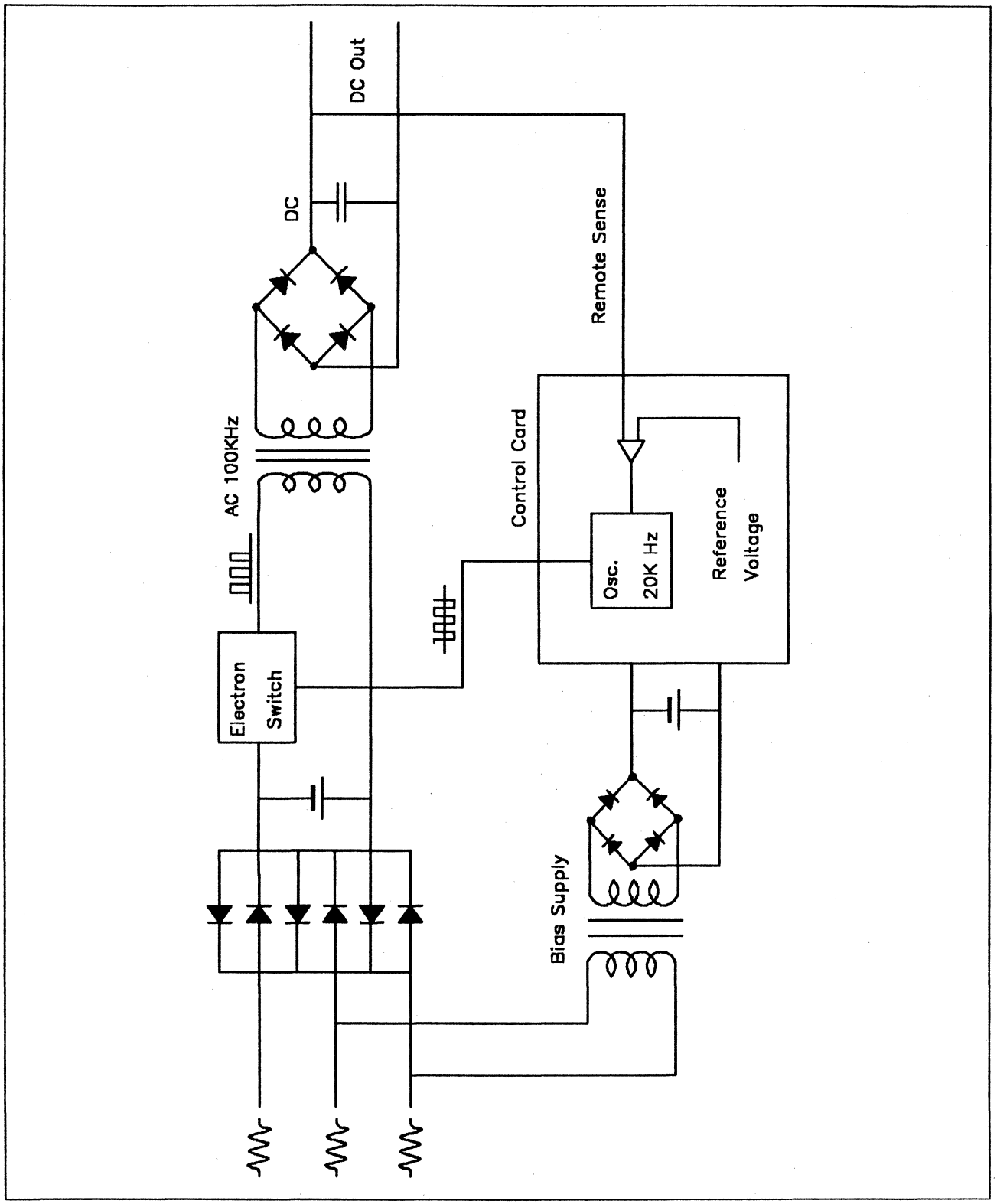
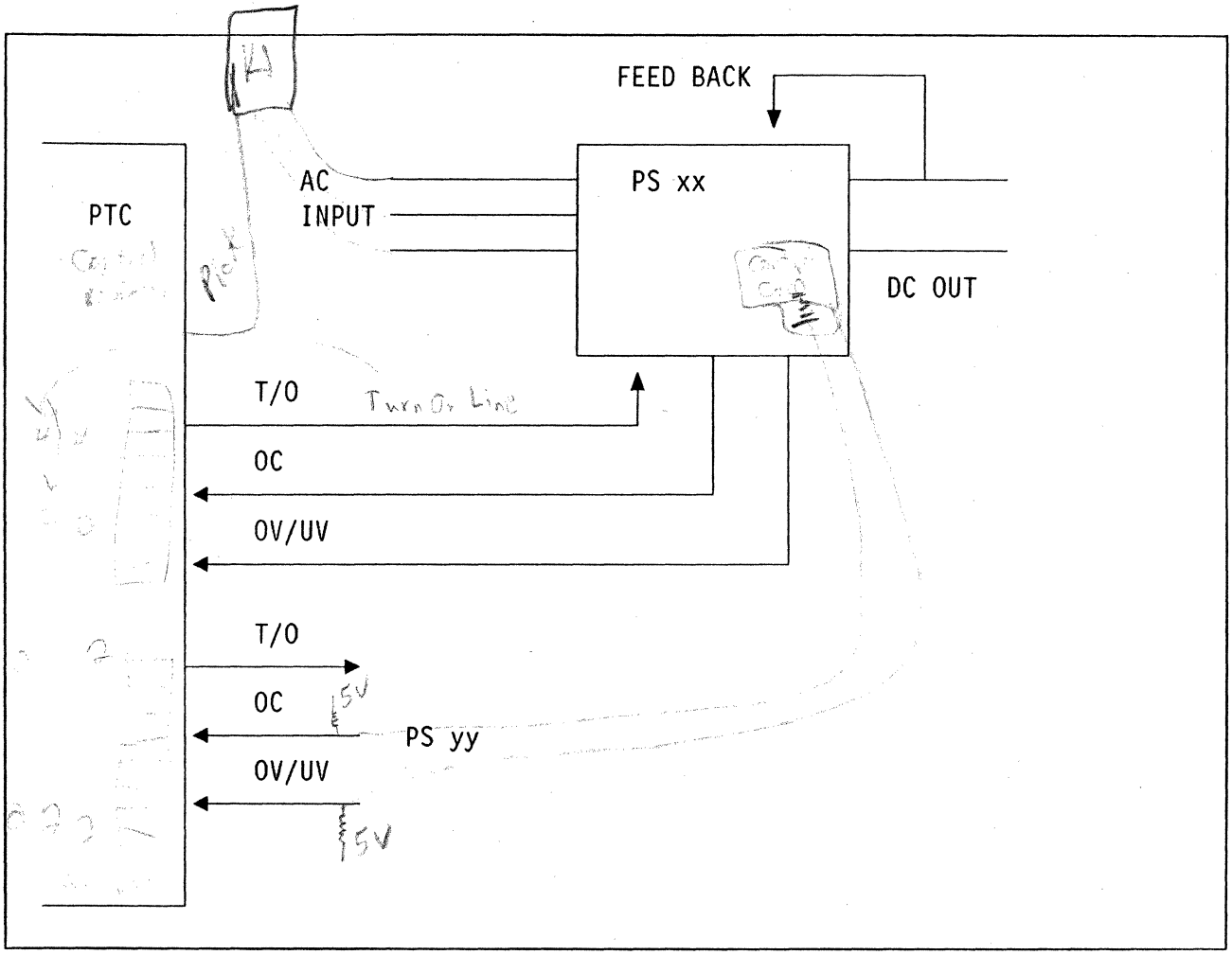


Visual 8-2. Switching Regulator

Notes

Power Supply Controls

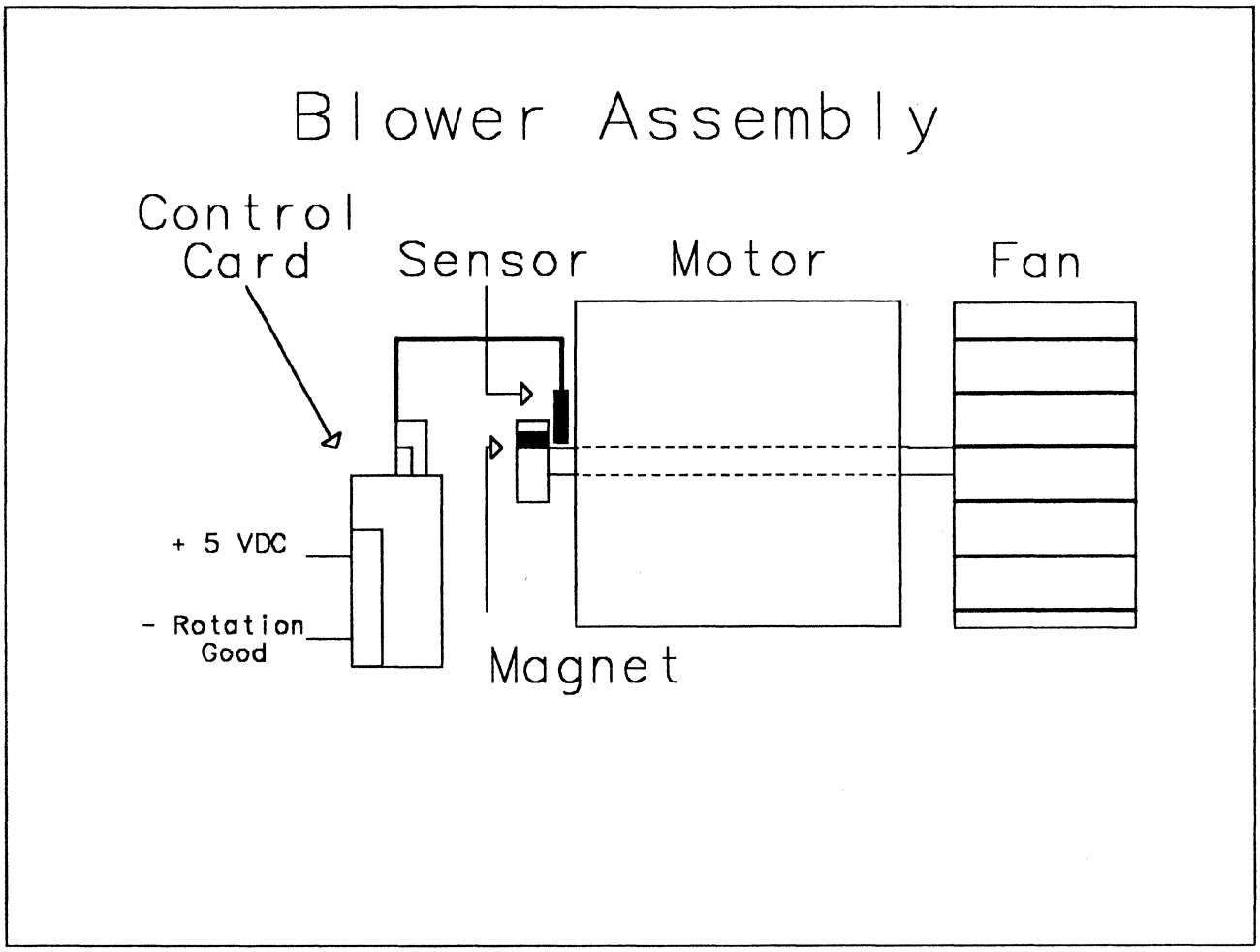


Visual 8-3. Power Supply Controls

- After AC has been applied, the power supply is turned on by the T/O- Control line.
- The correct function is verified via the OC-, and OV/UV- Sense line.

Notes

Blowers

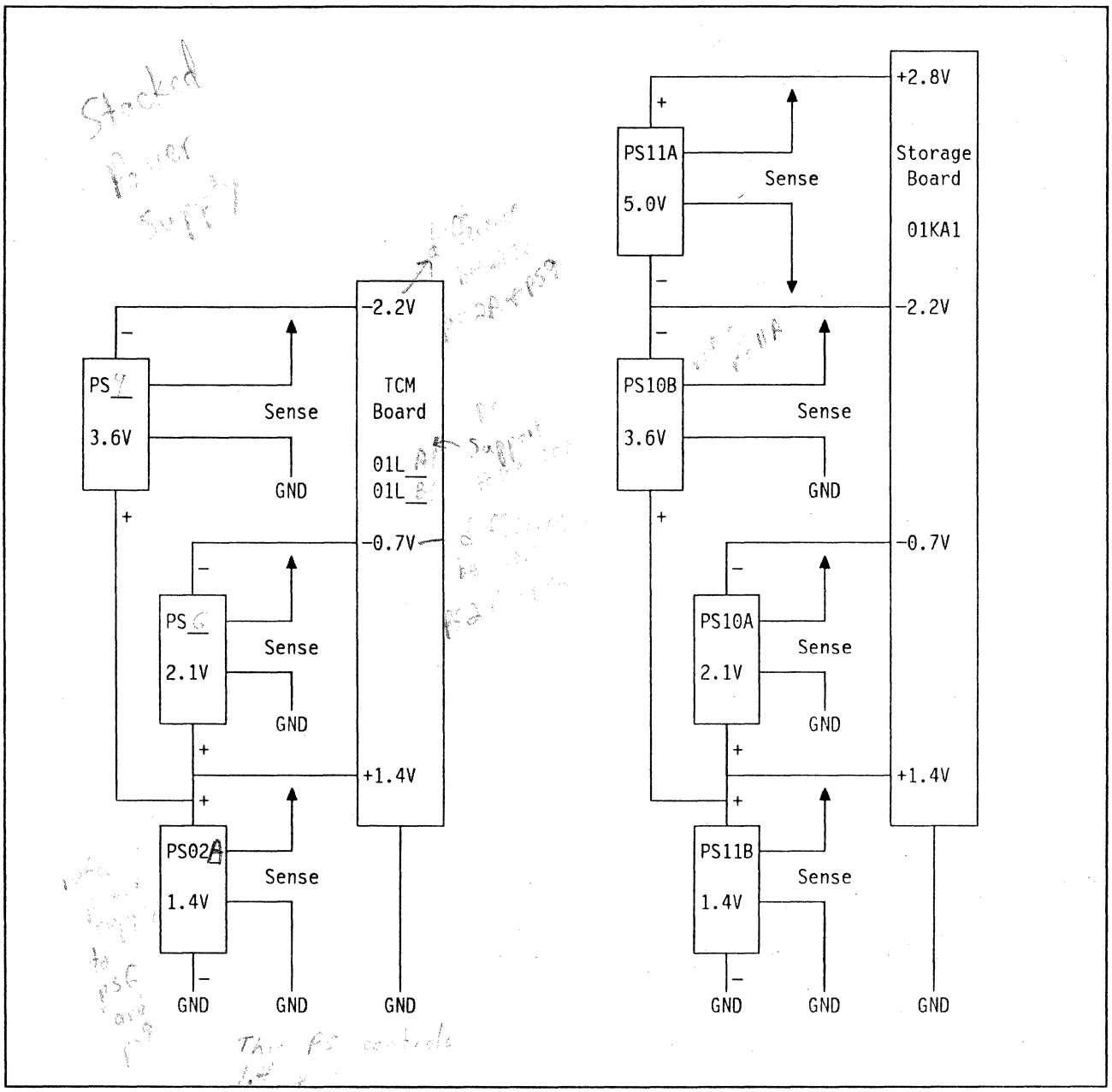


Visual 8-4. Blower

- Blowers are verified as being off or on by the rotation good sense line.

Notes

Stacked Power Supplies

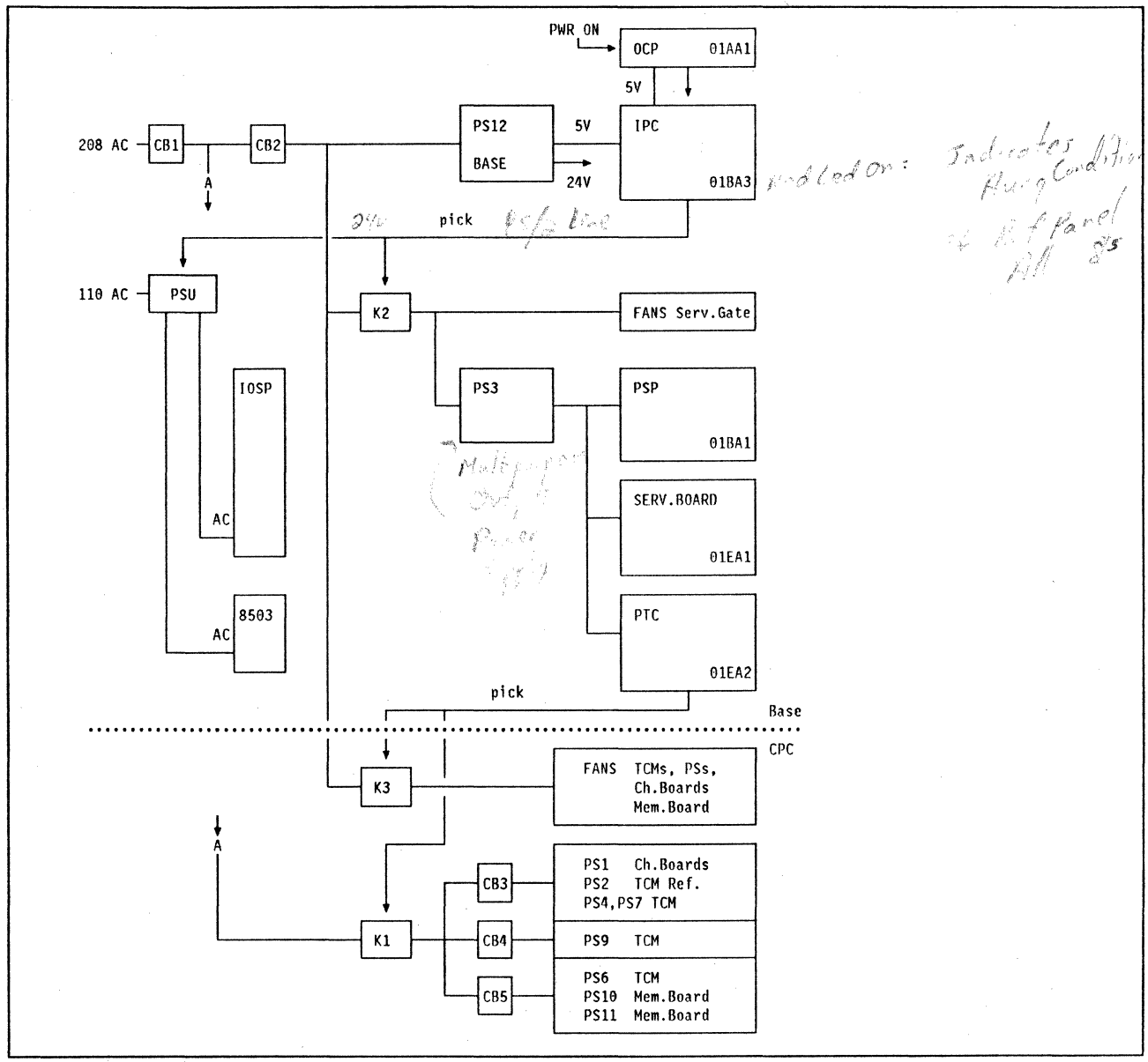


Visual 8-5. Stacked Power Supplies

- There are Multiple Power Supply boxes which contain more than one single power supply.

Notes

Power Components

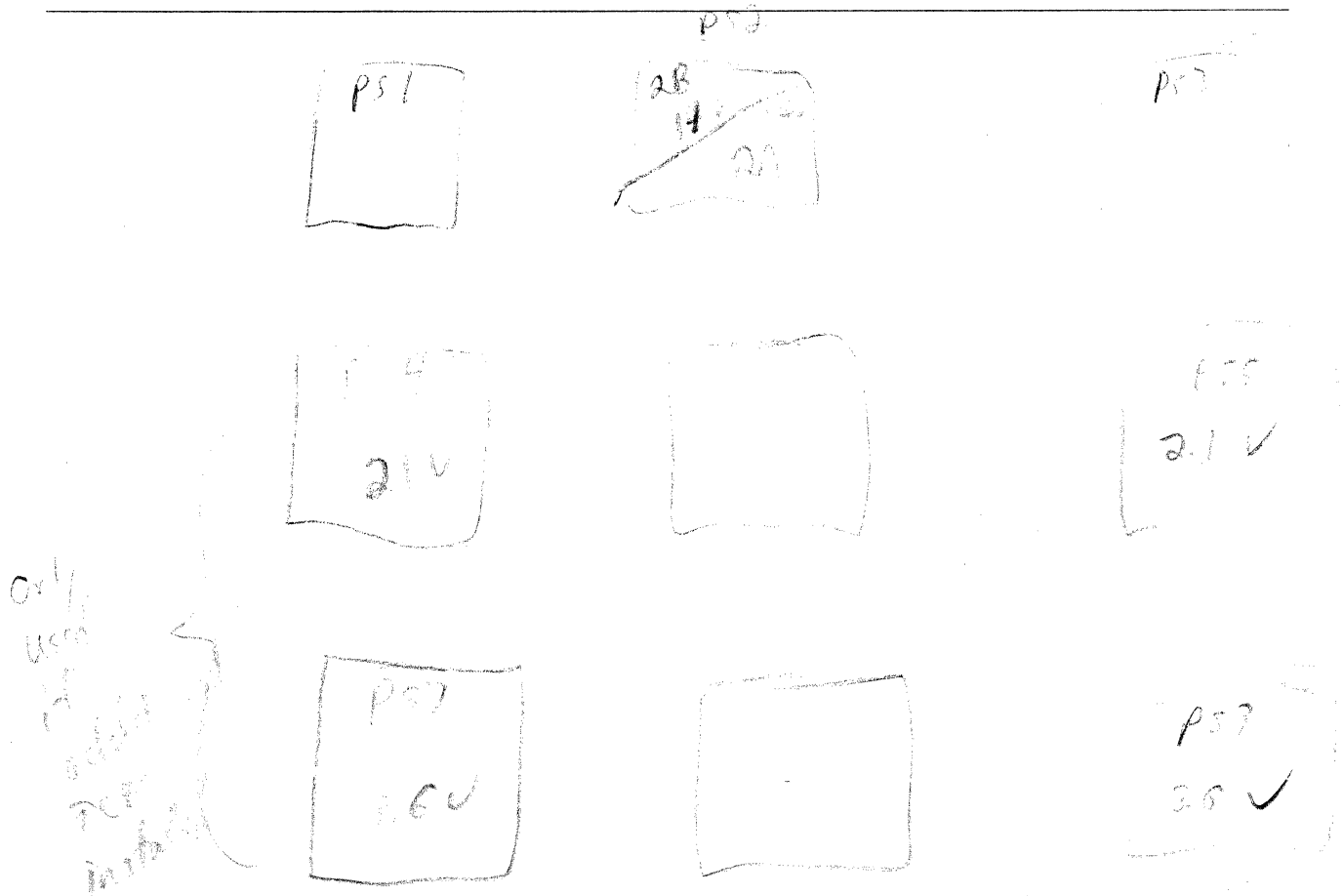


Visual 8-6. Power Components

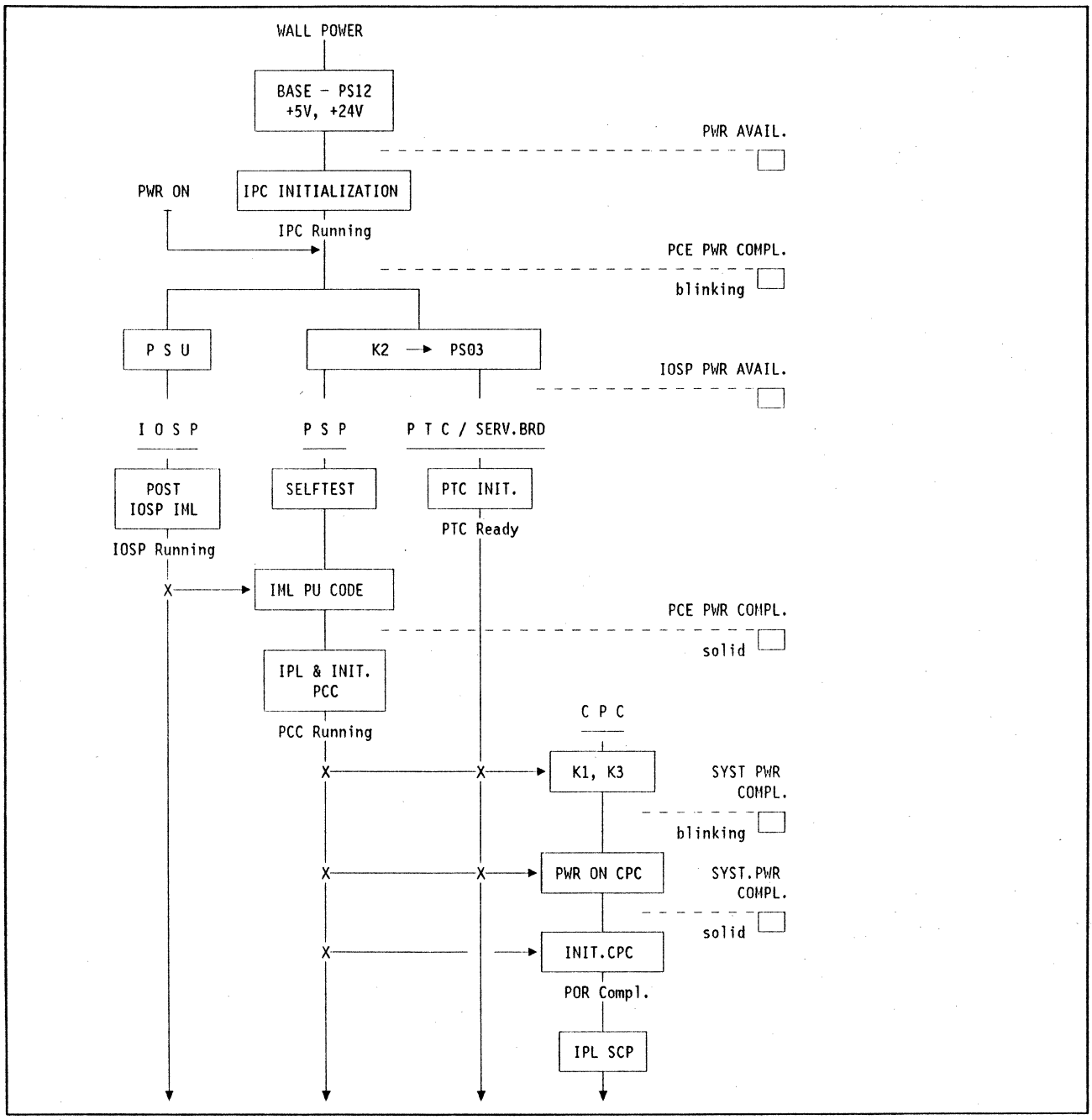
Refer to:

C01 9121 Service Information: Processor Controller Element Service Guide, SY27-2613; chapter 6, "Power Overview" and "PCE Power Description" for the description of that part of the 9121 Power System which powers the PCE.

Notes



9121 Bring-Up Flow



Visual 8-7. 9121 Bring-Up Flow

Refer to:

C01 9121 Service Information: Processor Controller Element Service Guide, SY27-2613; Chapter 6, " Power On-Off Relative Timing"

The previously referenced document will be used for a description of the Bring-Up sequence when the Power On pushbutton has been depressed.

- Wall Power applied activates the Base Power Supply.
  - The +5V is the logic voltage for the IPC.
  - The +24V will be used for the contactors and can be disconnected by the UEPO- switch.
  - The IPC will initialize and become active.
- As a result of pressing the Power On pushbutton:
  - Power is applied to the IOSP.
  - K2 is picked and activates the Service Multi Output Power Supply.
- IOSP runs the POST and initializes.
- The PTC initializes and becomes active.
- The PSP runs the self-test and requests to get microcode loaded from IOSP Fixed Disk.
- PSP then does IPL to IOSP Fixed Disk and initializes PCC.
- When PCC is running, K3 and K1 are picked to power up the CPC.
- CPC Power Sequencing is controlled by the PTC under control of the PCC.

Refer to:

C01 9121 Service Information: Processor Controller Element Service Guide, SY27-2613; Chapter 6, "Control Panel Assembly"

for a description of the indications on the Control Panel during the 9121 Bring-Up sequence.

Notes

8.1.2. Power Locations

Learning Objective

After completing this activity, you should be able to locate major power components and trace cabling within the power subsystem.

Supporting Activities

Identification of major power components in the 9121 frame according to their names/ functions.

- Primary Power Compartment

  Location:_____
- Base Power Supply

  Location:_____
- Service Multi Output Power Supply

  Location:_____
- Memory Dual Output Power Supplies

  Locations:_____
- Four Output Power Supply for the Channel Boards

  Location:_____
- I/O Sequencing Unit

  Location:_____
- Power/ Thermal Control Board

  Location:_____

- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 2
- *B03 9121 Service Information: Processor Service Guide Part 2, Power*, SY27-2611; Chapter 3

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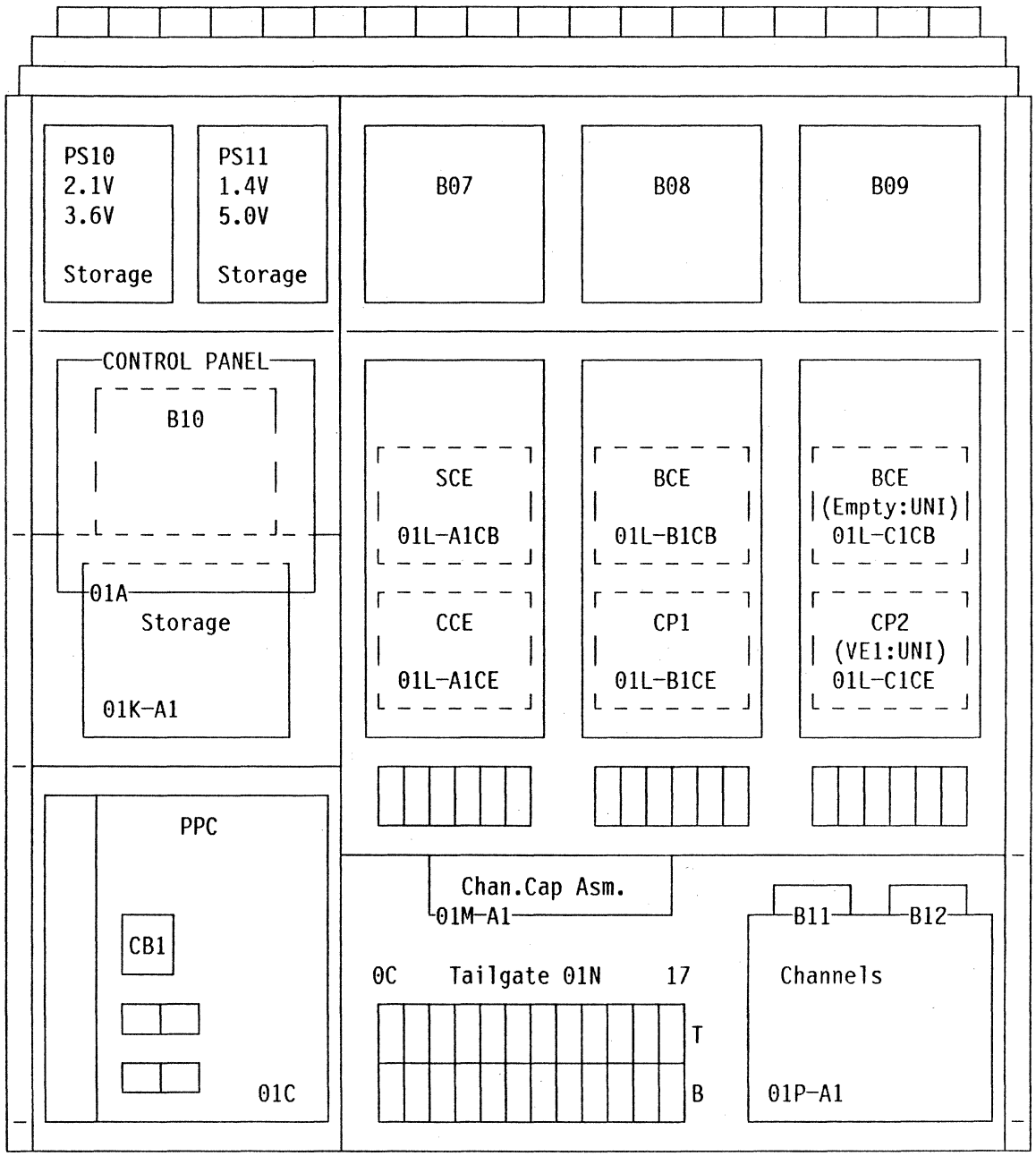
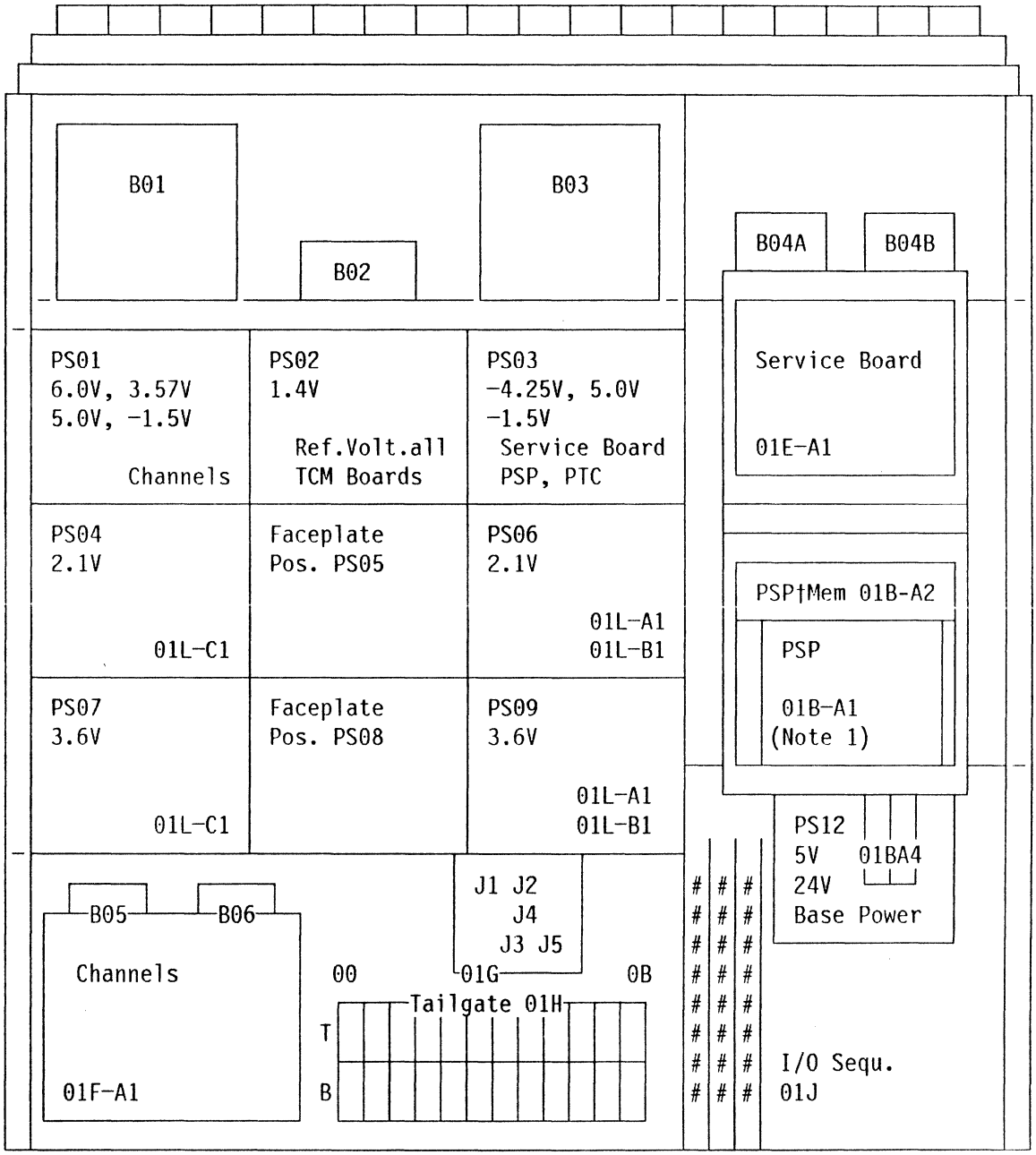
9121 Locations Front View



Visual 8-8. Front View

9121 Locations Rear View



Note 1) 01B-A3 IPC Planar Board, behind 01B-A1 (same Gate).
01E-A2 PTC Planar Board, behind 01B Gate.

Visual 8-9. Rear View

8.1.3. Cooling of Components

Learning Objective

After completing this activity, you should be able to identify the components cooled by air.

Supporting Activities

Reference to the on-site documentation we identifies the logic and power components cooled by air.

The method of monitoring the blower/fan function.

Cooling System

Summarize which components are air cooled by which blower(s)/fan(s):

Refer to:

Volume B01, Chapter 2, Section: Frame 01 Locations
Volume B03, Chapter 3, General FRU Locations

Blower(s) Fan(s)	Air Cooled Component(s)

- *B01 9121 Service Information: Service Guide*, SY27-2609; Chapter 2
- *B03 9121 Service Information: Processor Service Guide Part 2, Power*, SY27-2611; Chapter 3

Notes

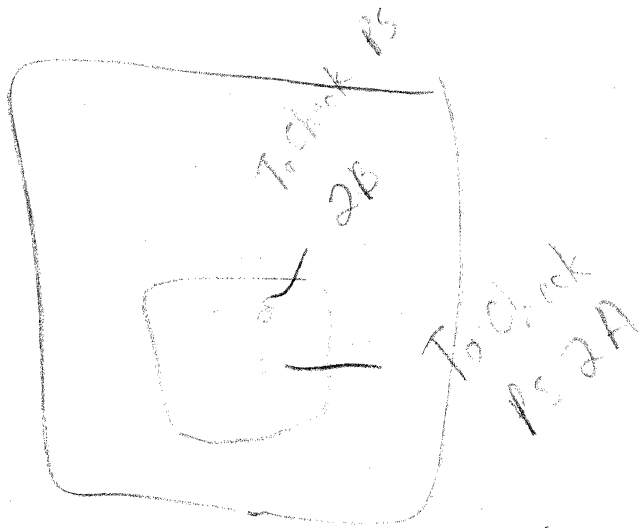
8.1.4. Power Boundaries

Learning Objective

After completing this activity, you should be able to identify the power boundaries and match them with the functional elements they apply power to.

Supporting Activities

- Define what constitutes a power boundary.
- List the power boundaries names.
- Relate boundaries to functional elements. (TCM/COB)



- *B03 9121 Service Information: Processor Service Guide Part 2, Power*, SY27-2611
- *D02 9121 Service Information: Frames, Part 1*, SY27-2617

PWRCON- Frame

```
                                                    23 JUN 90  11:38:09
                          POWER CONTROL                        <PWRCON>

   A= POWER BOUNDARIES (- = OFF, AC = AC VOLT PRES, + = ON)
   + 1 AC POWER COMPARTMENT 1
   + 2 CP1/SCE CCE
   + 3 VECTOR
   + 4 STORAGE LOGIC
   + 5 STORAGE ARRAY
   + 6 CHANNEL LOGIC 1
   + 7 CHANNEL INTERFACE 1




   B= POWER COMMANDS
     1. Power ON one boundary          5. Power ON I/O Power Sequencer
     2. Power OFF one boundary         6. Power OFF I/O Power Sequencer
     3. Power OFF all Boundaries       7. Power OFF all boundaries & I/O
     4. Recycle channel interface



COMMAND ==> _
```

Visual 8-10. PWRCON 1

List the Power Boundaries of a 9121 Model with the maximum number of features.

Refer to:

Volume D02, Frames
Chapter 1, Frames: PWRCON

Notes

8.1.5. Power Boundaries, Manual Control

Learning Objective

After completing this activity, you should be able to power on/off any power boundary.

Supporting Activities

- Layout of the PWRCON- Frame.
- Manual controls for the Power Boundaries.

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

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```
                                                    23 JUN 90  11:25:17
                          POWER CONTROL                      <PWRCON>

   A= POWER BOUNDARIES (- = OFF, AC = AC VOLT PRES, + = ON)
   + 1 AC POWER COMPARTMENT 1
   + 2 CP1/SCE CCE
  -> 3 VECTOR
  AC 4 STORAGE LOGIC
  AC 5 STORAGE ARRAY
  AC 6 CHANNEL LOGIC 1
  AC 7 CHANNEL INTERFACE 1




   B= POWER COMMANDS
     1. Power ON one boundary          5. Power ON I/O Power Sequencer
     2. Power OFF one boundary         6. Power OFF I/O Power Sequencer
     3. Power OFF all Boundaries       7. Power OFF all boundaries & I/O
     4. Recycle channel interface



COMMAND ==> A3 B1
```

Visual 8-11. PWRCON2

PWRCON- Frame

Refer to:

Volume D02, Frames
Chapter 1, Frames: PWRCON

- With no boundary powered on, only boundary no.1, AC POWER COMP.1 indicates 'AC' Volt. Present.
- When only AC POWER COMP.1 is powered up, all other boundaries show 'AC' Voltage Present.
- Manual power On/Off of a boundary may be required to power On/Off a prerequisite boundary first.
- Option 'B4': Recycle Channel Interface will reset the channel interface.

  As a prerequisite all installed channel interfaces must be powered up.

Notes

9121 Power Components

Brief Review

- Which regulator type is used.
- The power supply controls, (turn on, monitoring).
- The groups of the stacked power supplies.
- System bringup, (expl.: system power panel indications).
- Where are 9121 locations found in onsite documentation.
- Cooling Components.
- How to control power boundaries manually.

Topic 8.2. Power/Thermal Diagnostics-Task Lists

8.2.1. Task Lists

Learning Objective

After completing this activity, you should be able to execute a task list when directed by the maintenance package or RSC.

Supporting Activities

Discussed and supported by lab activities:

- Purpose and handling of power/thermal tasks.
- Procedure of execution when given a list of tasks.

AQE Messages

```
          Management Operations - General AQE Data          ◄AQEGEN►

                 —First Occ.— —Last Occ.—— No.  No. Msg
AQEID   AQE TYPE DDMMMYY HHMMSS DDMMMYY HHMMSS OCC. FRU Ind Reference
0000596P FLTISO   25JUN90 143449 25JUN90 143449 0001  08  Y  00080060210100

   MESSAGES

Blower/Fan rotation sensor on 1/B01 indicates a failure.              53708
A loss of phase may have occurred.                                    53705
Processor Complex Power fault occurred.                               20105
One or more power boundaries have been powered off.


   A= ACTION
     1. Display FRUs

   R= CALL OR RETURN TO
     1. Maint. Proc. Index   3. Mgmt. Op. - AQE          AQEID =► 0000596P
     2. Mgmt. OP. - AQ       4. Mgmt. Op. - FRU

COMMAND ==►
```

Visual 8-12. AQE / Task

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

Notes

8.2.2. P/T Diagnostics

Learning Objective

After completing this activity, you should be able to use the options of the P/T Diagnostics and Alter/Display Power Thermal-frames at the direction of RSC.

Supporting Activities

- Power/Thermal Diagnostics.

  Available selections;

  1. Interface
  2. All except Interface
  3. Control Hardware
  4. DIO
  5. TOS
  6. RAM

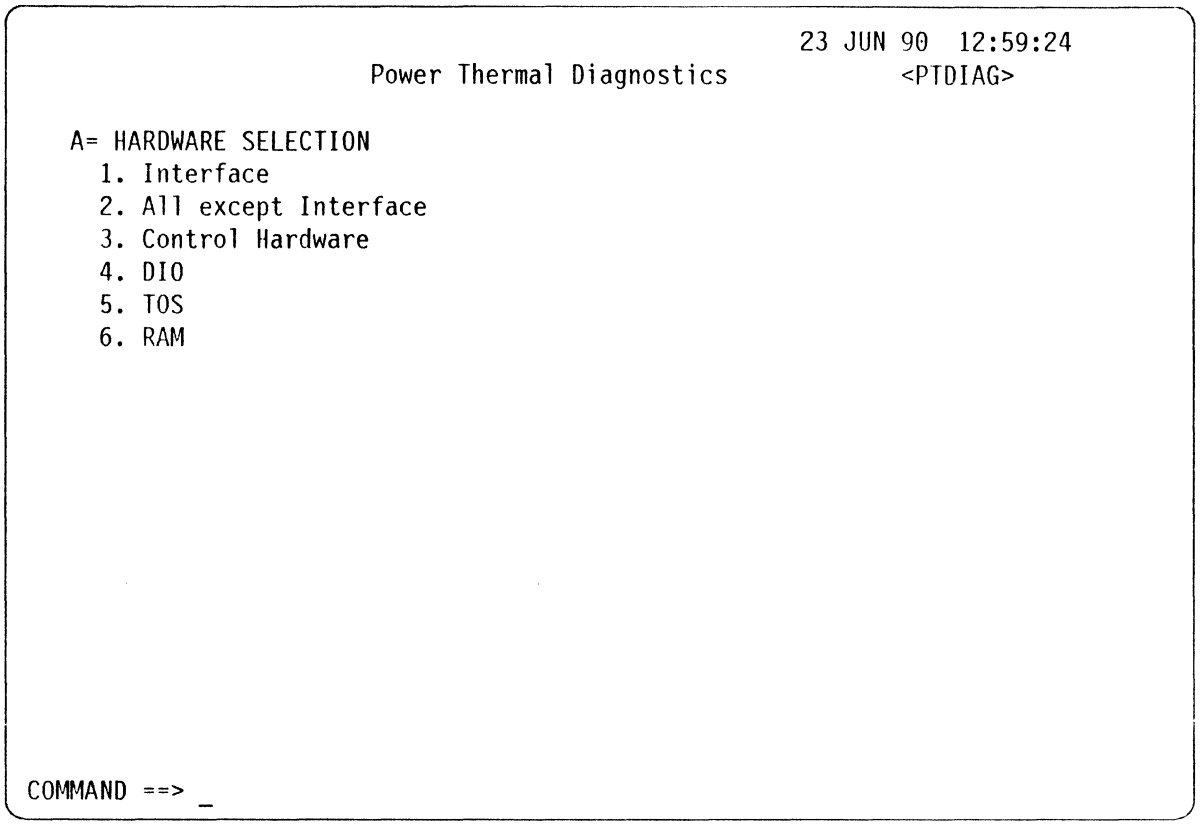
- Alter/Display Power Thermal Frames.

  Options available to Alter and Display data in the PTC hard-ware.

Note: All options are used as directed by RSC.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

PTDIAG- Frame



Visual 8-13. PTDIAG

Are used to checkout the PTC- hardware.

Notes

Topic 8.3. Power/Thermal Lab

8.3.1. P/T FRUs

Learning Objective

After completing this activity, you should be able to replace P/T FRUs when directed by maintenance procedures or RSC.

Supporting Activities

With reference to the on-site documentation it will be discussed:

- Identification of FRU's in the AQE lists.
- FRU Replacement as directed by the maintenance package.

FRU- List

```
                Management Operations - General AQE Data (FRUs)        ◄AQEGEN►

                    —First Occ.— —Last Occ.— No.  No. Msg
AQEID    AQE Type   DDMMMYY HHMMSS DDMMMYY HHMMSS OCC. FRU Ind Reference Code
0000596P FLTISO     25JUN90 143449 25JUN90 143449 0001  08  Y  EF00080060210100

Action            Location      Part Number Type       FEID  Inst Date  -How
NON RECOMENDED    01CK3             84X6113 CONT       EF00    19MAY90  -MFG
POTENTIAL REPLACE 01CA01            61X5085 ASSEM      EF00    19MAY90  -MFG
REPLACE           01_B01            58F1334 BLOWR      EF00    19MAY90  -MFG




   A= ACTION
     1. Display Messages

   R= CALL OR RETURN TO
     1. Maint. Proc. Index   3. Mgmt. Op. - AQE              AQEID =► 0000596P
     2. Mgmt. OP. - AQ       4. Mgmt. Op. - FRU

COMMAND ==►
```

Visual 8-14. AQE / FRU-Replace

Determine from the FRU- list in the AQE, which FRU's should be available at the machine when starting the repair action.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

Notes

Unit Checkpoint Activity

Through the lecture and discussion, you should be able to recognize the purpose and function of the power components for the 9121

Unit 9. 9121 Installation, EC/MES & Microcode

What This Unit is About

This unit covers the proper procedures for pre-installation planning, installation of the 9121 system, installation of EC's and MES's, preventive maintenance, and parts control.

Items addressed in this unit are:

- Pre-installation planning (System, EC and MES)
- Installation of ECs, MESs and System
- EC/MES recovery
- Using the Patch History File
- Method of retrieving patches using URSF
- Backing-up Microcode
- At install completions, using DFU procedures
- System relocation and discontinuance procedures
- Altered IBM Machines and MSQ Inspections

What You Should Be Able to Do

After completing this unit, you should be able to locate and describe the procedures for installing the 9121 ECs, and MESs.

Topic 9.1. EC/MES Installation

9.1.1. Pre-Installation of EC/MES

Learning Objective

After completing this activity, you should be able to perform pre-installation planning for EC/MES installs.

Supporting Activities

We will be using tables, visuals, and supplementary documentation along with the Student Notebook to look at the installation criteria and the procedures in order to perform a pre-installion check for an EC or MES.

We will perform BEFORE INSTALLATION EC/MES check points.

1.0 Machines Affected.

2.0 Prerequisites/Concurrent/Companion

3.0 B/M(s)to be Installed

4.0 Preparation

5.0 Programming

6.0 Purpose and Description

7.0 Installation Time

8.0 Special Tools and/or Material Required

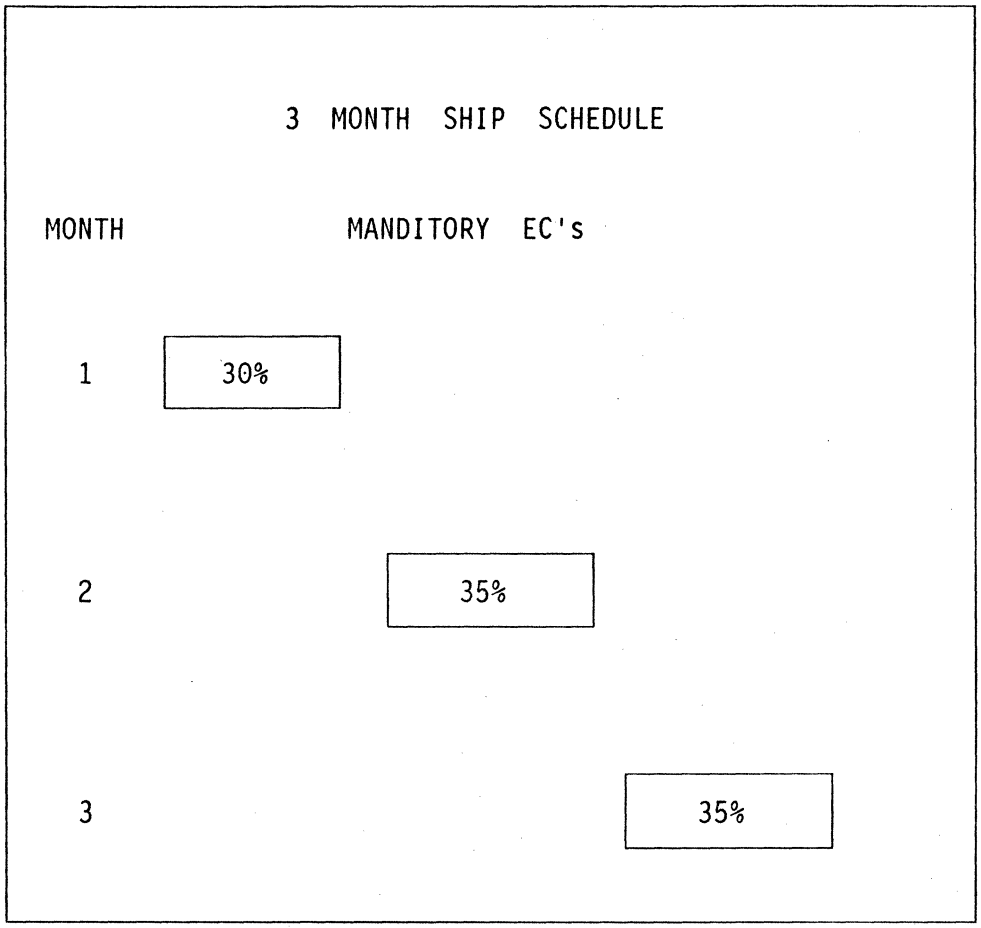
Manuals Available in the Classroom

- *D02 9121 Service Information: Frames, Part 1*, SY27-2617
- *EC BILL OF MATERIAL DOCUMENTATION*
  - *CUSTOMIZATION INFORMATION CHECKLIST*
  - *IBM INSTALLATION INSTRUCTION for EC Change*

This learning activity is supported by Lab Project 740ZXYYY and T/As.

EC STRATEGY

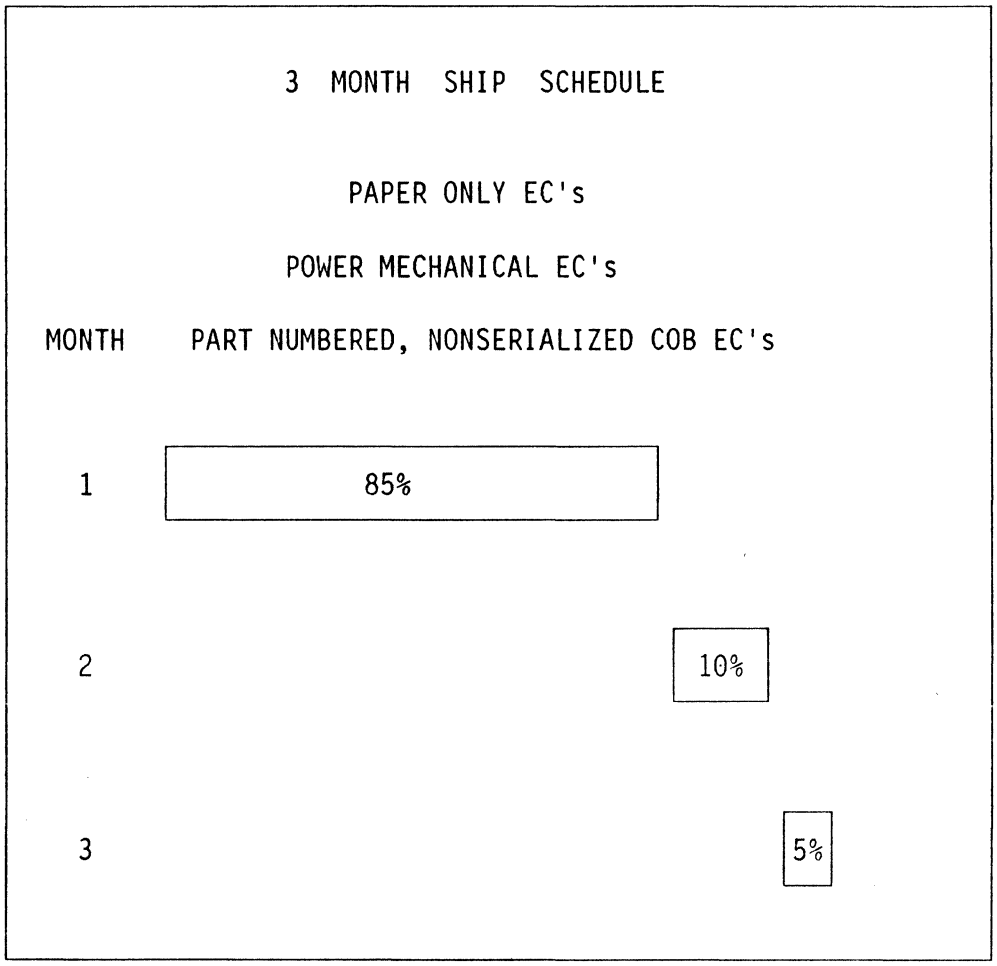
- MANDATORY EC's
  - Shipped, Installed, and Returned in 20 Days.



Visual 9-1. MANDATORY EC SHIP SCHEDULE

- Student Notes

EC STRATEGY



Visual 9-2. STANDARD EC SHIP SCHEDULE

- Student Notes

BEFORE INSTALLATION (Headings 1.0 - 8.0)

Locate the EC Bill of Material Documentation.

*1.0 Machines Affected.*_____

- Check the **SYSTEM DEFINITION** frame **(F SYSDEF)** to verify that EC nnnnnnnB is not installed.

```
                                          dd mmm yy hh:mm:ss
                        System Definition            <SYSDEF>

MACHINE TYPE: xxxx    MODEL: yyy        D= ACTION FOLLOWING POWER ON RESET
SERIAL NUMBER: 12345                      1. New Frame Name(A/N) :_______
SYSTEM EC LEVEL: 12345678                 2. Load Information(Hex) :
VERSION ID: A000                             MODE      ESA/370 tm or
                                                       ESA/370/TPF tm
 A= CONFIGURATION (Forces POR Required)      Load Addr: ____
   1. Maximum Installed                      Parameter: ________
                                             Target CP: _
 B= CLOCKS (B1 forces PC Warm Start)       (Above not used with LPAR POR)
   1. Set Date :__ ___ ____     day           I/O Pwr Seq Delay: __:__
         Time : __ : __                     Automatic Load: Not Active
   2. Enable Automatic TOD Setting       E= PROBLEM REPORT METHOD
      Zone offset:    __ : __ (hh:mm)  -> 1. Initiate by PA only
      Zone direction: ____ (East/West)    2. Initiate by PA or RSF
                                         F=RECOVERY ACTIONS
 C= SYSTEM NAME                            1. I/O Interface Reset
   1. Set Name : _______                   2. Set Recovery Time:

 ESA/370 is a trademark (tm) of the IBM Corporation.

COMMAND ==>
```

Visual 9-3. System Definition (SYSDEF) Frame

- Student Notes

2.0 Prerequisites/Concurrent/Companion

- This section gives product specific information regarding 9121 models and check points.

3.0 B/M(s)to be Installed

- This section gives a listing of B/Ms to be installed and their descriptions.

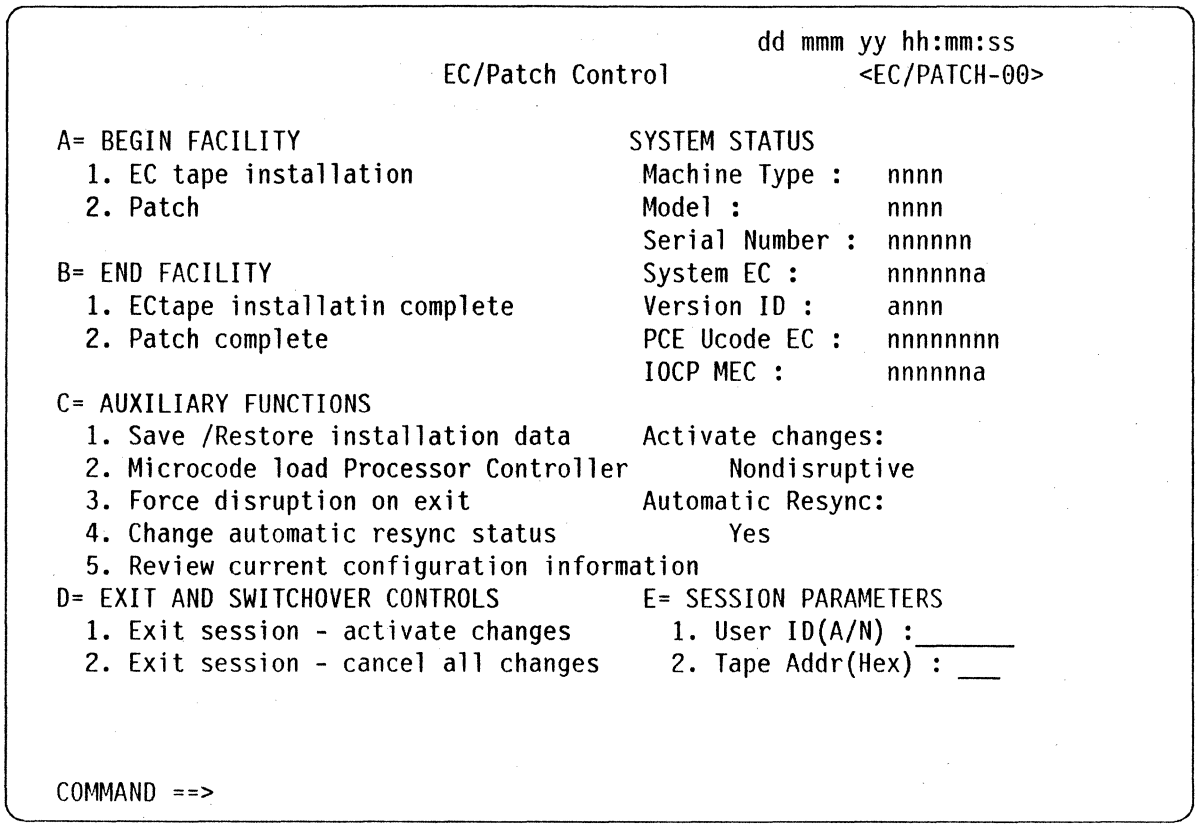
4.0 Preparation

- This Section gives you step by step instructions to check, in order to be sure everything is ok before the EC/MES installation is started.
- Verify configuration using Tape 2 listing and Customization Information Checklist. To make sure the Microcode matches the hardware.

```
                                          dd mmm yy hh:mm:ss
              EC Statistics and Levels                <ECSTAT>


   TYPE-MODEL      MACHINE S/N     SYSTEM EC LEVEL
   nnnn-nnn        nnnnn           nnnnnnnn



        Version ID.............aaaa
        PCE LIC EC Level....nnnnnna
        IOCP MEC Level........nnnnnna









 COMMAND ==>
```

Visual 9-4. ECSTAT - Engineering Change Status Frame

- Student Notes



Visual 9-5. EC1 -Ec/Patch Control Frame

- Student Notes

5.0 Programming_____

6.0 Purpose and Description_____

7.0 Installation Time_____

8.0 Special Tools and/or Material Required_____

9.1.2. EC/MES Installation

Learning Objective

After completing this activity, you should be able to install EC/MES using EC/MES instructions.

Supporting Activities

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

9.1.3. Direct File Update for EC/MES

Learning Objective

After completing this activity, you should be able to perform Direct File Update for complete EC/MES report panels at the completion of EC/MES installation.

Supporting Activities

Use the **Installation Complete CERF Update** procedure in Volume E01 page 6-19 at the completion of EC/MES activity.

This learning activity is supported by Lab Project 740ZXYYY.

- Student Notes

• TST 9121 Replace with correct symbol, ZZ27-ZZZZ; Section x-x

Make sure you do Backup Full Utility Before Installing EC/MES

9.1.4. EC/MES Recovery

Learning Objective

After completing this activity, you should be able to perform EC/MES recovery as directed by RSC.

Supporting Activities

Call RSC and discuss the recovery procedures to be used in order to recover from an EC/MES problem.

- Student Notes

Topic 9.2. Microcode Patches

9.2.1. Patch History Files

Learning Objective

After completing this activity, you should be able to display patch history files and determine if a patch is present, active or inactive for the 9121 complex.

Supporting Activities

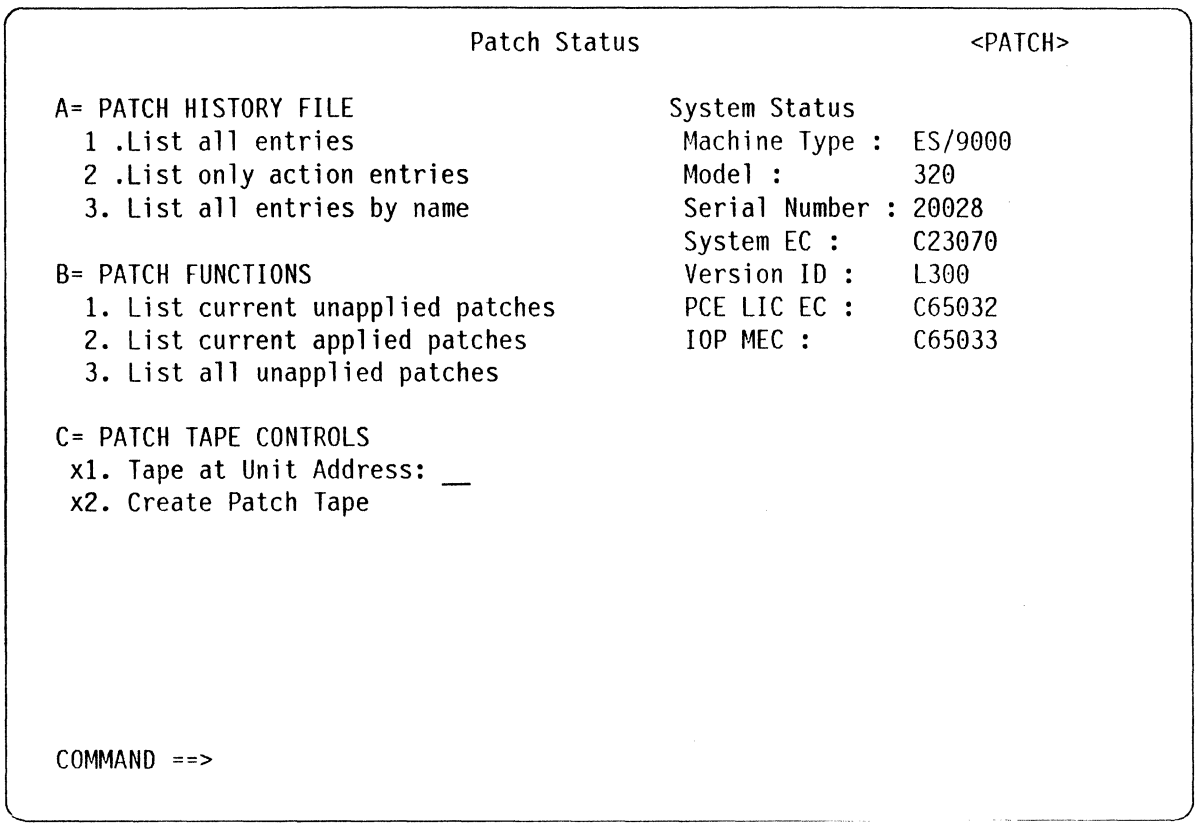
- Discussion of the procedures for displaying patch status and the frames associated with patch status.

Additional Information

In the field you will get very familiar with the Patch Facilities. If the customer has an RSF link that is enabled you should get updates on almost a weekly basis. It will be your responsibility to go in and view the status of patches and set up a time to apply them or activate them on your customers system.

- Use Service Guide VOL.B01 Start 100 for Patch Activities.

- *B01 9121 Service Information: Service Guide*, SY27-2609
- *D03 9121 Service Information: Frames, Part 2*, SY27-2622



Visual 9-6. Patch Facility

- Student Notes

9.2.2. Receive/Apply/Backout Microcode Patches

Learning Objective

After completing this activity, you should be able to receive, apply and backout microcode patches, including automated and manual patches.

Supporting Activities

- Overview of receiving patches to the PCE file using Service Update, Patch tape, or by manual entry.
- Discussion of the frames used to accomplish all patch activity.
- Lab Project xxx Perform a Service Update manually to receive a patch, then apply and backout the patch.

Additional Information

The patch facility is used to fix microcode type problems on the system. The patches that you receive may be a fix for the functional code or the operational code. There are three methods by which you can receive updates:

- RSF Service Update-automatic or manual
- Patch Tape-no RSF link or on an EC/MES
- Manual installation-emergency fix where you actually key the hex code in.

Once you have received the patches onto the PCE hard disk, applying and backing out the patches is the same procedure no matter what method was used to receive them.

- Service Guide vol.B01 Map 0600 contains a matrix for patch facility.
- Frames used: PATCH,RSFCNF,EC/PATCH

- *D03 9121 Service Information: Frames, Part 2*, SY27-2622

```
                                                        dd mmm yy hh:mm:ss

                      Remote Support Configuration (1 of 2)      (RSFCNF)
REMOTE ACCESS PHONE NUMBERS  (Enter phone, node, line speed, half or full)
  9W1-800-525-0683       RAL/R370/R     2400     FULL
  9W1-800-523-4822       SF2/R370/R     2400     FULL
  ____________________   ____________   ____     ____
  ____________________   ____________   ____     ____

A= INSTALLED EQUIPMENT                 D= SERVICE UPDATE SCHEDULE
  1. Manual Dial   3. Auto Dial          1. Day : 2  (1 = Monday)
  2. End of Number 4. X21BIS             2. Local time : 21 : 30
     required                            3. Start update immediately
                                         4. Disable update
B= OUTBOUND CALLS
  1. Enable                            E= BYPASS OPERATOR APPROVAL
  2. Disable                             1. Service Update
                                         2. System initiated error report
C= INBOUND CALLS                         3. Remote system initiated call
  1. Enable
  2. Disable                           F= DISPLAY RSF ACCESS CONTROLS
                                         1. Auth code  (______)

COMMAND ==>
```

Visual 9-7. RSF Configuration (Part 1)

RSF Configuration (Part 1)

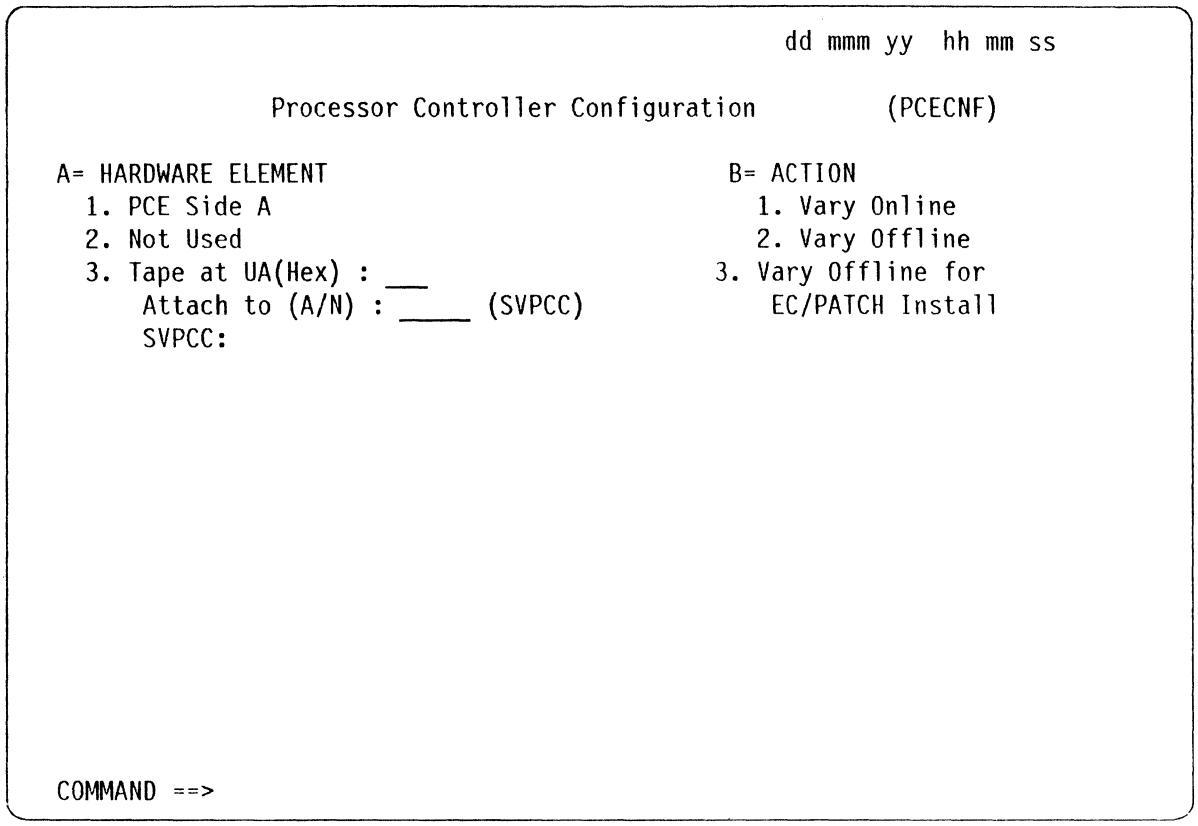
- Ensure fields have correct information and reflect customer requirements.
- Student Notes

```
                                                        dd mmm yy hh:mm:ss

                    RSF Configuration - Customer Info. (2 of 2)   (RSFCNF)-02
  CUSTOMER IDENTIFICATION INFORMATION
   Name : SERVICE EDUCATION ATLANTA _____________
   Address : 3100 WINDY HILL RD ____________________
             MARIETTA, GA 30067____________________
   System location : 4TH FLOOR COMPUTER ROOM_________________
   Account number : 4643411_

  CUSTOMER PHONE NUMBERS
   Main Number : 404-835-3894_______
   Console     : 404-835-3894_______
   RSF Modem   : 404-835-3077_______
   Modem Type   : 5853__

  IBM INFORMATION
   Country : USA_______
   Branch Office number : 0845
   Branch Office phone : 1-404-835-3478_____
   Prime shift dispatch phone : ____________________
   Off shift dispatch phone : _____________________

 COMMAND ==>
```

Visual 9-8. RSF Configuration (Part 2)

RSF Configuration (Part 2)

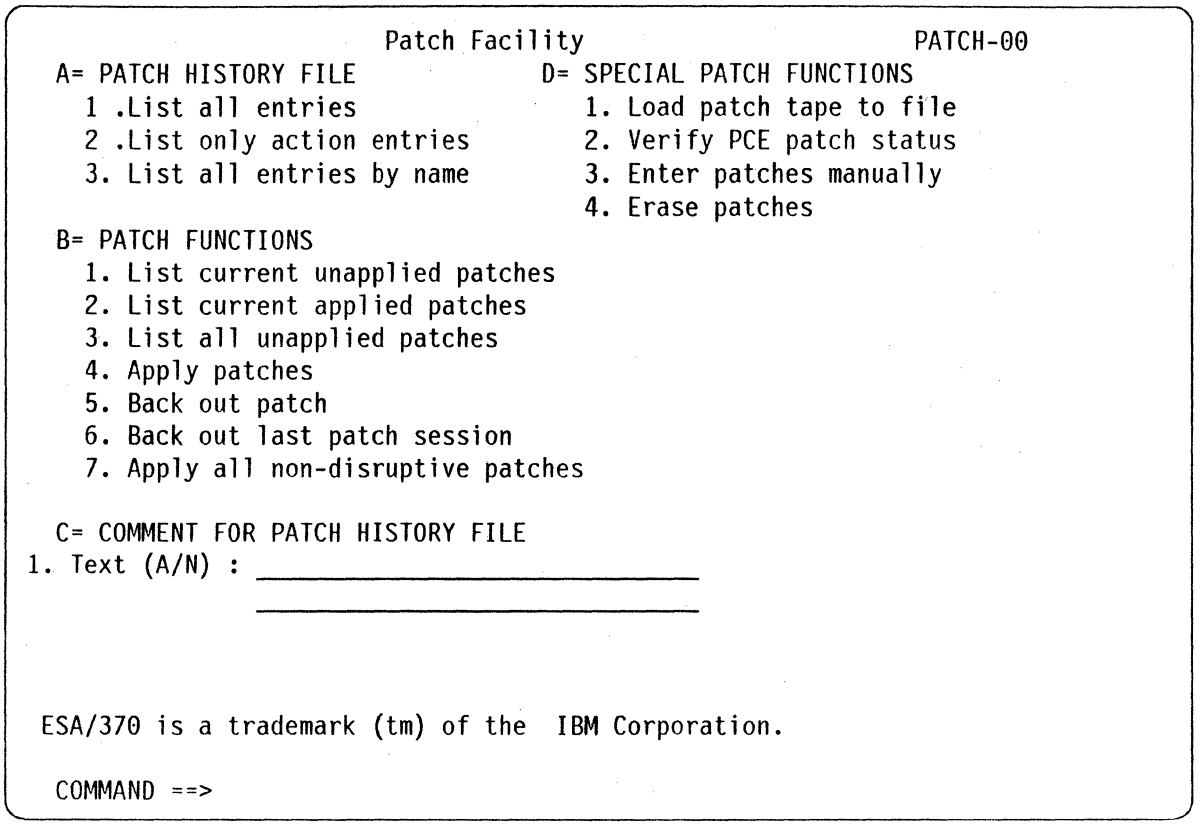
- Customer information and numbers must be accurate
- The Support Center uses thes numbers to contact you or the customer
- Student Notes



Visual 9-9. PCE Configuration

PCE Configuration

- Student Notes



Visual 9-10. EC/PATCH CONTROL

EC/PATCH CONTROL

- Student Notes

9.2.3. Patches from URSF

Learning Objective

After completing this activity, you should be able to follow retrieval procedures to obtain patches from Universal Remote Support Facility.

Supporting Activities

- Overview of using Data Bank Access and logging onto Retain System in order to view outstanding patches under URSF.

Additional Information

By assigning the Data Bank Access console you can from the Retain menu screen select an option named PCH. This option will allow you to search by machine type all applicable patches to your EC level.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

9.2.4. BACKUP OF LICENSED INTERNAL CODE

Learning Objective

After completing this activity, you should be able to maintain microcode backup media.

Supporting Activities

- Discuss proper procedure for for backing up code to tape.

Additional Information

The backup to tape procedure must be run any time patches have been applied or backed out to insure an up-to-date backup exists in the event that the code has to be restored. The utility will copy the read only data from the PCE fixed disk to an 8mm backup tape.

- PCE Service Guide Vol.C01 contains the procedure for creating the backup.

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

9.2.5. LPAR Traps

Learning Objective

After completing this activity, you should be able to receive, apply and backout traps used for LPAR.

Supporting Activities

- Overview of LPAR TRAPS and the procedure for setting up traps.

Additional Information

The Trap Facility is used to debug problems in the microcode used with Logical Partition Mode. You will be working under the guidance of the RSC to download the traps. Problems in LPAR can be difficult to define because you can partition resources such as memory and channels to different operating systems.

- Student Notes

- *D03 9121 Service Information: Frames, Part 2*, SY27-2622

```
                                                    dd mmm yy hh mm ss
                                                         <TRAP>
                        Trap Facility

A= ACTION                                   C= TRAP MANAGEMENT
  1. Activate Trap                            1. Erase Trap
  2. Deactivate Trap
  3. Auto-activate at LPAR POR/reload

B= SELECT TRAP
      -Name-   --------Comments--------  -Status- -Reason- -Auto Act-
  1. TRAP2001  Console hang after SETLP  Inactive No fix   Once
  2. TRAP2002  ACTLP Problem             Active   New trap Always
  3.
  4.
  5.
  6.
  7.
  8.
  9.
 10. Not Used
 Enter the auto-activate parameter.

COMMAND ==>
```

Visual 9-11. Trap Facility

- Student Notes

Topic 9.3. 9121 Installation

9.3.1. Pre-Installation Planning

Learning Objective

After completing this activity, you should be able to perform pre-installation planning with the Installation Planning Representative.

Supporting Activities

- Discuss pre-installation planning responsibilities.

SYSTEM ASSURANCE ACTIVITIES

To insure a smooth installation, two System Assurance(S/A) Review meetings are held prior to the 9121 install.

- The first meeting is held 4 to 6 months prior to ship. and it should include:
  - Review of customer's installation plans
  - Review of customer's migration plans
  - Assessment of customer's system management plans
  - Evaluation of the RAS of the 9121
  - IOCP configuration prior to install
- The 2nd S/A meeting is held 1 to 2 months prior to ship, it should include: (scheduled by NSD manager).
  - Review of all the things discussed in the first meeting.
  - An assessment of account readiness will be done at this time.

- Student Notes

- *Problem Analysis Guide, SA24-4184*
- *TR/Ethernet LAN Reference, SA33-1600*

9.3.2. Pre-Installation Checks

Learning Objective

After completing this activity, you should be able to perform pre-installation checks and site readiness.

Supporting Activities

- Overview of CE tasks after arrival of the 9121 Processor.

Additional Information

Pre-install tasks for CE:

1. Read and understand safety instructions
2. Verify that site is properly prepared for installation.
3. Insure completed copies of Installation and Pre-install check-lists are available.
4. Insure that the Exception has been located, reviewed and any corrections to the install process have been identified and documented.
5. Inventory cables necessary to install CP and IOSP.
6. Input line voltage checks and safety checks in accordance with safety procedures.
7. Pre register the 9121 in the Common Customer Profile and the National Service Support system to support the Remote Support Facility operations and that the correct RSF phone numbers have been obtained.

TEAM LEADER CONCEPT

It is recommended that prior to install the entire install team meet to discuss assignments and checkpoints to insure a smooth install. Also, the team leader should have acquired all the data necessary to pre-register the machine in the Common Customer Profile Facility(CCPF) and the National Service Support System(NSS). Much of this info will also be used to fill in Remote Support Facilty(RSF) screen during installation.

- *E01 9121 Service Information: Installation*, SY27-2616

9.3.3. Installation of 9121

Learning Objective

After completing this activity, you should be able to install, discontinue or relocate the 9121 complex.

Supporting Activities

- Classroom overview of the work flow and the order in which physical connection,testing, and reporting is accomplished.
- Lab Project 18 will be used to locate connections and familiarize the student with installation testing/reporting.

Additional Information

Team A will be routing interconnecting cables from the CP to the IOSP table and positioning frame 01. Team B will be setting up the IOSP(PS/2) at its location.

After the machine has been physically cabled power is checked out and the CP/IOSP powered up.

1. RSFCNF frame completion
2. Manual Service Update
3. After the update you will Apply Patches using Vol.B01 Service Guide.
4. Customer Problem Report entered
5. Run install test
6. Run channel wrap test
7. Test LPAR init w/Diagnostic IOCDS
8. CERF Update with all installation times and dates.

It is important that you follow the install steps to insure the least amount of disruption and delay to the customer. Be sure to pay particular attention to notes regarding plugging power in at the proper time. The physical install is fairly simple. Most of your time will be spent completing reports and doing post-install activity such as channel cables,I/O sequence cables,generate IOCDS,Channel Exerciser.

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

9.3.4. 9121 Installation Exercisers

Learning Objective

After completing this activity, you should be able to invoke exercisers for 9121 installation, relocation or pre discontinuance.

Supporting Activities

- Discussion of Install diagnostics and how to invoke them.
- Lab Project xxx will be used to familiarize you with the procedures to run diagnostics.

Additional Information

There are three tests selections that must be run during installation. These tests are intended to check out the operation of the functional elements of the 9121. They are:

1. Install Tests(Selection A1 on MANFE frame) A group of tests called VT's and a Processor Complex Exerciser(PCX).

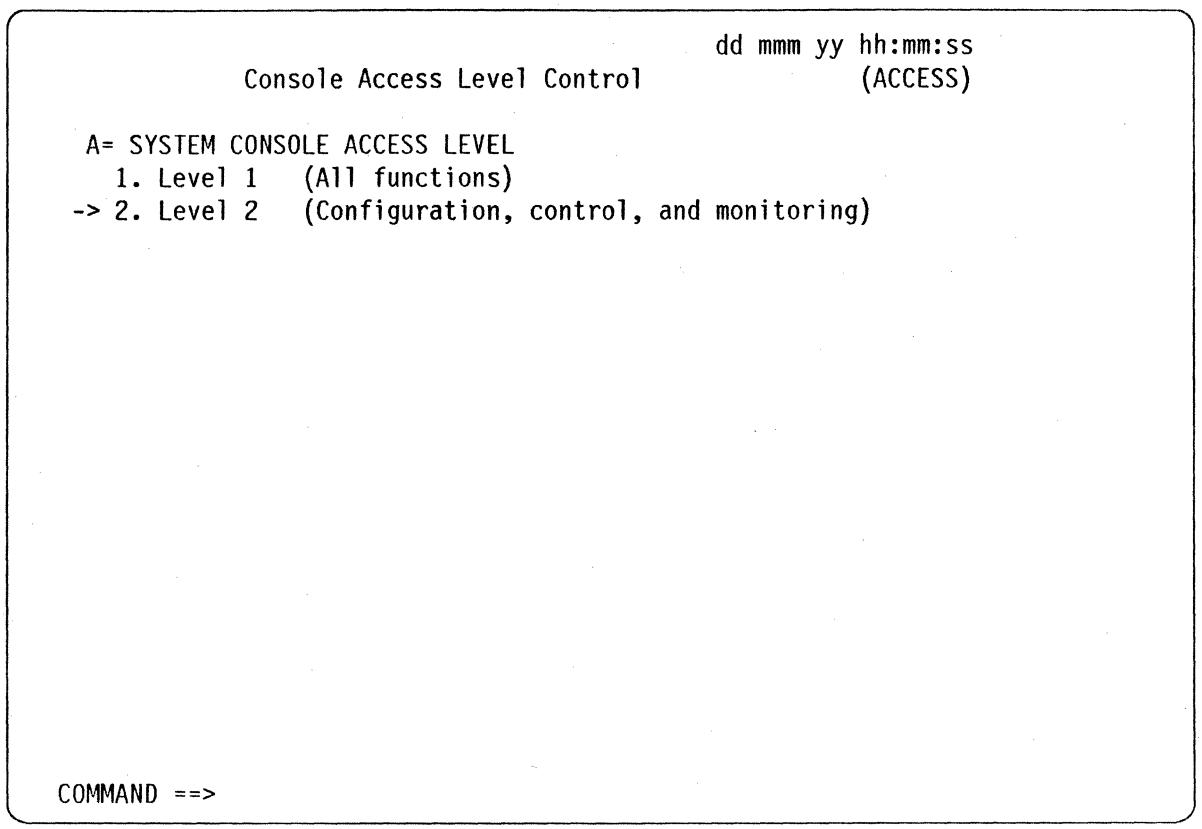
2. Channel Wraps-Run out to the CP tailgate.

3. LPAR Initialization Test-Power on reset in LPAR mode using a diagnostic IOCDS.

Upon completion of these tests service code 20 complete should be written and CERF Update done. The following list of activities are post-installation requirements and should not be reported as part of the install time.

- Install channel cables
- Install I/O power sequence cables
- Create IOCDS
- Run Channel Exerciser
- Inspect covers for damage

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x



Visual 9-12. Console Access Level Control Frame (System Console)

- Student Notes


```
                                                  dd mmm yy hh:mm:ss
                        Configuration                          (CONFIG)

 POWER ON RESET                                    ACTIVE IOCDS
    Required                                        AAAAAAAA

 A= ACTION                  D= PROCESSORS     F= STORAGE (TOTAL=256MB)
   1. Release               -> 1.CP1              CENTRAL    EXPANDED
   2. Power on reset                           1. 32MB       224MB
   3. Maximum Installed                        2. 48MB       208MB
   4. Select IOCDS Mgmt.                       3. 64MB       192MB
 B= CP MODE                                    4. 96MB       160MB
-> 1. ESA/370                                  5. 128MB      128MB
   2. Not Used              E= VECTORS         6. 192MB      64MB
   3. Not Used              -> 1. VE1       -> 7. 256MB      0MB
   4. LPAR

 C= I/O TRACE
   1. Type(hex): _______                      ---- CHPID STATUS ----
      Units: __                              Online: 32 Offline: 0

ESA/370 is a trademark (tm) of the  IBM Corporation.

 COMMAND ==>
```

Visual 9-13. Config Frame

- Student Notes

9.3.5. I/O Exercisers

Learning Objective

After completing this activity, you should be able to invoke exercisers for I/O configuration checkout.

Supporting Activities

- *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

9.3.6. Direct File Update for Installation

Learning Objective

After completing this activity, you should be able to perform Direct File Update for installation report panels at the completion of the installation.

Supporting Activities

- This activity involves a discussion of two panels in a DFU that address install activity.
- Lab Project xxx will allow you to display these panels to familiarize you with the information contained in them.

Additional Information

The two frames used are:

1. FRAME RPTINI(Installation Record)
2. FRAME RPTSTR(Site Readiness)

After testing is complete you will be required to perform a CERF Update to report the installation times that you have recorded for various tasks and to report any problems that you may have encountered.

The URSF facility will use this data to keep track of EC and Ucode levels for each system installed and to serve as a vehicle to 9121 PCC to allow enhancements of FRU isolation tools by supplying and comparing the original error data for each install. Times will also be used to get a more accurate data base for charging customers for third party installs.

• *TST 9121 Replace with correct symbol*, ZZ27-ZZZZ; Section x-x

Topic 9.4. Altered IBM Machine and MSQ Inspections

9.4.1. Alteration and MSQ Inspections

Learning Objective

After completing this activity, you should be able to perform an inspection of altered IBM machines and a Maintenance Service Qualification inspection on modified IBM machines.

Supporting Activities

- Discussion of altered machine and MSQ inspection procedures and their purpose.

The TSL contains information relating to both Inspection of Altered Machines and Maintenance Service Qualification procedures and when these inspections should be done.

These procedures are very important when modifications or alterations to IBM machines have been done with respect to Machine Level Control (MLC). Failure to perform these procedures can inpact future ECs and MESs.

Unit Checkpoint Activity

Lecture and discussion should allow you to be able to recognize what is:

needed for 9121 installation, ECs, and MESs. This will also be reinforced by lab activities.

Course Summary

Let's briefly review what has been covered in this course by unit.

Unit 1 Overview/Service Environment: We looked at the five major elements that make up the 9121 processing complex:

1. CP
2. SCE
3. CCE
4. PTC
5. PCE

We also discussed the service and support strategy for the 9121.

Unit 2 General Information: This unit covered items like safety procedures, preventive maintenance, 9121 messages and codes, and console operations. With console operations you learned how to perform normal system and service console functions like how to assign a console, switching consoles, and the purpose of the consoles available.

Unit 3 9121 Processor Controller Element: Unit 3 introduced you the PCE. Everything from PCE documentation to PCE FRU removal and replacement was presented. Some of the imporatant items covered were the purpose and function of the PCE, the elements of the PCE, PCE service modes, and reference codes from the IPC.

Unit 4 Maintenance Procedures: Unit five gave you the opportunity to look at more of the console frames and discuss the purpose of them as related to 9121 maintenance. We looked at AQEs and the information they provided. We also talked about FRU replacement and diagnostics selection.

Unit 5 9121 Power/Thermal: Power/Thermal components and locations was discussed in this unit. We also presented information on some of the power principles of the 9121 system. The purpose and function of the power boundaries was presented along with component cooling.

Unit 6 9121 Channel Subsystem: This unit covered a wide range of information related to I/O operations performed by the 9121 Everything from an overview of the Channel hardware fiber channel fundamentals. Unit six introduced you to IOCDS and how to create IOCDS files using IOCP. We also discussed the console frames used for IOPD and IO diagnostics.

Unit 7 9121 Installation, EC/MES and Microcode: In the final unit we talked about the methods and procedures for installing the 9121 system. Information on EC/MES procedures was also given.

The major points being backup/restore of the PCC tapes, looking at EC level information, and direct file update for installation.

Each chapter was reinforced through the lab exercises as well as the trouble analyses.

Appendix

Appendix A. 1.0 9121 ES/9000 Processor Family

Kingston
09-28-90
Revised 09-20-91

TSL

Model, Features, Service strategy

| This Technical Services Letter replaces TSL dated 08-09-91. This is a major
| revision and should be reviewed in its entirety.

1.1 General Information

IBM ES/9000 (TM) Processors

The IBM ES/9121 Processor family consists of nine models:

- o Four Uniprocessors (Models 190, 210, 260, 320)
- o Two Dyadic processors (Models 440 and 480)
- o Three Multiprocessors (MP) (Models 490, 570, 610).

The above Models provide for new function and processing power beyond currently installed 43XX and 308X Processors.

Product Description

Nine models of the IBM ES/9121 Processors are available. Models 190, 210, 260 and 320 are uniprocessors. Models 440 and 480 are dyadic processors. Models 490, 570, 610 are Multiprocessors (MP). Depending on the features ordered,

some configurations require an expansion frame. Multiprocessor configurations may require one or two expansion frames. All models may be installed with or without a raised floor. This allows installation in a data processing center or end-user work area.

Processor Models

- Model 190
  - Uniprocessor.
  - Supports 64MB to 512MB of total Storage, up to 128MB of Central Storage, variable Expanded Storage and up to 24 Parallel Channels or a mix of Parallel and ESCON and/or ESCON XDF channels up to a maximum of 32 Channels, or up to 28 all ESCON and/or ESCON XDF channels.
  - Upgradable to Models 210 or 260.
- Model 210
  - Uniprocessor.
  - Supports 64MB to 1024MB of total Storage, up to 256MB of Central Storage, variable Expanded Storage and up to 48 Parallel or 44 ESCON and/or ESCON XDF channels up to a maximum of 48 channels (with expansion frame).
  - Upgradable to Models 260 or 320.
- Model 260
  - Uniprocessor.
  - Supports 64MB to 1024MB of total Storage, up to 256MB of Central Storage, variable Expanded Storage and up to 48 parallel or 44 ESCON and/or ESCON XDF channels or a mix of parallel and ESCON and/or ESCON XDF channels up to a maximum of 48 channels (with expansion Frame).
  - Upgradable to Models 320, 440 and 480.
- Model 320
  - Uniprocessor.
  - Supports 64MB to 1024MB of total Storage, up to 256MB of Central Storage, variable Expanded Storage and up to 48 parallel or 44 ESCON and/or ESCON XDF channels or a mix of parallel and ESCON and/or ESCON XDF channels up to a maximum of 48 channels (with expansion Frame).
  - Upgradable to Models 440 and 480.
- Model 440

- Dyadic processor.

- Supports 128MB to 1024MB of total Storage, up to 256MB of Central Storage, variable Expanded Storage and up to 48 parallel or 44 ESCON and/or ESCON XDF Channels or a mix of Parallel and ESCON and/or ESCON XDF channels up to a maximum of 48 channels (with expansion Frame).

- Upgradable to Model 480.

o Model 480

- Dyadic processor.

- Supports 128MB to 1024MB total Storage, up to 256MB of Central Storage, variable Expanded Storage and up to 48 parallel or 44 ESCON and/or ESCON XDF channels or a mix of parallel and ESCON and/or ESCON XDF channels up to a maximum of 48 Channels (with expansion Frame).

- Upgradable to Models 570 and 610.

o Model 490

- Multiprocessor (uniprocessor + uniprocessor).

- Supports 128Mb to 2048Mb total storage, up to 512Mb of Central Storage, variable Expanded Storage and up to 96 parallel or 88 ESCON and/or ESCON XDF channels or a mix of parallel and ESCON and/or ESCON XDF channels up to a maximum of 96 channels (with expansion frame). Channels and storage may be configured asymmetrically.

- Upgradable to Model 570.

o Model 570

- Multiprocessor ((uniprocessor + dyadic processor) or (dyadic + uniprocessor)).

- Supports 192Mb to 2048Mb total storage, up to 512Mb of Central Storage, variable Expanded Storage and up to 96 parallel or 88 ESCON and/or ESCON XDF channels or a mix of parallel and ESCON and/or ESCON XDF channels up to a maximum of 96 channels (with expansion frame). Channels and Storage may be configured asymmetrically.

- Upgradable to Model 610.

o Model 610.

- Multiprocessor (dyadic processor + dyadic processor).

- Supports 256Mb to 2048Mb total storage, up to 512Mb of Central Storage, variable Expanded Storage and up to 96 parallel or 88 ESCON and/or ESCON XDF channels or a mix of parallel and ESCON and/or ESCON XDF channels up to a maximum of 96 channels (with expansion frame).

Channel and Storage may be configured asymmetrically.

Note: The IBM ESCON Converter Model 1 will be supported for attachment to the ESCON Channels of the above models at their General Availability. Direct attachment to the ESCON Channel operating in ESCON Converter Model 1 mode will be supported.

1.2 Technical Overview

Definition of A-Side and B-Side

The specify codes and feature codes for the ES/9000 air cooled frame processors identify either an A-or a B-side for each code. "A-side" is defined to include models 190, 210, 260, 320, 440 and 480 as well as the side indicated in the processor order as the A-side of models 490, 570 and 610. "B-side" refers to the side indicated in the processor order as the B-side of models 490, 570 and 610.

Significant Items

- The nine ES/9000 air cooled frame processors provide a performance range close to eight times, from the Model 190 to the Model 610.
- All models support the ESCON channel interface and continue to support the parallel byte and block multiplexor channel interface.
- An all-ESCON option is available at initial order for all models.
- All models support the ESCON XDF (Extended Distance Feature) channel interface.
- All models support the ESCON channel attachment to the IBM 9034 Model 1 ESCON Converter.
- All processors have a cycle time of 15.0 nanoseconds.
- Models 190, 210, 260 and 440 have a 64Kb high-speed cache per processor. Models 320, 480, 490, 570 and 610 have a 128Kb high-speed cache per processor.
- Storage and channels for models 490, 570 and 610 can be configured asymmetrically.
- Eight byte data flow between the processor and storage.
- Sixteen field-installable upgrades are available for the air cooled frame models.
- Multiple Preferred Guest support is provided with PR/SM.
- Very large scale integration (VLSI) logic circuitry is used extensively.

The ES/9000 models 490, 570 and 610 take advantage of IBM's 4Mb memory chip and an improved logic design unique to these models. Some customers may see performance on partitioned multiprocessors which may be slightly higher than on the logically equivalent one-sided processor models.

- Logical partitioning (LPAR) of the processor is a standard feature. Up to seven partitions can be supported on each side of the models (up to fourteen on models 490, 570 and 610 running in a partitioned configuration). A maximum of four LPARs is recommended for the model 190 to ensure balanced performance.

- Scientific and technical computing and numerically intensive computing applications are enhanced by the addition of new vector and scalar instructions. An optional Vector Facility may be added to each central processor. This facility is compatible with the higher performance ES/9000 processor Vector Facilities, this allowing applications to be developed and/or run on either processor family.

- High current air cooled power supplies are used in the design of the ES/9000 9121 processors. The power system is tolerant of variations in utility power, including single phase outages. Single phase outages whose duration is shorter than 20 seconds will have minimum impact on hardware operation.

- All models provide the capability for 256Mb of central storage per side, except model 190, which has 128Mb. Central storage can be allocated at initial machine load from a minimum of 16Mb to a maximum of 256Mb in increments of 16Mb. The 16Mb minimum has been reduced from the previous 32Mb minimum.

- The Processor Availability Facility contributes to increased system availability by automatically migrating work from one central processor to another in many cases for models 440, 480, 490, 570 and 610.

Storage Capacity

Total storage may be configured into increments of central storage and expanded storage at initial machine load (IML). The minimum central storage that can be assigned at IML is 16Mb (was 32Mb).

Central storage is available in increments of 16Mb up to 128Mb on model 190, up to 256Mb on models 210, 260, 320, 440 and 480, and up to 256Mb per side on models 490, 570 and 610.

Storage increments can be added asymmetrically on models 490, 570 and 610.

All numbers in the table below are megabytes.

Model	190	210	260	320	440	480
TOTAL						
Standard	64	64	64	64	128	128
1st incr.	64	64	64	64	128	128
2nd incr.	128	128	128	128	256	256
3rd incr.	256	256	256	256	512	512
4th incr.	---	512	512	512	---	---
Maximum	512	1024	1024	1024	1024	1024
Tot. Range	64 to 512	64 to 1024			128 to 1024	
CENTRAL						
Minimum	16	16	16	16	16	16
Maximum	128	256	256	256	256	256
EXPANDED						
Minimum	0	0	0	0	0	0
Maximum	496	1008	1008	1008	1008	1008

Model	490		570		610	
Side	A	B	A/B or A/B		A	B
TOTAL						
Standard	64	64	64/128	128/64	128	128
1st incr.	64	64	64/128	128/64	128	128
2nd incr.	128	128	128/256	256/128	256	256
3rd incr.	256	256	256/512	512/256	512	512
4th incr.	512	512	512/---	---/512	---	---
Maximum	1024	1024	1024/1024	1024/1024	1024	1024
Tot. Range	128 to 2048		192 to 2048		256 to 2048	
CENTRAL						
Minimum	16	16	16	16	16	16
Maximum	256	256	256	256	256	256
EXPANDED						
Minimum	0	0	0	0	0	0
Maximum	1008	1008	1008	1008	1008	1008

Standard Storage Offerings

(1Mb = 1,048,576 bytes)

- Models 190, 210, 260 and 320 have 64Mb of storage as standard.
- Models 440 and 480 have 128Mb of storage as standard.
- Model 490 has 64Mb of storage on each side as standard.
- Model 570 has 64Mb on one side and 128Mb on the other side as standard.
- Model 610 has 128Mb on each side of storage as standard.

Channels

The ES/9000 air cooled frame processors will operate in either ESA or LPAR mode. The channel subsystem always operates in ESA mode. However, when the system is in LPAR mode, S/370 I/O instructions can be supported. The ESCON and ESCON XDF channels operate according to the IBM ESCON Architecture. When an ESCON channel has an IBM 9034 Model 1 ESCON Converter attached, the ESCON channel, in conjunction with the IBM 9034 Model 1 ESCON Converter, provides block multiplexor capabilities. The IBM 9034 Model 1 ESCON Converter supports the new ESCON XDF channels only through an ESCON Director which has ESCON XDF feature.

The first eight parallel channels on each side can be initialized to operate as either byte multiplexor or block multiplexor channels. All other parallel channels can be initialized as block multiplexor channels only.

Twelve parallel, ESCON or ESCON XDF channels per side are standard on all models except for models 190 and 210 which have eight as standard. Channels can be combination of parallel, ESCON or ESCON XDF in groups of four. Additional channels can be added in groups of four as special features providing up to 24 parallel channels or up to 28 ESCON and/or ESCON XDF channels on models 190, and up to 48 parallel channels or up to 44 ESCON and/or ESCON XDF channels can be added in groups of four for models 210, 260, 320, 440, 480, 490, 570 and 610.

The ESCON channel may be configured at IML to operate in any one of three modes for attachment to ESCON peripherals (normal mode), the IBM 9034 Model 1 ESCON Converter (ESCON converter mode) or other ESCON Channels (Channel-To-Channel (CTC) mode). The interconnection can be point-to-point or routed through an IBM ESCON Director Model 1 or Model 2. The CTC allows the ES/9000 system to connect to any other system that has ESCON Channel capability.

ESCON channels permit cable lengths of up to 3 km (1.86 U.S. miles), extendable by IBM ESCON Directors to 6 and 9 km, between all 9121 processor models and the control unit. Both 62.5/125 and 50/125 micron multimode fiber are supported. Distance is limited to 2, 4 or 6 km when using 50/125 micron multimode fiber cables. For additional information, refer to IBM Publication GA23-0367, **Planning for Enterprise Systems/Connectivity.**

ESCON and ESCON XDF Connectivity

The connectivity distances possible with the IBM ESCON Architecture are being expanded by ESCON and ESCON XDF. This allows customers to further utilize the benefits of ESCON, IBM's ESA/390 I/O and interconnection architecture. The ESCON XDF is available as a new feature or field upgrade on ES/9000 air cooled frame processors.

ESCON products work together to provide:

- o Simplified device connectivity and sharing
- o Efficient use of channels and adapters
- o Increased connectivity distances
- o Configuration management under program control
- o High availability
- o Basis for growth and I/O performance
- o Reduced cable bulk and weight.

By utilizing laser/single mode fiber optic technology, connectivity distances can significantly exceed those offered by LED/multimode fiber technology. ESCON XDF is not intended to replace ESCON LED/multimode fiber optic implementations.

While ESCON LED/multimode fiber optic technology is the preferred cabling implementation for campus-wide interconnection, ESCON XDF provides solutions for customers requiring greater end-to-end connectivity distances. The requirement to use ESCON Directors as signal repeating devices to locate I/O devices up to 9 kilometers from the processor is minimized since unrepeated links can reach a maximum distance of 20 kilometers with ESCON XDF links.

The following are the maximum cable distances the ESCON I/O devices can be located from the processor using ESCON Directors with ESCON XDF channels:

Device	Maximum link Distance	Minimum Number of ESCON Directors Required
3990-2,3	9 km (5.6 mile)	1
9343-D04	9 km (5.6 mile)	1
3490-A01,A02,A10,A20, D31,D32,D41,D42 (see note)	9 km (5.6 mile) 23 km (14.3 mile)	1 1
3174-12L,22L	43 km (26.7 mile)	2
3172-1	43 km (26.7 mile)	2
ES/9000 Chan.-to-Chan.	60 km (37.3 mile)	2
ESCON Converter Models 1,2	3 km (1.9 mile)	1

Note: When there is a requirement for 3490 models A01, A02, A10, A20, D31, D32, D41, or D42 to be attached further than 9 kilometers from the host processor with ESCON XDF, please contact your local customer engineer for proper installation.

The ESCON analyzer function of the ESCON Supervisor provides support for viewing and selecting online panels associated with the collection and analysis of ESCON link incident records from ESCON and ESCON XDF channels. This function is provided at no charge via IBM Licensed Internal Code (LIC). This LIC is installed in a dedicated PS/2(R). One PS/2 is required per data center for this function.

ESCON and ESCON XDF channels operating ES/9000 air cooled frame processors have channel data rates up to 10 Megabytes per second.

For additional information, please see the ESCON and Sysplex Timer Technology Enhancements Overview Announcement Letter.

Channel Combinations per Side for All Models

PARALLEL	and	ESCON and/or ESCON XDF
0		8#,12,16,20,24,28*,32,36,40 or 44
4		4#,8,12,16,20*,24,28,32,36
8		0#,4,8,12,16,20*,24,28,32 or 36
12		0,4,8,12,16,20*,24,28,32 or 36
16		0,4,8*,12,16,20 or 24
20		0,4,8*,12,16,20 or 24
24*		0,4,8*,12,16,20 or 24
28		0,4,8 or 12
32		0,4,8 or 12
36		0,4,8 or 12
40		0,4 or 8
44		0 or 4
48		0

* Model 190 limit
\# Model 190 and 210 only

Model 190: Channels can be added in groups of four as optional features -- up to 24 parallel and up to 28 ESCON and/or ESCON XDF channels in combinations of parallel, ESCON and ESCON XDF. A maximum of 32 channels can be installed.

Models 210, 260, 320, 440, 480 and each side of models 490, 570 and 610: Channels can be added in groups of four as optional features -- up to 48 parallel, and up to 44 ESCON and/or ESCON XDF channels in combinations of parallel, ESCON and ESCON XDF. A maximum of 48 channels can be installed.

Note that some of the channel combinations in the table above can be achieved only by starting with an all-ESCON standard configuration.

Minimum and Maximum Channel Configurations Per Side

MODEL	190	210	260	320	440	480
Minimum Parallel	8,4 or 0	8,4 or 0	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0
Min ESCON, ESCON XDF	0,4 or 8	0,4 or 8	0,4 or 12	0,4 or 12	0,4 or 12	0,4 or 12
Maximum Parallel	24	48	48	48	48	48
Max ESCON, ESCON XDF	28	44	44	44	44	44
Total Parallel and ESCON ESCON XDF	32	48	48	48	48	48

MODEL	490		570		610	
SIDE	A	B	A	B	A	B
Minimum Parallel	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0	12,8 or 0
Min ESCON, ESCON XDF	0,4 or 12	0,4 or 12	0,4 or 12	0,4 or 12	0,4 or 12	0,4 or 12
Maximum Parallel	48	48	48	48	48	48
Max ESCON, ESCON XDF	44	44	44	44	44	44
Total Parallel and ESCON ESCON XDF	48	48	48	48	48	48

Channels may be configured asymmetrically on models 490, 570 and 610.

Limitations:

- Without an expansion frame, more than 12 parallel channels limits ESCON and/or ESCON XDF to 8 maximum per side.

- When more than 24 parallel or 28 ESCON and/or ESCON XDF or when more than 32 total channels are required per side, an additional 24 Parallel or 16 ESCON or ESCON XDF channels can be added per side in the expansion frame.

- Note that some of the channel combinations in the table above can be achieved only by starting with an all-ESCON standard configuration.

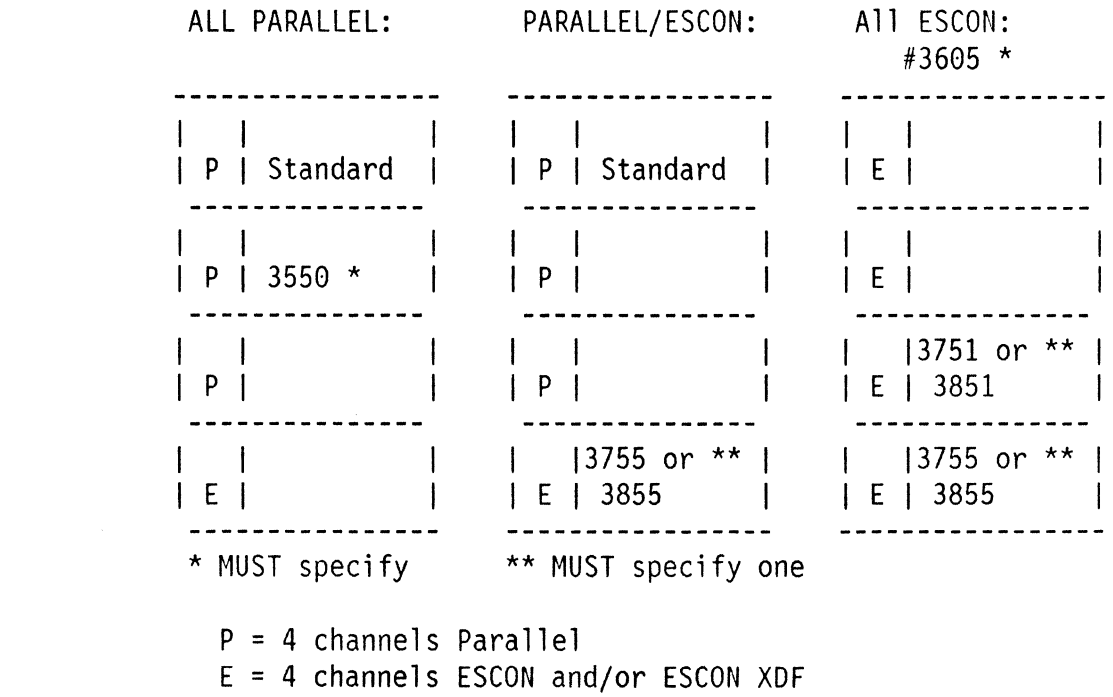
Standard Channel Configurations

Three options are available for the entry configuration of models 190, 210, 260, 320, 440, 480 and each side of models 490, 570 and 610. Each side of models 490, 570 and 610 is configured independently. It is strongly recommended that the entry channel options be configured using the HONE configurator. The options are:

- All parallel channels
- A combination of parallel and ESCON and/or ESCON XDF channels
- All ESCON and/or ESCON XDF channels.

The feature codes for the entry configurations described here and for additional channels are detailed in the **Special Features** section of this manual.

An entry configuration for models 190 and 210 has eight channels as standard and must include one of the following combinations:



An entry configuration for models 260, 320, 440, 480 and the A-side of models 490, 570 and 610 has twelve channels as standard and must include one of the

following combinations:

ALL PARALLEL:	PARALLEL/ESCON:	ALL ESCON: #3605 *
P | Standard	P | Standard	E |
P | Standard	P | Standard	E | 3753 or ** 3853
P | 3555 *	P |	E | 3751 or ** 3851
E |	E | 3755 or ** 3855	E | 3755 or ** 3855

* MUST specify ** MUST specify one

P = 4 channels Parallel
E = 4 channels ESCON and/or ESCON XDF

An entry configuration for the B-side of models 490, 570 and 610 has twelve channels as standard and must include one of the following combinations:

ALL PARALLEL:	PARALLEL/ESCON:	ALL ESCON: #4605 *
P | Standard	P | Standard	E |
P | Standard	P | Standard	E | 4753 or ** 4853
P | 4555 *	P |	E | 4751 or ** 4851
E |	E | 4755 or ** 4855	E | 4755 or ** 4855

* MUST specify ** MUST specify one

P = 4 channels Parallel
E = 4 channels ESCON and/or ESCON XDF

Standard Functions on All Models

- ESA/390 architecture

- Air cooled
- PR/SM
  - Storage reconfiguration
  - Security enhancement
  - Resource capping
  - Up to seven logical partitions (LPAR) on models 190, 210, 260, 320, 440 and 480 and up to fourteen on models 490, 570 and 610.
- SIE
- Parallel channel speed up to 4.5Mb/sec
- ESCON and ESCON XDF channels data rate up to 10Mb/sec
- Remote Support Facility
- DB2 Sort
- Enhanced Move Page for VM
- Dynamic Reconfiguration Management
- Program Even Recording (PER) -2
- Move inverse character (printed output from right to left)
- Preconfigured Input/Output Support Processor (IOSP) for Models 190, 210, 260, 320, 440 and 480
- Concurrent Maintenance Mode for IOSP and Processor Controller
- LPAR Preferred Path
- Nine new vector instructions
- Scalar square root instruction.

Standard Functions on Models 490, 570 and 610

- Processor Controller.
- Processor Availability Facility. This is also a standard feature on models 440 and 480.
- Subsystem Storage Protection (for availability on other models, refer to Significant Items, Subsystem Storage Protection section).

Specify Features

- ESCON analyzer
- National language support (NLS) for models 190, 210, 260, 320, 440 and 480
- A- and B-Side of models 490, 570 and 610.

Special Features

- Vector Facility on all models; up to two on models 440, 480 and 490, up to three on model 570 and up to four on model 610.
- Expansion frame (feature #6000 on the A-Side and #6001 on the B-Side) is required on model 610 and on one side of model 570 when the Vector Facility is to be installed. Feature #6000 (#6001 for models 570 and 610) is required on all models except 190, which have more than 24 parallel or 28 ESCON and/or ESCON XDF, or 32 total channels per side.
- Sysplex timer attachment
- I/O power sequence control
- Remote display
- IOSP and processor controller LAN attachment feature
- Parallel channel groups
- ESCON channel groups
- ESCON XDF channel groups
- Optional storage sizes.

Remote Operation Support

Remote Power On/Off

All ES/9000 air cooled frame processors support remote power on. Customers can have their own remote support wired in accordance with the information provided in RPQ #8K1733.

Remote Operator Support

Refer to Announcement Letter 290-396 and Target System Control Facility (TSCF) Announcement Letter 291-089. The TSCF interface uses one of the remote display ports and is available on models 190, 210, 260, 320, 440 and 480 only.

Remote Display

For customers who require an optional display remote from the processor, a

remote display will be offered for the service console and system support functions. This feature can be ordered as part of the processor.

1.3 Machine Requirements

Input/Output Support Processor (IOSP)

Required for models 190, 210, 260, 320, 440 and 480.

The processor controller element uses an input/output support processor, which provides a display console facility and I/O support for the processor controller element as a standard feature. The length of the cable between the processor and the IOSP is 6.4 meters (19.5 feet).

Keyboard is English only. The line cord, part of the power sequence unit which attaches to the processor controller element, will match the processor order. A printer is the only nonstandard item.

The processor controller element provides the controlling mechanism for configuring the system, loading the licensed internal code and monitoring and supervising the processor. The processor controller element assists the processor in error recovery and provides notification and automated problem analysis for certain processor conditions.

ESCON link incident records can be collected and analyzed by utilizing the ESCON analyzer. ESCON analyzer function is installed on a dedicated IBM PS/2 8580-A31 (or equivalent).

The following devices are supported with the IOSP:

o Modem

  Remote Support Facility (RSF) modem(s) must be made available (refer to RSF modem specify features). One modem is required.

  The RSF modem must be ordered separately for delivery with the processor or supplied by the customer at the installation site.

o Display stations

  Up to four remote display stations with unique keyboards are optional for use as the system display and the service support display.

o Optional printer

  One printer is supported. The printer is used for printing screens from the display station. The following printers are supported:

  - 4201-003
  - 2380
  - 2381

- 2390
- 2391.

o Optional LAN feature.

One local area network (LAN) adapter is supported.

Processor Controller for Models 490, 570 and 610

The processor controller uses a duplex input/output support processor. It provides a display console facility and I/O support as a standard feature. The length of the cable between the multiprocessor and the processor controller is 10.67 meters (35 feet).

The processor controller provides the controlling mechanism for configuring the system, loading licensed internal code, and monitoring and supervising the processor. The processor controller assists the processor in error recovery and provides notification and automated problem analysis for certain processor conditions. It also provides the adapters for the remote display stations and the optional printers. The processor controller provides the interface for local and remote service and support for the processor complex.

The processor controller has the ability to allow concurrent maintenance should one side require repair, provided the system is not in a partitioned configuration.

RPQ 8K1745 provides the customer the ability to order models 490, 570 or 610 without the processor controller.

RPQ 8K1746 provides the customer the ability to order the processor controller without models 490, 570 or 610.

The following are the devices required for the processor controller:

o Modem

Remote Support Facility (RSF) modems must be made available (refer to RSF modem specify features). Two modems are required for the processor controller.

o Display Stations

Up to four remote display stations for use as the system display and the service support display are supported on the processor controller. Two are required and are orderable.

o Optional Printer

Up to two printers are supported by the processor controller. The printers are used for printing screens from the display station. The following printers are supported:

4201-003

- 2380
- 2381
- 2390
- 2391.

o Optional LAN Feature.

  Up to two LAN adapters are supported on the processor controller. These LANs are used with the ESCON analyzer for models 490, 570 and 610.

Display Station Control Unit

Operating system consoles must be provided by the customer and attached via a display station control unit. Refer to operating systems configurations for console requirements.

I/O Devices Supported -- Parallel Channel Interface

The following products are supported for attachment to the ES/9000 Model 190, 210, 260, 320, 440, 490, 480, 570 and 610 parallel channel:

Product Number	Models	Description
Direct Access Storage Devices (DASD) and Control Units		
3330 (1 2)		Direct Access Storage (CKD)
3340 (2 4)		Direct Access Storage (CKD)
3350 (1 2)	A2, A2F	Direct Access Storage (CKD)
3370 (2 4)		Direct Access Storage (FBA)
3375 (1 2)	A1, B1, D1	Direct Access Storage (CKD)
3380 (1)	AA4 (2), B04 (2), AJ4, AK4, BJ4, BK4, AD4, AE4, A04, BD4, BE4	Direct Access Storage (CKD)
3390 (1)	A14, A18, B14, B18, B1C, A24, A28, B24, B28, B2C	Direct Access Storage (CKD)
3390	003	Direct Access Storage (CKD)
3380	CJ2, CJ2 (with TCO)	Direct Access Storage (CKD) with integrated Storage Control
3880	3,13 (all 2) 23	Storage Control
3990	1,2,3(G03,J03,L03,Q03)	Storage Control
Magnetic Tape Units and Controls		
2440	A01, A02, J02	Magnetic Tape Subsystem
3420 (2)	3, 4, 5, 6, 7, 8	Magnetic Tape Unit
3430 (4)	A01	Magnetic Tape Subsystem
3803 (2)	1,2	Magnetic Tape Control
3422 (2)	A01, B01 (1)	Magnetic Tape Subsystem
3424	AG-APG (APG Only)	Magnetic Tape Subsystem
3480 (2)	A11 (2), A22, B11 (12), B22 (1)	Magnetic Tape Subsystem
3490	A01, A02	Magnetic Tape Control
3490	B02 (1), B04 (1)	Magnetic Tape Unit
3490	D31, D32	Magnetic Tape Subsystem
3490E	A10, A20	Magnetic Tape Control
3490E	B20, B40	Magnetic Tape Unit
3490E	D41, D42	Magnetic Tape Subsystem

Display/Printer Control Units

3174 (2)	1L,1R,2R,3R,51R,52R, 53R,81R,82R	Subsystem Control Unit
3174	11L,11R,12R,13R,61R, 21L, 21R 62R,63R,90R,91R,92R	Establishment Controller
3272		Control Unit
3274 (2)	As, Bs, Ds	Display Control Unit
7170 (2)		Device Attachment Control Unit
7171		ASCII Device Attachment Control Unit
9775 (3 4)	M002	Intel Control Unit (Stand-alone)

Graphics Controllers

5088		Graphics Channel Controller
5088 (2)	11R	Graphics Channel Controller
5098 (4)	N05	Graphics System
6098	001	Channel Control Unit (Rack mounted)

Printers

3200	AG-APG (APG-Only)	Printing Subsystem
3203 (2)	5	Line Printer
3211/3811		Line Printer and Control
3262	5	Line Printer/Channel Attached
3800 (2)	1, 3, 6	Printing Subsystem
3900	001	Advanced Function Printer
3800 (2)	2, 8 AG-APG (APG-Only)	Printing Subsystem
3820		Page Printer
3825		Page Printer
3827		Page Printer
3831 (2)	AG-APG (APG-Only)	Page Printer
3835		Page Printer
4224 (1)	2xx	Printer
4245	1 (2) 12, 20	Line Printer
4248		Impact Line Printer
6262		Impact Line Printer/channel mdls

Communication Controllers

3704 (4)		Communication Controller
3705		Communication Controller
3720 (2)		Communication Controller
3725 (2)	1, 2	Communication Controller
3745		Communication Controller

Channel Connections

2914 (2 4)		Switching Unit
3044	C01, C02, D01, D02	Fiber Optic Channel Extender
3088	A1, 1, 2	Multisystem Channel Communic. Unit
3172	001, 002	Interconnect Controller
3814	A1 - C4	Switching Management System
8232		LAN Channel Station
9035		ES Connection Converter, Model 2
308X CTCA		Channel to Channel Adapter
4381 CTCA		Channel to Channel Adapter
9221 MCCU		Mult. Comm. Conn. Unit (FC 6200)

Other Products

1287	1, 3, 5, 2(2), 4(2)	Optical Reader
1442 (4)		Card Read Punch
2501 (2)		Card Reader
3505 (2)		Card Reader/Control
3525 (2)		Card Punch
3540		Diskette Input/Output Unit
3838		Array Processor
3848 (2)	1	Cryptographic Unit
3881		Optical Character Reader
3890	XP (all others 2)	Document Processor
4955 (2)		Series/1
4956 (2)	E70 (2), B10, E10, 31D, K00, 61D (2)	Series/1
4753		Network Security Processor

Notes:

1. These devices are supported through control units attached to a parallel channel.
2. These products have been withdrawn from marketing.
3. Trademark of Intel Corporation.
4. Supported via RPQ only.

Refer to the current list of device support within the individual operating

systems for mode and extent of I/O device support.

ESCON Channel Interface: The following ESCON attached Products are supported at the Product GA.

Product Number		Description
Direct Access Storage Devices (DASDs) and Control Units		
3390 003		Direct Access Storage (CKD)
3380 AD4,DB4,AE4,BE4,AJ4, BJ4,AK4,BK4		Direct Access Storage (CKD)
3390		Direct Access Storage (CKD)
3990	2, 3	Storage Control
Tape Units and Controllers		
3490		Magnetic Tape Subsystem
3490E		Cartridge Tape System
Display/Printer Control Units		
3174	12L, 22L	Establishment Controller
Channel Connections		
9032	2	ES Connection Director
9033	1	ES Connection Director
9034	1	ES Connection Converter
3172	1	Interconnect Controller
9021		Processor ESCON CTCs
9121		Processor ESCON CTCs
9221		Processor ESCON CTCs

Refer to the current list of device support within the individual operating systems for mode and extent of I/O device support.

For Control Units not on these lists for Parallel or ESCON Channel attachment the customer should submit an RPQ to request support.

I/O Devices Supported -- ESCON XDF Channel Interface

To attach any device to an ESCON XDF channel, an IBM ESCON Director Model 1 or 2 must be used. Special features are required on the ESCON Director.

ESCON Analyzer

Additional information can be obtained from ESCON Analyzer TSL. This is a customer PD aid only. It is **not** required for service.

EC Requirements for Supported I/O

Refer to ES/9121 RETAIN TIP 003 (Record H065707).

1.4 Special Features

Parts removed or replaced during field installation become the property of IBM and must be returned to IBM. Price assumes unaltered IBM parts. (Refer to feature list.)

Ensure that special features are not ordered prior to their availability date.

IOSPPC. IBM Token-Ring Network (LAN) Attachment (#1000), A-Side

Provides the connectivity to a LAN for the IOSP and processor controller. This feature includes a 2.44 meter (8.0 foot) LAN adapter and attachment cable for attachment to a LAN to route control messages to the appropriate node when required. This feature must be present for ESCON analyzer support; specify code #9830 must be indicated on the order. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitation: Customer must install or have a LAN installed and must provide attachment cable if a length greater than 2.44 meters (8.0 feet) is required.

Remote Displays: All Models

A maximum of four remote displays is supported on all models and are orderable.

A minimum of two remote displays (IBM 3151 with unique keyboard for use as service console and system support functions) is required for models 490, 570 and 610. Specify #9205 and/or #9206 if the displays are customer-supplied. Two additional remote displays are optional on models 490, 570 and 610. The default color is amber for all remote displays. If green is required, specify #9740. Remote displays will have voltage specify codes of #9700, #9701, #9702 or #9703.

Remote Display, First (#1001)

For customers requiring an optional display remote from the processor, this feature provides a remote display with 1920 character support and a unique keyboard for attachment to the IOSP for Models 190, 210, 260, 320, 440 and 480; and for attachment to the processor controller for models 490, 570 and 610. This console uses an RS422A interface. Using the RS422A interface, the maximum distance from the IOSP or the processor controller can be 606 meters (2000 feet). A 30 meter (100 foot) cable will be provided. The customer must provide the cable if the distance is greater than 30 meters between the IOSP or the processor controller and the remote console. For models 490, 570 and 610, specify #9205 to indicate that the customer will supply the 3151 display. A 30 meter (100 foot) cable from the processor controller to the customer provided 3151 display will be included when this code is specified.

Code #9205 cannot coexists with #1001. Models 490, 570 and 610 MUST specify either #1001 or #9205. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitation: Cannot be installed in a 110/120V southern hemisphere environment; cannot coexist with #9205.

Remote Display, Second (#1002)

For customers requiring a second optional display remote from the processor, this feature provides a remote display with 1920 character support and a unique keyboard for attachment to the IOSP for models 190, 210, 260, 320, 440 and 480; and for attachment to the processor controller for models 490, 570 and 610. This console uses normal RS422A interface. Using the RS422A interface the maximum distance from the IOSP or the processor controller can be 606 meters (2000 feet). The customer must provide the cabling between the IOSP or the processor controller and the remote console. For models 490, 570 and 610 specify #9206 to indicate that the customer will supply the 3151 display. A 30 meter (100 foot) cable from the processor controller to the customer provided 3151 display will be included when this code is specified. Code #9206 cannot coexists with #1002. Models 490, 570 and 610 MUST specify either #1002 or #9206. Prerequisites: #1001 or #9205. Corequisites: None. Maximum: One. Field installation: Yes. Limitation: Cannot be installed in a 110/120V southern hemisphere environment.

Remote Display, Third (#1003)

For customers requiring a third optional display remote from the processor, this feature provides a remote display with 1920 character support and a unique keyboard for attachment to the IOSP for models 190, 210, 260, 320, 440 and 480; and for attachment to the processor controller for models 490, 570 and 610. This console uses an RS422A interface. Using the RS422A interface, the maximum distance from the IOSP or the processor controller can be 606 meters (2000 feet). A 30 meter (100 foot) cable will be provided. The customer must provide the cable if the distance is greater than 30 meters between the IOSP or the processor controller and the remote console. Prerequisites: #1002 or #9206. Corequisites: None. Maximum: One. Field installation: Yes. Limitation: Cannot be installed in a 110/120V southern hemisphere environment.

Remote Display, Fourth (#1004)

For customers requiring a fourth optional display remote from the processor, this feature provides a remote display with 1920 character support and a unique keyboard for attachment to the IOSP for models 190, 210, 260, 320, 440 and 480; and for attachment to the processor controller for models 490, 570 and 610. This console uses an RS422A interface. Using the RS422A interface, the maximum distance from the IOSP or the processor controller can be 606 meters (2000 feet). A 30 meter (100 foot) cable will be provided. The customer must provide the cable if the distance is greater than 30 meters between the IOSP or the processor controller and the remote console. Prerequisites: #1003. Corequisites: None. Maximum: One. Field installation: Yes. Limitation: Cannot be installed in a 110/120V southern hemisphere environment.

Storage: A-Side

Total storage on all models can be partitioned at IML into central and expanded storage by responding to the appropriate storage configuration questions. This allows repartitioning of storage to meet changing requirements. Further allocation of this physical storage can be made when operating in LPAR mode under PR/SM.

Central storage increments of 16, 32, 48, 64, 80, 96, 112, 128, 144, 160, 176, 192, 208, 224, 240 and 256Mb are supported on models 210, 260, 320, 440, 480 and on each side of models 490, 570 and 610. Central storage increments of 16, 32, 48, 64, 80, 96, 112 and 128Mb are supported on model 190.

All storage above these increments up to the total storage capacity is treated as expanded storage. For example, if 32Mb is allocated to central storage and total storage capacity is 128Mb, then 96Mb is allocated to expanded storage.

Only one pricing code and one storage capacity code is permitted. For upgrades, remove old codes. The corequisite pricing code must be specified with each storage capacity feature. See the list below for the correct code and upgrade path.

Total Storage, 128Mb Capacity (#2001), A-Side

Provides additional storage, increasing total storage to 128Mb. This feature is available on models 190, 210, 260, 320, 490 and on model 570 when it has specify feature #9001. Prerequisites: None. Corequisites: #1900 (64-128Mb). Maximum: One. Field installation: Yes.

Total Storage, 256Mb Capacity (#2005), A-Side

Provides additional storage, increasing total storage to 256Mb. Prerequisites: None. Corequisites: On initial orders, #1910 (64-256Mb) or #1920 (128-256Mb). Corequisite for MES field upgrades, #1910 (64-256Mb) or #1920 (128-256Mb). Maximum: One. Field installation: Yes.

Total Storage, 512Mb Capacity (#2010), A-Side

Provides additional storage, increasing total storage to 512Mb. Prerequisites: None. Corequisites: On initial orders #1930 (64-512Mb) or #1940 (128-512Mb). Corequisites: For MES field upgrade #1930 (64-512Mb), #1940 (128-512Mb) or #1950 (256-512Mb). Maximum: One. Field installation: Yes.

Total Storage, 1024Mb Capacity (#2015), A-Side

Provides additional storage, increasing total storage to 1024Mb. Prerequisites: None. Corequisites: On initial orders #1960 (64-1024Mb) or #1970 (128-1024Mb). Corequisites: For MES field upgrade #1960 (64-1024Mb) or #1970 (128-1024Mb) or #1980 (256-1024Mb) or #1990 (512-1024Mb). Maximum: One. Field installation: Yes. Limitation: Not available on model 190.

I/O Power Sequence Control: A-Side

I/O Power Sequence Control (#2100), A-Side

Provides the capability for power on/off control for sixteen parallel control units attached to the processor. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes.

I/O Power Sequence Control, Expansion Frame (#2110), A-Side

Provides the capability for power-on/off control for sixteen additional parallel control units attached to the processor or for sixteen parallel control units attached to the expansion frame. Prerequisites: #6000 and #2100. Corequisites: None. Maximum: One. Field Installation: Yes. Limitation: Not available for model 190.

Vector Facilities: A-Side

Vector Facility, (#2710), A-Side

Provides a Vector Facility for models 190, 210, 260 and 320 or for the first processor of models 440, 480, 490, 570 and 610. Prerequisites: #6000 for models 440, 480, 570 and 610 with specify code #9011. Corequisites: None. Maximum: One. Field installation: Yes.

Vector Facility, Second (#2720), A-Side

Provides a Vector Facility for the second processor of the models 440, 480, 570 and 610 with specify code #9011. Prerequisites: #2710. Corequisites: None. Maximum: One. Field installation: Yes. Limitation: None.

Standard Channel Configurations: A-Side

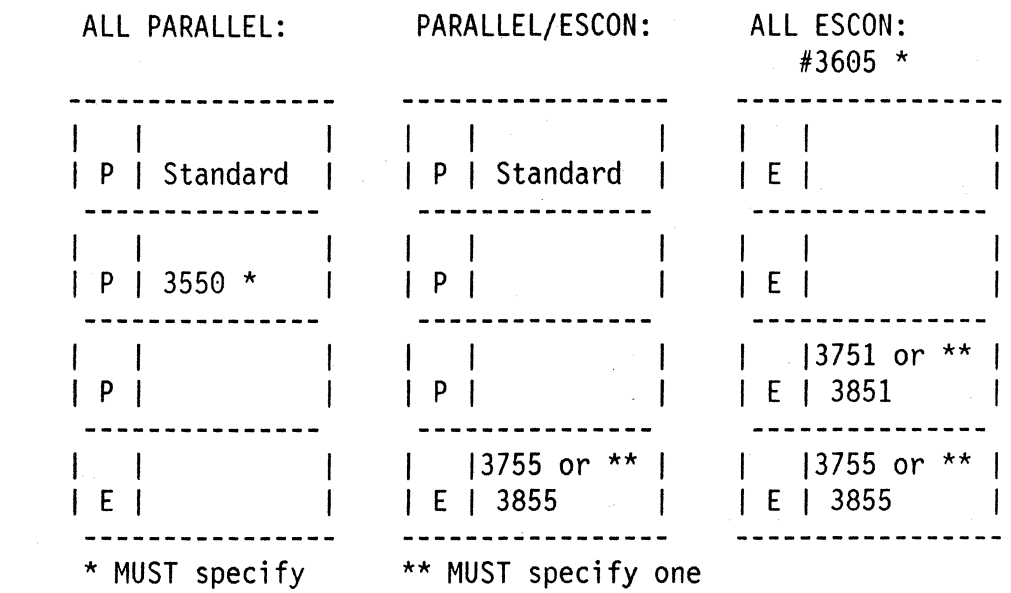
- Eight channels are standard on Models 190 and 210.
- Twelve channels are standard on Models 260, 320, 440 and 480.
- Twelve channels are standard on the A-side of models 490, 570 and 610.

All models have the following options:

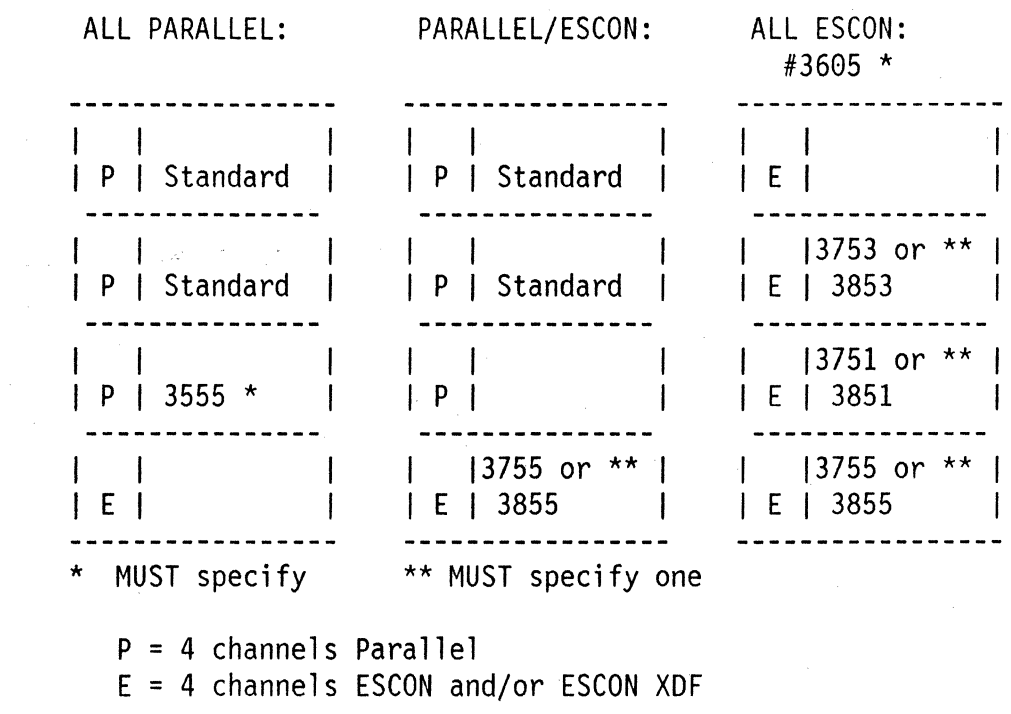
- All parallel
- A combination of parallel and ESCON and/or ESCON XDF
- All ESCON and/or ESCON XDF.

The options presented below are described in more detail later in this section.

An entry configuration for models 190 and 210 must include one of the following combinations:



An entry configuration for models 260, 320, 440, 480 and the A-side of models 490, 570 and 610 must include one of the following combinations:



Standard Channel Feature Codes for Models 190 and 210

Entry Parallel Channels (#3550), A-Side

No charge feature provides eight parallel channels. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3605, #3551, #3755 or #3855. Field installation: No.

Entry Mixed Channels: ESCON Channels First (#3755), A-Side

No charge feature provides four ESCON channels and four parallel channels on models 190 and 210. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3550, #3700, #3800 or #3855. Field installation: No.

Entry Mixed Channels: ESCON XDF Channels First (#3855), A-Side

Provides four ESCON XDF channels and four parallel channels on models 190 and 210. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3550, #3700, #3800 or #3755. Field installation: No.

Entry All ESCON and/or ESCON XDF Feature (#3605), A-Side

No charge feature provides the capability to install up to sixteen ESCON channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3751 or #3851. Limitations: Cannot coexist with #3500, #3550, #3555, #3700, #3800, #3704 or #3804. Field installation: No. Maximum: One.

Entry All ESCON Channels First (#3755), A-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3700, #3800, #3855 or #3550. Field Installation: No. Maximum: One.

Entry All ESCON XDF Channels First (#3855), A-Side

Provides four ESCON XDF channels at initial order. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3700, #3800, #3755 or #3550. Field installation: No. Maximum: One.

Entry All ESCON Channels Second (#3751), A-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3605. Limitations: Cannot coexist with #3851. Field installation: No. Maximum: One.

Entry All ESCON XDF Channels Second (#3851), A-Side

Provides four ESCON XDF channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3605. Limitations: Cannot coexist with #3751. Field installation: No. Maximum: One.

Standard Channel Feature Codes for Models 260 through 480, A-Side

Entry Parallel Channels (#3555), A-Side

No charge feature provides twelve parallel channels. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3605, #3755, #3855 or #3500. Field installation: No. Maximum: One.

Entry Mixed Channels: ESCON Channels First (#3755), A-Side

No charge feature provides four ESCON channels and eight parallel channels on all models except 190 and 210. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3555, #3700, #3800 or #3855. Field installation: No. Maximum: One.

Entry Mixed Channels: ESCON XDF Channels First (#3855), A-Side

Provides four ESCON XDF channels and eight parallel channels on all models except 190 and 210. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3700, #3800, #3755 or #3555. Field Installation: No. Maximum: One.

Entry All ESCON and/or ESCON XDF Feature (#3605), A-Side

No charge feature provides the capability to install up to sixteen ESCON and/or ESCON XDF channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3751 or #3851; #3753, #3853, #3752 or #3852. Limitations: Cannot coexist with #3500, #3550, #3555, #3700, #3800, #3704 or #3804. Field installation: No. Maximum: One.

Note: #3752 and #3852 provide additional channel groups for models 190 and 210 and upgrades from models 190 and 210 to models 260 and 320.

Entry All ESCON Channels First (#3755), A-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3700, #3800, #3855 or #3555. Field installation: No. Maximum: One.

Entry All ESCON XDF Channels First (#3855), A-Side

Provides four ESCON XDF channels at initial order. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #3700, #3800, #3755 or #3555. Field installation: No. Maximum: One.

Entry All ESCON Channels Second (#3751), A-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3605. Limitations: Cannot coexist with #3851. Field installation: No. Maximum: One.

Entry All ESCON XDF Channels Second (#3851), A-Side

Provides four ESCON XDF channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3605. Limitations: Cannot coexist with #3751. Field installation: No. Maximum: One.

Entry All ESCON Channels Third (#3753), A-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: #3751 or #3851. Corequisites: #3605. Limitations: Cannot coexist with #3853. Field installation: No. Maximum: One.

Entry All ESCON XDF Channels Third (#3853), A-Side

Provides four ESCON XDF channels at initial order. Prerequisites: #3751 or #3851. Corequisites: #3605. Limitations: Cannot coexist with #3753. Field installation: No. Maximum: One.

Feature Codes for Additional Parallel Channels: A-Side

Parallel Channel Feature Base Frame (#3400), A-Side

No charge feature provides the capability to install up to twelve additional parallel channels and four ESCON or ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3600.

Parallel Channel Group Option - Models 190 and 210 (#3551), A-Side

Provides four additional parallel channels. Prerequisites: #3755 or #3855. Corequisites: None. Limitations: Cannot coexist with #3550. Maximum: One. Field installation: Yes.

Parallel Channel Group, Basic (#3500), A-Side

Provides four additional parallel channels.

For models 190, 210: Prerequisites: #3550 or #3551. Corequisites: None. Maximum: One. Limitations: None. Field installation: Yes.

For models 260, 320, 440, 480, 490, 570 and 610: Prerequisites: #3755 or #3855 or #3700 or #3800. Corequisites: None. Maximum: One. Limitations: Can not coexist with #3555 or #3605. Field installation: Yes.

Parallel Channel Group, First (#3501) A-Side

Provides four additional parallel channels. Prerequisites: #3400. Corequisites: None. Maximum: One. Field installation: Yes.

Parallel Channel Group, Second (#3502), A-Side

Provides four additional parallel channels. Prerequisites: #3400 and #3501. Corequisites: None. Maximum: One. Field installation: Yes.

Parallel Channel Group, Third (#3503), A-Side

Provides four additional parallel channels, completing the parallel channel additions for the processor frame. Prerequisites: #3400, #3501 and #3502. Corequisites: None. Maximum: One. Field installation: Yes.

First Parallel Channel Feature, Expansion Frame (#3401), A-Side

No charge feature provides the capability to install twelve parallel and four ESCON or ESCON XDF channels. Prerequisites: #6000. Corequisites: None.

Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3601; not available for model 190.

Parallel Channel Group, Fourth (#3504), A-Side

Provides four additional parallel channels on the first parallel channel expansion frame feature. Prerequisites: #3401. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190.

Parallel Channel Group, Fifth (#3505), A-Side

Provides four additional parallel channels. Prerequisites: #3401 and #3504. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190.

Parallel Channel Group, Sixth (#3506), A-Side

Provides four additional parallel channels. Prerequisites: #3401, #3504 and #3505. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190.

Second Parallel Channel Feature, Expansion Frame (#3402), A-Side

No charge feature provides the capability to install twelve additional parallel channels. Prerequisites: #6000. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3600, #3601, #3605, #3705 or #3805; not available for model 190.

Parallel Channel Group, Seventh (#3507), A-Side

Provides four additional parallel channels. Prerequisites: #3402. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3705 or #3805; not available for model 190.

Parallel Channel Group, Eighth (#3508), A-Side

Provides four additional parallel channels. Prerequisites: #3402, #3507 and #6000. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3701 or #3801; not available on model 190.

Parallel Channel Group, Ninth (#3509), A-Side

Provides four additional parallel channels. Prerequisites: #3402, #3507, #3508 and #6000. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3700 or #3800; not available on model 190.

Feature Codes for Additional ESCON and/or ESCON XDF Channels: A-Side

ESCON or ESCON XDF Channel Feature, Base Frame (#3600), A-Side

No charge feature provides the capability to install sixteen additional ESCON or ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum:

One. Field installation: Yes. Limitations: Cannot coexist with #3400. Installing this feature limits the number of parallel channels in the processor frame to twelve.

ESCON or ESCON XDF Channel Feature, Expansion Frame (#3601), A-Side

No charge feature provides the capability to install sixteen additional ESCON or ESCON XDF channels. Prerequisites: #6000. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3401; not available on model 190.

ESCON or ESCON XDF Channel Feature, First Frame (#3605), A-Side

Provides the capability to install sixteen additional ESCON or ESCON XDF channels at initial order. Prerequisites: #3755 or #3855. Corequisites: #3751 or #3851 and #3753 or #3853 or #3852 or #3752. Maximum: One. Field installation: No. Limitations: Cannot coexist with #3500, #3550, #3555, #3700, #3800, #3704 or #3804.

Note: #3752 and #3852 provide additional channel groups for models 190 and 210 and upgrades from models 190 and 210 to models 260 and 320.

ESCON Channel Group, First (#3700), A-Side

Provides the first four ESCON channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3755, #3800, #3855 or #3605.

ESCON Channel Group, Second (#3701), A-Side

Provides four additional ESCON channels. Prerequisites: #3400 or #3600. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3801.

ESCON Channel Group, Third (#3702), A-Side

Provides four additional ESCON channels. Prerequisites: #3600 and #3701 or #3801. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3802.

ESCON Channel Group, Fourth (#3703), A-Side

Provides four additional ESCON channels. Prerequisites: #3600 and #3702 or #3802. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3803.

ESCON Channel Group, Fifth (#3704), A-Side

Provides four additional ESCON channels. This group completes population of feature #3600. Prerequisites: #3600 and #3703 or #3803. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3804 or #3605.

ESCON Channel Group, Sixth (#3705), A-Side

Provides four additional ESCON channels. Prerequisites: #3601 or #3401. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3805.

ESCON Channel Group, Seventh (#3706), A-Side

Provides four additional ESCON channels. Prerequisites: #3601; #3705 or #3805. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3806.

ESCON Channel Group, Eighth (#3707), A-Side

Provides four additional ESCON channels. Prerequisites: #3601; #3706 or #3806. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3807.

ESCON Channel Group, Ninth (#3708), A-Side

Provides four additional ESCON channels. Prerequisites: #3601; #3707 or #3807. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3808.

ESCON Channel Group, Second (#3751), A-Side

Provides four standard ESCON channels. Prerequisites: #3605; #3755 or #3855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3851 or #3555.

ESCON Channel Group, Third (#3752), A-Side

Provides four additional ESCON channels for models 190 and 210 and upgrades from models 190 and 210 to models 260 and 320. Prerequisites: #3605; #3751 or #3851; #3755 or #3855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3852, #3753 or #3853.

ESCON for Models 260 through 480 (#3753), A-Side

Provides four standard ESCON channels. Prerequisites: #3605; #3751 or #3851; #3755 or #3855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not for Models 190 and 210; cannot coexist with #3853, #3752 or #3852.

ESCON Channel Group, Fourth (#3754), A-Side

Provides four additional ESCON channels. This group completes population of the first ESCON only board. Prerequisites: #3605; #3752, #3852, #3753 or #3853. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3854.

ESCON XDF Channel Group, First (#3800), A-Side

Provides the first four ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3605, #3700, #3755 or #3855.

ESCON XDF Channel Group, Second (#3801), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3400 or #3600. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3701.

ESCON XDF Channel Group, Third (#3802), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3600 and #3801 or #3701. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3702.

ESCON XDF Channel Group, Fourth (#3803), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3600; #3802 or #3702. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3703.

ESCON XDF Channel Group, Fifth (#3804), A-Side

Provides four additional ESCON XDF channels. This group completes population of feature #3600. Prerequisites: #3600; #3803 or #3703. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3605 or #3704.

ESCON XDF Channel Group, Sixth (#3805), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3601 or #3401. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3705.

ESCON XDF Channel Group, Seventh (#3806), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3601; #3805 or #3705. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3706.

ESCON XDF Channel Group, Eighth (#3807), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3601; #3806 or #3706. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3707.

ESCON XDF Channel Group, Ninth (#3808), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3601; #3807 or #3707. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190; cannot coexist with #3708.

ESCON XDF Channel Group, First (#3855), A-Side

Provides the first four ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: No. Limitations: Cannot coexist with #3700, #3800 or #3755.

ESCON XDF Channel Group, Second (#3851), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3605; #3755 or #3855. Corequisites: None. Maximum: One. Field installation: No. Limitations: Cannot coexist with #3751.

ESCON XDF Channel Group, Third (#3852), A-Side

Provides four additional ESCON XDF channels for models 190 and 210 and upgrades from models 190 and 210 to models 260 and 320. Prerequisites: #3751 or 3851; #3755 or 3855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3752, #3753 or #3853.

ESCON XDF for Models 260 through 480 (#3853), A-Side

Provides four additional ESCON XDF channels. Prerequisites: #3751 or 3851; #3755 or 3855. Corequisites: None. Maximum: One. Field installation: No. Limitations: Not for models 190 and 210; cannot coexist with #3753, #3852 or #3752.

ESCON XDF Channel Group, Fourth (#3854), A-Side

Provides four additional ESCON XDF channels. This group completes population of the first ESCON XDF only board. Prerequisites: #3751 or #3851; #3752 or #3852; #3753 or #3853; #3755 or #3855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #3754.

Other Feature Codes: A-Side

Expansion Frame (#6000), A-Side

Provides the capability to add a Vector Facility and additional channel features beyond the processor frame limit, allowing up to maximum channels on all models (except model 190) and/or up to two Vector Facilities on the A-side of models 440, 480, 490, 570 and 610. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Not available for model 190.

Sysplex Timer Attachment (#6150), A-Side

Provides the attachment of the Sysplex Timer, which synchronizes clock time-of-day in coupled systems environments. The connection from the processor to the synchronizer is available via fiber optic cables. Prerequisites: Refer to Announcement Letter 190-127 dated 9/5/90. Corequisites: None. Maximum: One. Field installation: Yes.

IOSPPC IBM Token-Ring Network (LAN) Attachment (#1100), B-Side

Provides the connectivity to a LAN for the processor controller. This feature includes a 2.44 meter (8.0 foot) LAN adapter and attachment cable for attachment to a LAN to route control messages to the appropriate node when required. Required for ESCON analyzer support; specify code #9830 must be indicated on the order. Prerequisites: #1000. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Customer must install or have a LAN installed and must provide attachment cable if a length greater than 2.44 meters (8.0 feet) is required.

Storage: B-Side

Total storage on all models can be partitioned at IML into central and expanded storage by responding to the appropriate storage configuration questions. This allows repartitioning of storage to meet changing requirements. Further allocation of this physical storage can be made when operating in LPAR mode under PR/SM.

Central storage increments of 16, 32, 48, 64, 80, 96, 112, 128, 144, 160, 176, 192, 208, 224, 240 and 256Mb are supported on models 210, 260, 320, 440, 480 and on each side of Models 490, 570 and 610. Central storage increments of 16, 32, 48, 64, 80, 96, 112 and 128Mb are supported on model 190.

All storage above these increments up to the total storage capacity is treated as expanded storage. For example, if 32Mb is allocated to central storage and total storage capacity is 128Mb, then 96Mb is allocated to expanded storage.

Only one pricing code and one storage capacity code is permitted. For upgrades, remove old codes. The corequisite pricing code must be specified with each storage capacity feature. See the list below for the correct code and upgrade path. Only one pricing code and one storage capacity code is permitted. For upgrades, remove old codes.

Total Storage, 128Mb Capacity (#3001), B-Side

Provides additional storage, increasing total storage to 128Mb on models 490 and 570. Prerequisites: #9002 for model 570. Corequisites: #1901 (64-128Mb). Maximum: One. Field installation: Yes.

Total Storage, 256Mb Capacity (#3005), B-Side

Provides additional storage, increasing total storage to 256Mb. Prerequisites: None. Corequisites: On initial orders #1911 (64-256Mb) or #1921 (128-256Mb). Corequisites: For MES field upgrade #1911 (64-256Mb) or #1921 (128-256Mb). Maximum: One. Field installation: Yes.

Total Storage, 512Mb Capacity (#3010), B-Side

Provides additional storage, increasing total storage to 512Mb. Prerequisites: None. Corequisites: On initial orders #1931 (64-512Mb) or #1941 (128-512Mb). Corequisites: For MES field upgrade #1931 (64-512Mb) or #1941 (128-512Mb) or #1951 (256-512Mb). Maximum One. Field installation:

Yes.

Total Storage, 1024Mb Capacity (#3015), B-Side

Provides additional storage, increasing total storage to 1024Mb. Prerequisites: None. Corequisites: On initial orders #1961 (64-1024Mb) or #1971 (128-1024Mb). Corequisites: For MES field upgrade #1961 (64-1024Mb) or #1971 (128-1024Mb) or #1981 (256-1024Mb) or #1991 (512-1024Mb). Maximum: One. Field installation: Yes. Limitations: None.

I/O Power Sequence Control

I/O Power Sequence Control (#3100), B-Side

Provides the capability for power on/off control for sixteen parallel control units attached to the processor. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes.

I/O Power Sequence Control, Expansion Frame (#3110), B-Side

Provides the capability for power-on/off control for sixteen additional parallel control units attached to the processor or for sixteen parallel control units attached to the expansion frame. Prerequisites: #6001 and #3100. Corequisites: None. Maximum: One. Field installation: Yes.

Vector Facilities: B-Side

Vector Facility (#2711), B-Side

Provides a Vector Facility for the first processor of models 490, 570 and 610. Prerequisites: #6001 for 610; #6001 for 570 which has specify code #9012. Corequisites: None. Maximum: One. Field installation: Yes.

Vector Facility, Second (#2721), B-Side

Provides a Vector Facility for the second processor of models 570 and 610 which have specify code #9012. Prerequisites: #2711. Corequisites: None. Maximum: One. Field installation: Yes.

Standard Channel Configurations, B-Side

Twelve channels are standard on the B-Side of Models 490, 570 and 610. All models have the following options:

- All parallel
- A combination of parallel and ESCON and/or ESCON XDF
- All ESCON and/or ESCON XDF.

The entry configuration for the B-side of models 490, 570 and 610 must include one of the following combinations:

ALL PARALLEL:	PARALLEL/ESCON:	ALL ESCON: #4605 *
P | Standard	P | Standard	E |
P | Standard	P | Standard	E | 4753 or ** 4853
P | 4555 *	P |	E | 4751 or ** 4851
E |	E | 4755 or ** 4855	E | 4755 or ** 4855

* MUST specify ** MUST specify one

P = 4 channels Parallel
E = 4 channels ESCON and/or ESCON XDF

Standard Channel Feature Codes for Models 490, 570 and 610: B-Side

Entry Parallel Channels (#4555), B-Side

No charge feature provides twelve parallel channels. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #4500, #4605, #4755 or #4855. Field installation: Yes. Maximum: One.

Entry Mixed Channels: ESCON Channels First (#4755), B-Side

No charge feature provides four ESCON channels and eight parallel channels on models 490, 570 and 610. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #4555, #4700, #4800 or #4855. Field installation: Yes. Maximum: One.

Entry Mixed Channels: ESCON XDF Channels First (#4855), B-Side

Provides four ESCON XDF channels and eight parallel channels on models 490, 570 and 610. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #4555, #4700, #4800 or #4755. Field installation: Yes. Maximum: One.

Entry All ESCON and/or ESCON XDF Feature (#4605), B-Side

No charge feature provides the capability to install sixteen ESCON and/or ESCON XDF channels at initial order. Prerequisites: #4755 or #4855. Corequisites: #4751 or #4851; #4753 or #4853. Limitations: Cannot coexist with #4500, #4555, #4700, #4800, #4704 or #4804. Installation: Yes. Maximum: One.

Entry All ESCON Channels First (#4755), B-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #4555, #4700, #4800 or #4855. Field installation: Yes. Maximum: One.

Entry All ESCON XDF Channels First (#4855), B-Side

Provides four ESCON XDF channels at initial order. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #4555, #4700, #4800 or #4755. Field installation: Yes. Maximum: One.

Entry All ESCON Channels Second (#4751), B-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: #4755 or #4855. Corequisites: #4605. Limitations: Cannot coexist with #4851. Field installation: Yes. Maximum: One.

Entry All ESCON XDF Channels Second (#4851), B-Side

Provides four ESCON XDF channels at initial order. Prerequisites: #4755 or #4855. Corequisites: #4605. Limitations: Cannot coexist with #4751. Field installation: Yes. Maximum: One.

Entry All ESCON Channels Third (#4753), B-Side

No charge feature provides four ESCON channels at initial order. Prerequisites: #4751 or #4851. Corequisites: #4605. Limitations: Cannot coexist with #4853. Field installation: Yes. Maximum: One.

Entry All ESCON XDF Channels Third (#4853), B-Side

Provides four ESCON XDF channels at initial order. Prerequisites: #4751 or #4851. Corequisites: #4605. Limitations: Cannot coexist with #4753. Field installation: Yes. Maximum: One.

Feature Codes for Additional Parallel Channels: B-Side

Parallel Channel Feature Base Frame (#4400), B-Side

No charge feature provides the capability to install up to twelve additional parallel channels and four ESCON or ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4600.

Parallel Channel Group, Basic (#4500), B-Side

Provides four additional parallel channels. Prerequisites: #4755 or #4855 or #4700 or #4800. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4555 or #4605.

Parallel Channel Group, First (#4501), B-Side

Provides four additional parallel channels. Prerequisites: #4400.

Corequisites: None. Maximum: One. Field installation: Yes.

Parallel Channel Group, Second (#4502), B-Side

Provides four additional parallel channels. Prerequisites: #4400 and #4501. Corequisites: None. Maximum: One. Field installation: Yes.

Parallel Channel Group, Third (#4503), B-Side

Provides four additional parallel channels, completing the parallel channel additions for the processor frame. Prerequisites: #4400, #4501 and #4502. Corequisites: None. Maximum: One. Field installation: Yes.

First Parallel Channel Feature, Expansion Frame (#4401), B-Side

No charge feature provides the capability to install twelve parallel and four ESCON or ESCON XDF channels. Prerequisites: #6001. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4601.

Parallel Channel Group, Fourth (#4504), B-Side

Provides four additional parallel channels on the first parallel channel expansion frame. Prerequisites: #4401. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: None.

Parallel Channel Group, Fifth (#4505), B-Side

Provides four additional parallel channels. Prerequisites: #4401 and #4504. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: None.

Parallel Channel Group, Sixth (#4506), B-Side

Provides four additional parallel channels. Prerequisites: #4401, #4504 and #4505. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: None.

Second Parallel Channel Feature, Expansion Frame (#4402), B-Side

No charge feature provides the capability to install twelve additional parallel channels. Prerequisites: #6001. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4600, #4601, #4605, #4705 or #4805.

Parallel Channel Group, Seventh (#4507), B-Side

Provides four additional parallel channels. Prerequisites: #4402. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4705 or #4805.

Parallel Channel Group, Eighth (#4508), B-Side

Provides four additional parallel channels. Prerequisites: #4402, #4507 and #6001. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4701 or #4801.

Parallel Channel Group, Ninth (#4509), B-Side

Provides four additional parallel channels. Prerequisites: #4402, #4507, #4508 and #6001. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4700 or #4800.

Entry Parallel Channels (#4555), B-Side

No charge feature provides twelve parallel channels. Prerequisites: None. Corequisites: None. Limitations: Cannot coexist with #4500, #4755, #4855, #4605. Field installation: Yes.

Feature Codes for Additional ESCON and/or ESCON XDF Channels: B-Side

ESCON or ESCON XDF Channel Feature, Base Frame (#4600), B-Side

No charge feature provides the capability to install sixteen additional ESCON or ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4400. The installation of this feature limits the number of parallel channels supported in the processor frame to twelve.

ESCON or ESCON XDF Channel Feature, Expansion Frame (#4601), B-Side

No charge feature provides the capability to install sixteen additional ESCON or ESCON XDF channels. Prerequisites: #6001. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4401.

ESCON or ESCON XDF Channel Feature, First Frame (#4605), B-Side

Provides the capability to install sixteen ESCON or ESCON XDF channels at initial order. Prerequisites: #4755 or #4855. Corequisites: #4751 or #4851; #4753 or #4853. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4500, #4555, #4700, #4800, #4704 or #4804.

ESCON Channel Group, First (#4700), B-Side

Provides the first four ESCON channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4605, #4755, #4800 or #4855.

ESCON Channel Group, Second (#4701), B-Side

Provides four additional ESCON channels. Prerequisites: #4400 or #4600. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4801.

ESCON Channel Group, Third (#4702), B-Side

Provides four additional ESCON channels. Prerequisites: #4600; #4701 or #4801. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4802.

ESCON Channel Group, Fourth (#4703), B-Side

Provides four additional ESCON channels. Prerequisites: #4600; #4702 or #4802. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4803.

ESCON Channel Group, Fifth (#4704), B-Side

Provides four additional ESCON channels. This group completes population of feature #4600. Prerequisites: #4600; #4703 or #4803. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4804 or #4605.

ESCON Channel Group, Sixth (#4705), B-Side

Provides four additional ESCON channels. Prerequisites: #4601 or #4401. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4805.

ESCON Channel Group, Seventh (#4706), B-Side

Provides four additional ESCON channels. Prerequisites: #4601; #4705 or #4805. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4806.

ESCON Channel Group, Eighth (#4707), B-Side

Provides four additional ESCON channels. Prerequisites: #4601; #4706 or #4806. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4807.

ESCON Channel Group, Ninth (#4708), B-Side

Provides four additional ESCON channels. Prerequisites: #4601; #4707 or #4807. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4808.

ESCON Channel Group, Second (#4751), B-Side

Provides four standard ESCON channels. Prerequisites: #4605; #4755 or #4855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4851 or #4555.

ESCON Channel Group, Third (#4753), B-Side

Provides four standard ESCON channels. Prerequisites: #4605; #4751 or #4851; #4755 or #4855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4853.

ESCON Channel Group, Fourth (#4754), B-Side

Provides four additional ESCON channels. This group completes population of the first ESCON only board. Prerequisites: #4605; #4753 or #4853. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4854.

ESCON XDF Channel Group, First (#4800), B-Side

Provides the first four ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4605, #4700, #4755 or #4855.

ESCON XDF Channel Group, Second (#4801), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4400 or #4600. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4701.

ESCON XDF Channel Group, Third (#4802), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4600; #4701 or #4801. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4702.

ESCON XDF Channel Group, Fourth (#4803), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4600; #4802 or #4702. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4703.

ESCON XDF Channel Group, Fifth (#4804), B-Side

Provides four additional ESCON XDF channels. This group completes population of feature #4600. Prerequisites: #4600; #4803 or #4703. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4605 or #4704.

ESCON XDF Channel Group, Sixth (#4805), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4601 or #4401. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4705.

ESCON XDF Channel Group, Seventh (#4806), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4601; #4805 or #4705. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4706.

ESCON XDF Channel Group, Eighth (#4807), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4601; #4806 or

#4706. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4707.

ESCON XDF Channel Group, Ninth (#4808), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4601; #4807 or #4707. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4708.

ESCON XDF Channel Group, First (#4855), B-Side

Provides the first four ESCON XDF channels. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4700, #4800 or #4755.

ESCON XDF Channel Group, Second (#4851), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4605; #4755 or #4855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4751.

ESCON XDF Channel Group, Third (#4853), B-Side

Provides four additional ESCON XDF channels. Prerequisites: #4605, #4751 or 4851; #4755 or 4855. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4753.

ESCON XDF Channel Group, Fourth (#4854), B-Side

Provides four additional ESCON XDF channels. This group completes population of the first ESCON only board. Prerequisites: #4605; #4751 or #4851; #4753 or #4853; #4755 or #4755. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: Cannot coexist with #4754.

Other Feature Codes: B-Side

Expansion Frame (#6001), B-Side

Provides the capability to add Vector Facilities and additional channel features for models 490, 570 and 610. Prerequisites: None. Corequisites: None. Maximum: One. Field installation: Yes. Limitations: None.

Sysplex Timer Attachment (#6151), B-Side

Provides the attachment of the Sysplex Timer, which synchronizes clock time-of-day in coupled systems environments. The connection from the processor to the synchronizer is available via fiber optic cables. Prerequisites: Refer to Announcement Letter 190-127 dated 9/5/90. Corequisites: None. Maximum: One. Field installation: Yes.

Accessories

None

Customer Replacement Parts

None

Machine Elements

None

Supplies

None

Diskettes

None

1.5 Machine and System Installation

Installation Planning

The Installation Planning process is used to ensure that the customer is ready to install the product. The IBM Installation Planning Representative should provide assistance to the customer in planning for the system install. Items that need to be provided by the customer must be checked in advance of the installation to ensure that the customer is actually ready to install the product. Examples of the items to be checked are:

- Proper Power Plug Installed?
- RSF Phone line installed?
- Is there sufficient clearances from the dock to the computer room for the product?
- Etc.

The ES/9000 IM-PP, GC22-7083, contains all the physical planning specifications, requirements, and descriptions for Models 190, 210, 260, 320, 440 and 480. For Models 490, 570, 610, Installation Manual GC22-7084 is required.

The Checklists can be directly sent to your VM reader by entering the following command at the READY;

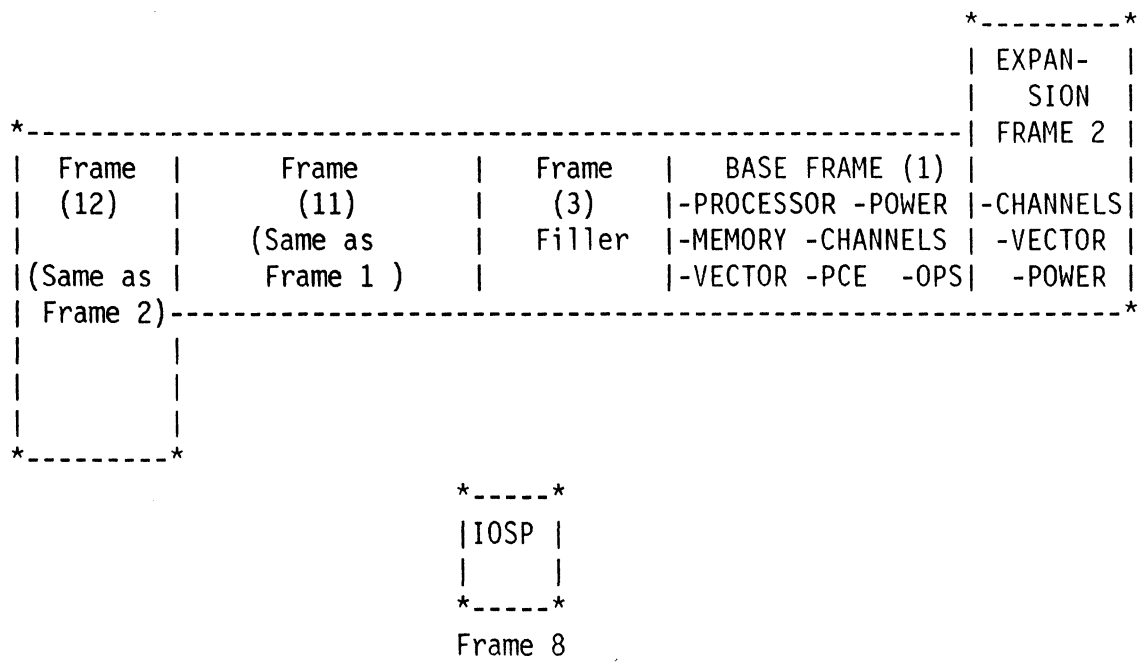
TOOLS SENDTO LEXVMK IBMBOOKS IUOBOOKS GET 9121CHKL LIST3820

The file can only be printed on a 3812 or 3820. Use local print procedures to print the file.

Layouts

The following diagrams can be used as references:

FRAME LAYOUT



Installation Workload

PRODUCT	MACHINE	MODEL	INSTALLATION TIME (hrs)	NUMBER CEs
ES/9000	9121	190	4.0	2
ES/9000	9121	210	4.0	2
ES/9000	9121	260	4.0	2
ES/9000	9121	320	4.0	2
ES/9000	9121	440	4.0	2
ES/9000	9121	480	4.0	2
ES/9000	9121	490	8.0	2
ES/9000	9121	570	8.0	2
ES/9000	9121	610	8.0	2

	Svc Code	Hours	Number CEs
Install	20	4.0	2
Discontinue/Relocate	20	4.0	2
Installation Planning	20	8.0	1

Refer to the FE/MIS Data Base to obtain the most current information.

Discontinue or Relocate System

Packing Materials for ES/9121 Frame 01

Order the following B/Ms when Discontinuing or Relocating the ES/9121. If Discontinuing a non-IBM owned machine, the On-Site Ship Group Tools defined in the Tools and Test section must be included when packing the machine. B/Ms are available and must be ordered from branch office DP orders and movements 45 days before the anticipated removal date.

B/M 7333822 - Environmental Climate Controlled Van

P/N	Description	Qty
7331475	Poly Bag	1
7372748	Corrugated Sheet	2
7330841	Corrugated Sheet	2
7397202	Corner Guards	4
7330562	Filament Tape	1 (roll)
7331440	Unpack Instructions	1 (reference)
7372222	Clear Plastic Envelope	1
7333821	Pack Instructions	1 (reference)

Non-Environmental Van	Air Freight	Frame
B/M 7333520	7333521	01/11
B/M 7333948	7334073	02/12
B/M 7334183	7334184	03
B/M 7334043	7334044	08 (PCE)
B/M 7334144		01/11 (9580)*
B/M 7334145		01/11 (9571)*
B/M 7334146		02/12 (9571)*
B/M 7334147		02/12 (9580)*

Note: * Feature Code 9571 is for a reduced size and feature code 9580 is for a height reduced machine. You may have one or both features for your account.

Physical Characteristics

Weight and Dimensions with Covers *

Frame	Weight kg (lb)	Depth mm (inches)	Width mm (inches)	Height (3) mm (inches)
Processor (each)	905 (2000)	835 (32.5)	1640 (64.5)	2025 (79.6)
Expansion Frame (each)	420 (925)	1157 (45.5)	826 (32.5)	1900 (74.8)
MP Frame (1,2)	150 (330)	826 (32.5)	508 (20.0)	1838 (72.4)
Processor Controller(1)	420 (925)	826 (32.5)	826 (32.5)	2029 (71.0)
IOSP (4)	40 (18)	318 (12.5)	483 (19.0)	597 (23.5)

Notes:

1. Models 490, 570 and 610 only.
2. Including stabilizing outriggers for moving.
3. Except for IOSP, height without heat output distributing top hat is 1775 mm (70.0 inches).
4. Models 190, 210, 260, 320, 440 and 480 only.
5. Floor clearance with casters and with corners is 2.75 inches.
6. Covers and Tophat weigh approximately 35 lbs apiece.
7. * Specifications are subject to change without notice.

Service Clearance

Service clearance is an area around the perimeter of the machine that must be kept clear to permit access to the machine with the covers open. This area is 76.2 cm (30 inches) around the machine.

Environment

Operating

The Processors will operate in a Class B Extended (downward) environment:

	Power On	Power Off
Air Temperature	10.0C to 32.0C (50.0F to 90.0F)	10.0C to 43.0C (50.0F to 109.0F)
Relative Humidity	8% to 80%	8% to 80%
Max. Wet Bulb	23.0C (73.4F)	27.0C (80.6F)

Corrosive Gas: Subclass G1 (Business Office).

Particulate Installation: Subclass P1 (Business Office).

Shipping and Storage

	Shipping	Storage
Air Temperature	-40.0C to 59.4C (-40.0F to +140.0F)	+1.0C to 59.4C (+33.8F to +140.0F)
Relative Humidity	5% to 100%	5% to 80%
Max. Wet Bulb	+1.0C to 29.4C (33.0F to 85.0F)	+1.0C to 29.4C (33.0F to 85.0F)

Note: Class B Extended environment is not applicable to shipping, storage or product power off conditions.

Acoustics and Power Dissipation

FRAME	ACOUSTICS bels (w/covers)	AIR FLOW CFM (m3/min)	HEAT Output kBtu/hr (kW)	kVA
Frame 01	7.2	2000	18.4-21.2	6.0-6.9
Frame 01 + 02	7.5	3800 (51.0)	33.8 (9.9)	11.0

Interconnection Distances

The following table shows the maximum interconnection distances.

FROM	TO	Cable Distance
Frame 01	IOSP	6.4m (19.5ft)
Frame 03	IOSP	10.67m (35ft)
IOSP	IOSP Local Display	2.0m (6.0ft)
IOSP	IOSP Remote Display (up to 4)	606.m (2000ft)
IOSP	Optional Printer	12.2M (40.0ft)
IOSP	MODEM	2.0.m (6.0ft)

Usability Characteristics

The IBM ES/9121 Processor models may be operated remotely from a central site in a lights out environment for such operations as turning power on/off, IMLing, IPLing, and problem analysis.

The user interface is handled by the I/O Support Processor (IOSP).

Licensed Internal Code

Refer to Section 14 of the Agreement for Purchase of IBM Machines or Section 15 of the Agreement for Lease or Rental of IBM Machines.

Each ES/9121 Model is provided with Licensed Internal Code customized, by serial number, for use on that specific machine. The Licensed Internal Code is an integral part of the machine.

System Planning Considerations

Systems Assurance

Service Delivery Planning working in conjunction with Engineering, M&S, NSDHQ and System Center personnel will provide a System Assurance Product Review (SAPR) Guide.

A Product Installability Review (PIR) meeting will be held prior to or immediately after announcement with representatives from Service Delivery Planning, M&S, and the Washington Systems Center.

MES Installation

IBM ES/9121 Processor MES Installation Times (hrs)

Upgrades to models 210, 260, 320, 440, 480	4.0
Upgrades to 490, 570 or 610	12.0 - 14.0
Model conversion 190 to 210	3.0 - 4.0
190 to 260	3.0 - 4.0
210 to 260	3.0 - 4.0
210 to 320	3.0 - 4.0
260 to 320	3.0 - 4.0
260 to 440	3.0 - 4.0
260 to 480	3.0 - 4.0
320 to 440	3.0 - 4.0
320 to 480	3.0 - 4.0
440 to 480	3.0 - 4.0
320 to 490	12.0 - 14.0
320 to 570	12.0 - 14.0
480 to 570	12.0 - 14.0
480 to 610	12.0 - 14.0
490 to 570	3.0 - 4.0
570 to 610	3.0 - 4.0
Model Conversions	3.0 - 4.0
Parallel Channels	2.0 - 3.0
ESCON Channels	2.0 - 3.0
ESCON XDF Channels	2.0 - 3.0
Storage Upgrades	1.5 - 2.5
Features	2.0 - 3.0

Notes:

1. The Installation Times are estimates only and have not been tested.

2. Model downgrades are not available.

3. More current information is available via the Field Installation Time (FIT) application. Authorization access is handled through the common security facility CSF administrator in the B/O. Authorized users can access FIT from the CCDN menu.

Parallel Channel Gate 01P

The channel gate is installed as an assembly containing the channel board, gate, cards, I/O Panel, and cables.

One of the following assemblies is provided if a gate is to be installed.

Gate Assembly with Parallel Channels 12-15
Gate Assembly with Parallel Channels 12-19

Gate Assembly with Parallel Channels 12-23
Gate Assembly with ESCON Channels 24-27
Gate Assembly, Parallel channels 12-15, ESCON channels 24-27
Gate Assembly, Parallel channels 12-19, ESCON channels 24-27
Gate Assembly, Parallel Channels 12-23, ESCON channels 24-27

Additional Hardware

EMC Cover (used for all configurations)
Fiber Optic Cable Guide (if ESCON channels installed)

```
Times for Installing Parallel Channel Gate =1.5 Hours Mechanical Rework
                                            1.0 Code & Diagnostics
```

The following times are for installing additional channels if the channel board has been previously installed.

```
Parallel Channels 8-11
If installing Parallel Channels 8-11, install time = .3 hrs. Mechanical
                                                     1.0 hrs. Code & Diag

Parallel Channels 12-15
If installing Parallel Channels 12-15, install time = .3 hrs. Mechanical
                                                      1.0 hrs. Code & Diag

Parallel Channels 16-19
If installing Parallel Channels 16-19, install time = .3 hrs. Mechanical
                                                      1.0 hrs. Code & Diag

Parallel Channels 20-23
If installing Parallel Channels 20-23, install time = .4 hrs. Mechanical
                                                      1.0 hrs. Code & Diag
```

ESCON Channel Gate 01P

The channel gate is installed as an assembly containing the channel board, gate, cables, and cards.

Gate Assembly with ESCON Channels 24-27
Gate Assembly with ESCON Channels 20-27
Gate Assembly with ESCON Channels 16-27
Gate Assembly with ESCON Channels 12-27

Additional Hardware

EMC Cover (used with all configurations)
I/O Fiber Optic Cable Guide

```
Times for Installing Parallel Channel Gate = 1.5 Hours Mechanical Rework
                                             1.0 Code & Diagnostics
```

The following times are for installing additional channels if the channel board has been previously installed.

```
ESCON Channels 28-31 (1st ESCON Channel Group)
If installing ESCON Channels 28-31 on board 01F
                              install time = 1.0 Mechanical
                                             1.0 Code & Diag

ESCON Channels 24-27 (2nd ESCON Channel Group)
If installing ESCON Channels 24-27  on Parallel board 01P
                              install time = 1.0 Mechanical
                                             1.0 Code & Diag

ESCON Channels 20-23 (3rd ESCON Channel Group)
If installing ESCON Channels 20-23,
                              install time =  .3  Mechanical
                                             1.0 Code & Diag

ESCON Channels 16-19 (4th ESCON Channel Group)
If installing ESCON Channels 16-19,
                              install time =  .3  Mechanical
                                             1.0 Code & Diag

ESCON Channels 12-15 (5th ESCON Channel Group)
If installing ESCON Channels 12-15,
                             install time =  .3  Mechanical
                                            1.0 Code & Diag
```

Model Upgrades

Model 190 to 210, install time = 1.0 hrs. Mechanical
1.0 hrs. Code & Diag

Model 190 to 260, install time = 1.0 hrs. Mechanical
1.0 hrs. Code & Diag

Model 210 to 260, install time = 1.0 hrs. Mechanical
1.0 hrs. Code & Diag

Model 210 to 320, install time = 1.5 hrs. Mechanical
1.0 hrs. Code & Diag

Model 260 to 320, install time = 2.5 hrs. Mechanical
1.0 hrs. Code & Diag

Model 260 to 440, install time = 2.5 hrs. Mechanical
1.0 hrs. Code & Diag

Model 260 to 480, install time = 2.5 hrs. Mechanical
1.0 hrs. Code & Diag

Model 320 to 440, install time = 2.5 hrs. Mechanical
1.0 hrs. Code & Diag

Model 320 to 480, install time = 2.5 hrs. Mechanical
1.0 hrs. Code & Diag

Model 440 to 480, install time = 1.0 hrs. Mechanical
1.0 hrs. Code & Diag

```
Memory Upgrades
---------------

64M to 128M Memory upgrade, install time = 0.5 hrs. Mechanical
                                           1.0 hrs. Code & Diag

128M to 256M Memory upgrade, install time = 0.5 hrs. Mechanical
                                            1.0 hrs. Code & Diag

256M to 512M Memory upgrade, install time = 1.5 hrs. Mechanical
                                            1.0 hrs. Code & Diag

512M to 1024M Memory upgrade, install time = 1.5 hrs. Mechanical
                                             1.0 hrs. Code & Diag

Install Vector
----------------

Install Vector 1, install time = 1.0 hrs. Mechanical
                                 1.0 hrs. Code & Diag

Install Vector 2, install time = 1.0 hrs. Mechanical
                                 1.0 hrs. Code & Diag

Install Sysplex Timer
---------------------------------------

Install Sysplex Timer          = 1.0 hrs. Mechanical
                                 1.0 hrs. Code & Diag

Install I/O Sequencer
--------------------

Install I/O Sequencer, install time = 1.0 hrs. Mechanical
                                      1.0 hrs. Code & Diag
```

1.6 Maintenance Service Qualification

The Maintenance Service Qualification (MSQ, Formerly MAQ) Inspection is performed on Modified IBM machines to qualify the machine for IBM Maintenance.

Inspections are required for the following:

- Machines that are off IBM Maintenance and are going on.
- A modification was done on the machine by a TPM (using IBM parts).
- A Customer has requested the inspection.

For example, an Inspection would be preformed if a TPM installed a Memory

upgrade using IBM Memory cards.

Note: Machines already on IBM Maintenance which are modified by IBM customer engineers using IBM parts do not require an MSQ Inspection.

The inspection procedures are in one book called the "Maintenance Service Qualification Guide and Record" Form # ZZ22-9469 and is available in soft copy in Lexington on the IBMBOOKS repository.

To obtain a soft copy of the latest level document, at the VM Command line, type:

TOOLS SENDTO LEXVMK IBMBOOKS IUOBOOKS GET 9121MSQ LIST3820

This file is already formatted and can be printed on a 3820 or 3812.

A copy of the Feature and Installation/Discontinuance Activity (IDA) Information should be provided to the Marketing Account team for updating AAS/PMINQ/MLC records.

Failure to do this step will result in incorrect MLC Records and could impact the next EC/MES for your machine!

A copy of the MSQ Record should be kept in the B/O and the original should be sent to the appropriate MSQ Coordinator.

1.7 Inspection of Altered Machines

The Guide for Inspection of Altered Machines (R009) is used when performing an inspection on Altered IBM machines to ensure the unaltered portion of the machine is serviceable my IBM.

This inspection is performed only when IBM machines are Altered by TPMs using NON-IBM parts (i.e., OEM Memory).

Note: It may be necessary to perform two Inspection, one for the alteration (Inspection of Altered Machines) and one for the Modification (Maintenance Service Qualification) if for example the machine was upgraded to the next Model and OEM Memory was installed.

The inspection procedures are in one book called the "Guide for Inspection of Altered Machines (R009)" Form # ZZ38-0032 and is available in soft copy in Lexington on the IBMBOOKS repository.

To obtain a soft copy of the latest level document, at the VM Command line, type:

TOOLS SENDTO LEXVMK IBMBOOKS IUOBOOKS GET INSPECT LIST3820

This file is already formatted and can be printed on a 3820 or 3812.

A copy of the Feature and Installation/Discontinuance Activity (IDA) Information should be provided to the Marketing Account team for updating AAS/PMINQ/MLC records.

Failure to do this step will result in incorrect MLC Records and could impact the next EC/MES for your machine!

A copy of the R009 should be kept in the B/O and the original should be sent to the appropriate Alteration Administrator.

1.8 Maintenance Plans

Maintenance Strategy

The primary means of providing IBM Service for the ES/9121 Processor will be via the on-site Maintenance Package. The maintenance package follows that of the 3090 Processor complex and includes the automation of call routing, log data gathering, problem management, and communications. Console messages will inform the customer when the Processor requires service. A call will automatically be placed to RETAIN, with customer concurrence. Both the customer engineer via dispatch and the Remote Support Center (RSC) will be notified of all calls, by RETAIN. Appropriate actions by both groups will be determined by the type of call.

The Branch Office will maintain overall problem management responsibility for all service calls. Problem management responsibility is defined as scheduling maintenance time, reviewing action plans for customer acceptability, and communicating action plans to the customer.

The RSC will have technical responsibility for all calls for which remote diagnosis is required. Technical responsibility is defined as creating action plans for isolation and resolution of machine problems in and out of the Maintenance Package, including Maintenance Package Escapes.

Product Engineering is responsible for design faults, all Maintenance Package faults, and for problem resolution of all calls that cannot be resolved by the RSC.

Remote Support Facility (RSF)

Remote support of the ES/9121 Processor uses service facilities comprised of RSF, Universal Remote Support Facility (URSF) Product Application Program (PAP) and a communications link between them. These facilities provide:

- Service call routing
- Service data transmission
- Remote service console operation
- Customer engineer dispatching
- Parts ordering information
- Patch distribution
- Call typing

- o Data bank searches
- o ES/9121 Processor history data collection
- o Reference Code Exception search.

The Processor Controller Element uses an external modem with integrated auto-call and auto-answer capabilities. The RSF Application in the Processor Controller Element (PCE) is the primary method of starting the Service Delivery Process for the ES/9121 Processor.

RSF provides five modes of operation. They are Automatic Problem Reporting, Automatic Service Update, Data Bank Access, URSF Console, and Remote Console.

1. Automatic Problem Reporting

   This function enables the RSF, PCE application to communicate with the ES/9121 URSF Product Application Program in RETAIN to report machine and customer detected failures. This mode uses the ES/9121 auto-dial capability to place a customer authorized service call. The ES/9121 URSF/PAP uses machine and customer entered data to determine the proper routing for the service call.

2. Automatic Service Update

   This function is a machine initiated auto-call to RETAIN to test the data link on a weekly basis. Applicable microcode patches will also be downloaded to the machine from the ES/9121 URSF Product Application in RETAIN. This function requires customer authorization.

3. Data Bank Access (DBA) - (DL2)

   This function allows an on-site PCE to act as a RETAIN terminal.

   Example of use:

   - o TIP/DIAG search & display
   - o Symptom fix search & display
   - o Problem Management Records (PMR) visibility and add text capability - for the machine S/N placing the call only.

4. URSF Console

   The customer engineer will manually invoke this function from the console assignment screen in the PCE to report activity on:

   - o Service action/call completion
   - o Installations
   - o EC(s)
   - o M(s).

   The customer engineer can update/close the PMR associated with any of the above activities using this function. Remote calls to the RSC can also be

placed for information or assistance using this mode.

5. Remote Console:

   The connection of an on-site PCE to RETAIN to allow control and/or retrieval of data.

   Note: Remote console operations are not supported for PCE maintenance.

   - DL1 - having ES/9121 call an activated RETAIN port selected by the RSC.
   - DL2 - ES/9121 calls an auto-answer RETAIN port.
   - DL3 - auto-calling the ES/9121 system from RETAIN.

Maintenance Package

The Maintenance Package is all tools, tests, documentation, and procedures supplied to the service community for the ES/9121 Processor Complex that are used to analyze faults, isolate Field Replaceable Units (FRUs), repair, and verify repairs. The maintenance package consists of the following:

1. Hard Copy Documentation

   - Entry point into the Maintenance Procedures
   - PCE MAPS
   - Physical Removals and Replacement Procedures
   - Power/Thermal Guide.

2. Online.

   - Menu Driven Procedures (error logs, REFCODE, FRU calls)
   - RSF Problem Reporting
   - Diagnostics
   - Exercisers
   - Analysis Routines (A/Rs run automatically)
   - Verification Tests (used to verify certain repair actions)
   - Manual Diagnostics (under M/P or RSC direction).

Concurrent Maintenance

1. Concurrent Diagnose

   The following functional units can be diagnosed concurrently with system operation.

   - Channel attached I/O devices by invoking OLTEP.
   - Processor Storage by browsing Processor Memory Array Diagnostic (PMAD) error files and invoking fetch only tests.
   - Single channel(s).

2. Concurrent Repair.

   The following functional units can be repaired concurrently with system operation.

   - o Channel attached I/O devices
   - o Processor Controller I/O devices (IOSP).

Deferred Maintenance

Deferred maintenance is supported by automatic and manual reconfiguration, instruction retry and System Control Program (SCP) recovery procedures.

1. In multiple CP models (dyadics) a single central processor can be varied off-line.

2. Failing pages of storage both processor and expanded will be deallocated from use by the operating system or manually varied off-line.

3. Single channels can be varied off-line either by the operating system or manually, and diagnosed concurrently with customer operations.

Some degradation is caused by reconfiguring and the use of vary commands. The system and/or operator can eliminate a failing element or facility to prevent further disruptions.

Detection of an error causes immediate action to be taken to collect information related to the error. This data is used to determine the hardware recovery action.

If hardware recovery is not possible the PCE will present a hard machine check interrupt to the SCP for recovery.

The PCE will initiate recovery and test the success of the attempt when hardware recovery is possible. The PCE will present a soft machine check interrupt to the SCP if recovery is successful.

The error data is saved in the PCE for AR analysis and Service Personnel viewing.

Maintenance Procedures

Maintenance Procedures provide menu-driven support for maintenance and repair of the ES/9121 Processor and Power/Thermal.

This section provides a brief description of the M/P functions.

Management Operations

Management Operations aid the user in error correlation and diagnostic file access and management. Management Operations allows the user to view Action Queue Entries (AQE) associated with particular faults or FRUs.

Fault Isolation

A list of manual isolation tasks is provided for fault isolation and reduction of the FRU call for Power/Thermal faults.

FRU Swapping

FRU swapping means the interchanging of the same P/N FRUs within a machine. This does not include installation of new parts for diagnostic purposes.

Following is the ES/9121 FRU Swap Strategy:

FRU swapping will only be performed under the direction of the RSC or PE.

The machine may be returned to the customer with FRUs in a swapped state, under RSC or PE direction, when diagnostics are unable to reproduce the customer failure.

All swapped parts must be restored to their original locations after the problem is resolved unless otherwise directed by RSC or PE.

Exception: Storage cards should not be returned to their original location.

The old TCM is returned to the manufacturing location when a new TCM is installed in a machine. The original TCM should not be reinstalled in the machine even if the new TCM did not fix the problem except in AG/AP (see note).

The one exception to this is when a solid recreatable failure is caused by a defective TCM board all original TCMs should be reinstalled in the machine. This includes original TCMs in other than the defective board.

In no case will a TCM or TCM boards plugged even once on a machine be returned to stock as new.

FRU Replacement

FRU Replacement is used to guide the replacement of FRUs to repair hardware faults. It provides the list of FRUs to be replaced. All FRUs, including Power/Thermal FRUs, must be replaced with the system powered off (power off push button).

Open FRU Replacement

Open FRU Replacement allows the user to select any set of FRUs for replacement and maintains the diagnostic files. (Used under RSC direction.)

Repair Validation

Repair Validation is used to verify that a hardware fault has been eliminated by the replacement of FRUs, and to verify that the new FRUs are functioning

properly. It provides:

- A check that the correct configuration is available for the tests.
- Execution of a predetermined list of diagnostic tests to verify the repair of a hardware fault.
- Updated history files based on the results of the tests.

Validation for Power/Thermal is performed by powering on the ES/9121 Processor Complex. Validation provides the means to indicate the repair action taken.

Manual Diagnostics

Diagnostic tests are invoked manually by the RSC or on-site customer engineer. The diagnostic tests are either hardware tests that detect a hardware fault and recommend FRUs to be replaced or functional exercisers that are able to determine there is a functional problem.

Call Types and Flow

Four types of Service calls are used for the ES/9121 product. Call Types 1-3 use the Automatic Problem Reporting Mode of Operation.

Type 1 Call Description

A Type 1 call is one that the ES/9121 has:

- Detected a unrecoverable error and/or
- Reached an error threshold and
- The Maintenance Package has isolated to an acceptable FRU count.

Notes:

1. The FRU count will be dependent on the failing component technology.
2. PCE and Power/Thermal failures are routed as Type 1 regardless of the FRU count.

If the customer has not selected the "Bypass Operator Approval" option on the Remote Service Configuration Frame, the PCE will notify the customer of the error and request customer input, if required, through a PCE Service Authorization frame.

The customer will input call information, such as system available for service (Y/N) and authorize a data link to RETAIN. The PCE will transfer the call information (machine type and serial, FRU(s) part number(s) AQE, ref-code, and customer input) to RETAIN. The ES/9121 URSF Application within RETAIN will determine if the call is a Type 1 call. URSF automatically opens a PMH record that includes all information relating to the problem.

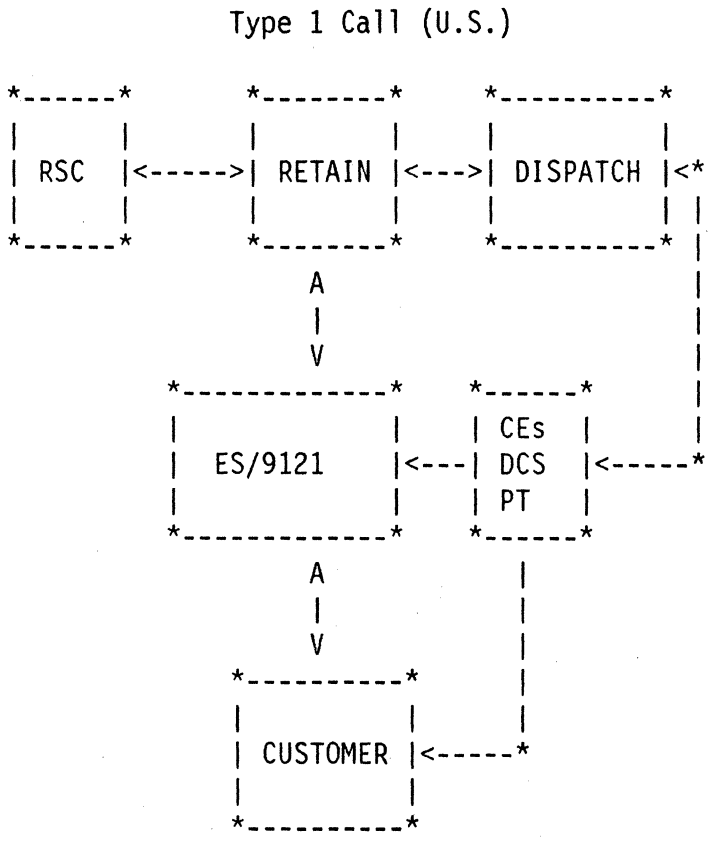
The call information will be sent to the appropriate dispatch and to the

customer engineer's PT if URSF determined a Type 1 call. The customer engineer will call the customer to confirm the status of the ES/9121 complex and order and/or pick-up the parts for FRU replacement. The customer engineer will then go on-site and follow the maintenance procedures to repair the fault and verify the fix. Upon completion of the call he will re-invoke the Data Link to transfer call completion information.

This information will be comprised of:

- o FRU(s) that fixed the problem
- o Time of completion
- o Additional tracking data.

The completion scenario will hold true for all three call types and will not be repeated. The customer engineer will notify the RSC and this call will be considered a Maintenance Package Escape (MPE) if the FRU(s) fail to fix the problem.



Type 2 Call Description

A Type 2 call is one that the ES/9121 has:

- o Detected a unrecoverable error and/or
- o Reached an error threshold and
- o Not isolated to an acceptable FRU group.

Note: The FRU count will be dependent on the failing technology.

If the customer has not selected the "Bypass Operator Approval" option on the Remote Service Configuration Frame, the PCE will notify the customer of the error and request customer input, if required, through a PCE Service Authorization frame.

The customer will input call information such as system available for service (Y/N), etc., and authorize a data link to RETAIN. The PCE will transfer the call information to RETAIN. The ES/9121 URSF Application within RETAIN will determine if the call is a Type 2 call, and automatically open a PMH record.

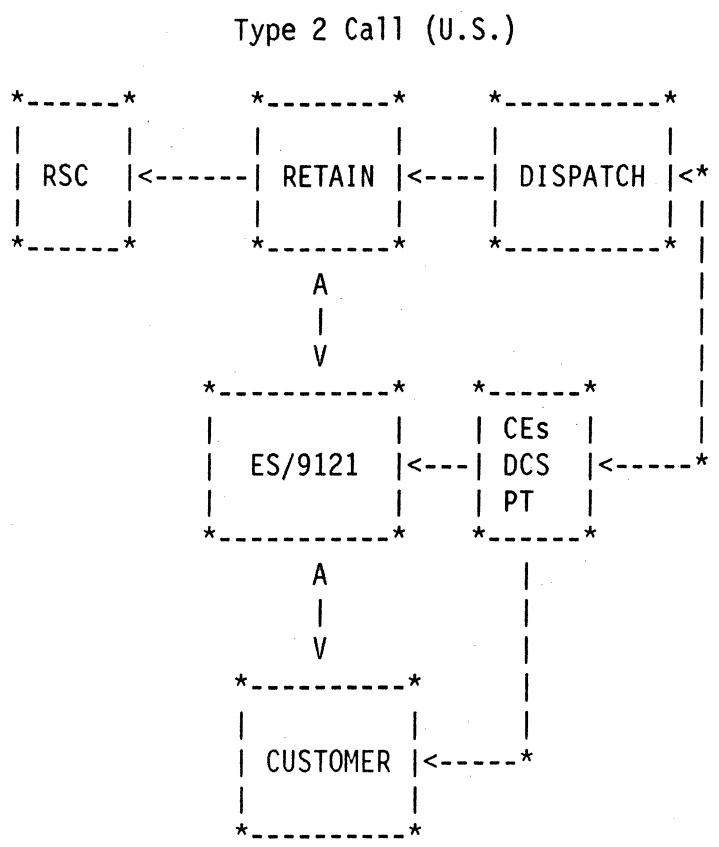
The call information will be sent to the appropriate dispatch and the RSC if URSF determined a Type 2 call. The Remote Support application will request the associated error logs from the PCE. These logs can be used for off-line problem isolation by the RSC. The customer engineer will communicate with the customer to confirm the status of the call, schedule maintenance time and will order and/or pick-up any needed parts.

The customer engineer will further isolate the FRU group under the RSC direction if the customer engineer is on-site.

When the system is available for service and the customer engineer is not on-site, the RSC will call the customer and request authorization for Remote Console to perform further isolation.

The customer engineer will follow the maintenance procedures to repair the fault and verify the fix once isolation is complete.

The RSC will create an action plan to resolve the problem should the isolation fail.



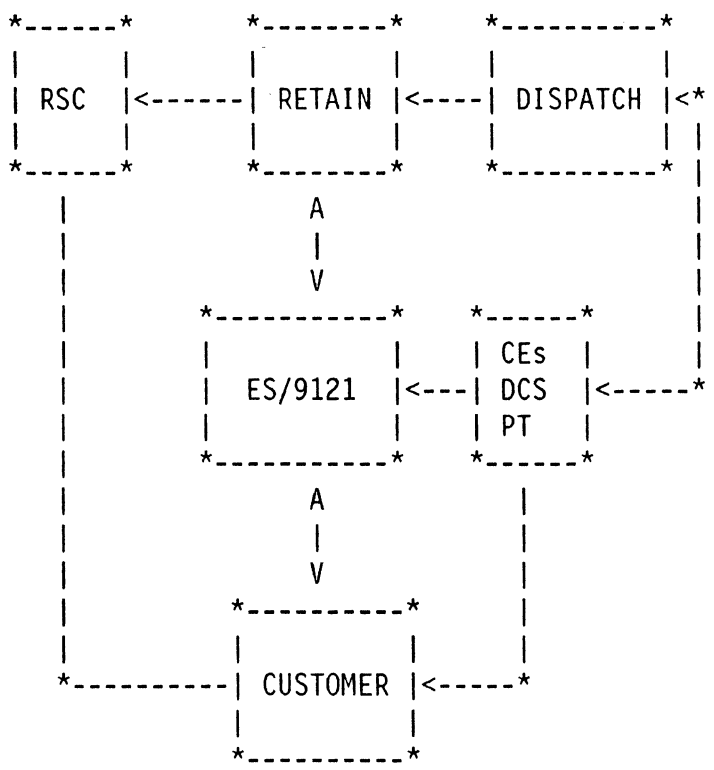
Type 3 Call Description

A Type 3 call is one that the customer has reported a suspected system error. Examples of this type of error are:

- PCE
- Uncoded waits
- Hard wait
- Soft wait
- Program loop
- Hang condition
- Degradation
- Cannot IPL
- Incorrect data
- Program check
- Etc.

If the customer can determine the failing system component by using Problem Analysis Frames and his normal PD efforts, the customer will notify the appropriate responsible party. If the customer determines that ES/9121 hardware assistance is required, RSF/PA facilities can be used by the customer to request a service call. The PCE will transfer call information that has been entered by the customer to RETAIN. The call is sent to the appropriate Dispatch and the RSC if the system is available for service. Only the appropriate Dispatch receives the call if the system is not available for service.

Type 3 Call (U.S.)



Type 4 Call Description

A Type 4 call is one that RSF link is unavailable or the use of RSF link is restricted.

- Same as Type 1, 2, or 3 except that the RSF communication link is not available.
- RSC assistance via telephone is available to the customer engineer.
- The customer engineer must gather the required information to open a PMR with the RSC and phone this information in as soon as possible, but no more than one hour after arriving on site.

Call Type Exception

Four types of exceptions can surface during the ES/9121 URSF application's examination of the call:

- Ref-code Exception - The ref-code generated by the maintenance package is not valid or flagged as requiring RSC involvement.
- Hot Account - The machine serial number is included in the Hot Account list in URSF.
- Reoccurrence - URSF application has determined this is a reoccurrence of a previously reported problem.

- Multiple Calls - Multiple calls of the same type will be BUNDLED together if they are on the Outbound Call Queue when URSF completes gathering the data for the original call request.

These exceptions will be routed as Type 2 calls and involve both the RSC and the appropriate Dispatch.

In the case of a Primary or Secondary Maintenance Package escape the RSC will assume technical responsibility of the call.

Non-Remote Call Description

Non-remote support accounts will be serviced by using current methods. These accounts will call for service using "Business as Usual" procedures. A customer engineer will be dispatched to the account and follow the maintenance procedures. The customer engineer will contact the appropriate support level (RSC) for problem resolution and will work via telephone with the RSC if this is a maintenance package escape.

Maintainability Features

Error Detection

The basic objective of ES/9121 error detection is instantaneous detection of hardware errors. "Instantaneous Detection" means hardware error detection at or close to the point of error occurrences. "Reproducible Detection" refers to the ability to detect reproducible hardware failures by using validation tests and support documentation in addition to the hardware error detectors.

Error Detection Means

The following features are available for error detection.

- Processor Storage contains single bit error correction and multiple bit error detection. Detected multiple bit errors will cause the PCE to invoke recovery procedures. Most types of double bit errors will be recoverable through double complement.

- Parity checking.

- Decode checking.

- Microcode contains check bits.

- Hang detectors and stall alarms.

- Power and Cooling hardware is checked by a variety of sensors and analog-to-digital converters.

- Data checks.

Error Isolation Process

ES/9121 Processor Isolation Method: Isolation is performed by the customer engineer or by the RSC using Maintenance Procedures (M/P) when servicing the ES/9121 Processor.

Isolation can be performed on a single channel using Single-Channel-Service (SCS) mode. SCS isolation can be performed concurrently with customer operation.

ES/9121 PCE Isolation: When servicing the ES/9121 PCE and attached I/O units, isolation is performed on-site by the customer engineer under the direction of the PCE Maintenance Package or the RSC using:

- Service Support Console (Problem Analysis and Offline Diagnostic Package)
- PCE Reference Library
- Maintenance Analysis Procedures (MAPs).

If isolation is completed successfully (FRU call reduced to below FRU call limit), the FRU or group of FRUs is replaced. If the FRU call was not reduced to or below the FRU call limit, the customer engineer requests the RSC to make a FRU decision. If there was a Maintenance Package escape, the customer engineer contacts the RSC and assists with diagnosis.

ES/9121 Power/Thermal Isolation: ES/9121 Power/Thermal isolation is performed by the on-site customer engineer under direction of the Maintenance Package.

The customer engineer enters the Power AQE to be serviced and the Power/Thermal isolation facility is invoked. The Power/Thermal isolation facility displays instructional messages to guide the customer engineer to make manual and visual checks. These messages are generated by the analysis routines, using logout data from sensors and logic.

A series of tasks are used to isolate the FRUs to be replaced or repaired. The customer engineer contacts the RSC who assists with diagnosis if there is a Maintenance Package escape.

Diagnostics and Exercisers

The following diagnostics and exercisers are provided for the ES/9121 Processor:

Processor Diagnostics

Analysis Routines: Analysis Routines (ARs) are automatically invoked microcode routines that analyze error logout data recorded by the error handler. ARs attempt to isolate the failure to a FRU or group of FRUs. ARs also provide information to schedule further diagnostic actions for that incident. ARs only analyze error log-out data and do not recreate an error condition.

Intersection Isolation is used to compare logic FRU calls for the most recent log-out to logic FRU calls of related, previously generated, AQEs to find

overlapping sets of FRUs. The count of occurrences in the previous AQE is updated on the assumption that the original error has reoccurred when intersection is found. An AQE is created for the new error if no intersection is found.

Array Diagnostics: Array diagnostics will test all actual array logic using patterns scanned into the arrays through the LSS circuitry. These tests will be generated using Service Language Command (SLC) and converted to run with the Fast Verification Test Interface (FVTI).

Processor Memory Diagnostic: PMAD is the array diagnostic for processor storage. It consists of PCC microcode and uses the Hardware Assist Memory Tester (HAMT) to perform the testing functions.

PMAD:

- Maps single-bit errors by array card.
- Identifies defective cards.

Channel Diagnostics: The Channel Microprocessor (CHN) will be tested via microdiagnostics and Fast VTs (FVT).

A subset of the channel microdiagnostics can run concurrently on a single channel that is in single-channel-service mode while the customer is using the remainder of the system. These tests include standard diagnostics (simulated I/O) and wrap diagnostics. The customer must relinquish the channel subsystem including the CCE to run the full set of microdiagnostics.

Service Board Diagnostics: This group tests the internal function of the LSS associated with each functional element as well as the LSA/LSS interface communications. Tests of the LSSG, CLSS, SAD Instrumentation counters and I/O meter functions are included.

LSA Diagnostics: LSA Diagnostics are a FVT type of diagnostic that includes tests of the interface and internal LSA functions.

Scan Ring Diagnostics: Scan Ring Diagnostics are a series of FVTs that verify the scan ring continuity, length, and the ring independence of each of the scan rings in each TCM.

Cache Exerciser: The CP Cache will be tested by a Cache exerciser that runs using a microcode assist.

Channel Exerciser: The Channel Exerciser is a CHN facility that can exercise an I/O device or devices at machine speed concurrently with customer operations. It performs all of the normal channel functions associated with an I/O operation and simulates main storage accesses.

Note: Does not support serial channels.

Processor Complex Exerciser (PCX): PCX is a test program that checks out the ES/9121 processor using System 370 and 370XA instruction sets.

Channel Subsystem Exerciser (CSX): CSX is a program used to checkout the I/O channel circuitry and outboard channel interface operations.

Note: CSX supports serial channels.

OLTSEP-XA: On-line Test Stand-alone Executive Program - Extended Architecture (OLTSEP-XA) runs the programs to test I/O devices.

Processor Controller Maintenance

The following diagnostics and exercisers are provided for the PCE:

- PCE Analysis Routine

  A PCE machine check or check stop during PCE operations creates a log. The analysis routine (AR) program analyzes the check information and additional data (registers, status info, etc.) to generate an 8-byte REFCODE and SYMCODE. The codes are used as a pointer to an entry into a maintenance analysis procedure to identify the malfunction. This REFCODE/SYMCODE information is used by problem analysis to determine the FRU call or other maintenance procedure.

- PCE/IOSP Off-Line Diagnostics Package

  This diagnostic package is provided for the IOSP and its associated I/O and adapters. The diagnostics reside on a diskette shipped with the system. The off-line diagnostic package is used for isolating failures within the IOSP as well as verifying problem resolution.

- POST Test

  POST Tests run automatically upon powering-up of the PCE and verifies correct operation of the PU and IOSP.

OPS Tests

Power/Thermal diagnostics are categorized as follows: The internal Power Thermal Controller (PTC) board is tested during the power on cycle. Base power problems are isolated using the Power MAPS.

Service Aid Facilities

The following aids are available within the ES/9121 service environment:

Console Log - Log information for ES/9121 consoles.

Dump - Dump of various PCC records and PCE storage.

Error Log Displays - Allow service personnel to display which functional elements have had error log-outs and their associated logs.

IPCS - Interactive Problem Control System. IPCS is a repair management and reporting system that will supply a dump and problem report when an

unusual PCE microcode condition occurs.

Log Format and Display - Displays or provides hard copy printouts of all log records maintained within the processor controller.

Messages - Messages provide status of the ES/9121 Processor Complex. Messages can also furnish information such as return codes, wait-state codes, and abend codes. Messages are displayed on the ES/9121 consoles from:

- PCC
- System Control Program.

Operator Controls - The operator functions include:

- Address Compare
- Alter/Display
- Channel Configuration
- I/O Problem Determination
- Operator Control
- Problem Analysis
- SCP Control
- System Activity Display Control
- System Configuration
- System Definition.

Patch Facility - The patch facility provides the capability to install, test and backout microcode patches for any part of the ES/9121 Processor Complex; display the contents of the Patch History File; and list applied or unapplied patches.

Problem Analysis - Provides the operator with information related to the ES/9121 system and suggested actions to resolve problems encountered.

Service Language Commands (SLCs) - SLCs are used to interrogate, initialize, and display data in any addressable facility of the processor complex.

Trace-Function Hardware - Capture the state of key hardware signals at each cycle for at least 64 cycles and are helpful in saving the state of the hardware prior to an error. They can be set to start and stop on several different conditions to determine the status of the system prior to an error.

Trace-Function Microcode - An added Trace Facility is provided to support the microcode driven elements of the ES/9121 Processor Complex.

View-mode - Allows viewing of addressable facilities that have been previously saved as data sets by SLC commands or by the Error Handler.

System Support Requirements

The above maintenance strategy is based on all of the following items or

requirements.

1. Programming Systems Support

   - o Recovery Management Support (RMS)
   - o Full configuration support which will not require re-IPL of the continuing system
   - o PC/SCP interface for RAS-related functions which include reconfiguration
   - o OLTEP/OLTS support under IBM operating systems
   - o I/O Driver support.

2. Logout capabilities are provided under the control of RMS. The following programs are provided to edit and print the recorded information.

   - o Environmental Recording and Print (EREP)
   - o SDA (for 3850 MSS).

1.9 Education Strategy and Plans

Training Strategy

Customer engineer education will be a single level of training consisting of how to use the maintenance package effectively. This approach was chosen because of the technology reliability and the supporting maintenance package.

The RSC Representative and ADS will receive additional training.

1.10 CE Training

The customer engineer is the primary person to be called for service. The customer engineer will employ the use of the automated maintenance procedures to replace the called FRU(s) and verify the repair. In the areas not supported by automated maintenance procedures (PCE, Power/Thermal) the customer engineer will use MAPs, diagnostics, and other service aids to analyze to the failing FRU. Other service aids include the use of data bank information and analysis of data via the customer engineer console. The customer engineer will also be responsible for the installation of ECs, MESs, and the installation of the Processor Complex.

The maintenance package is based on the current 3090 automated maintenance package. Customer engineers that are prior 3090 trained will benefit from their previous 3090 training by a reduced length of training required.

A more detailed course is offered to introduce the student to the 3090 style

maintenance approach for customer engineers not previously 3090 trained.

The prerequisites for the customer engineer will be prior S/370 CPU training and the following:

Course	Course Name	Length
70993	RETAIN User Orientation	6 hr
77293	EREP	8 hr
70526	XA Intro	13 hr
77285	PT2 Intro & Operation	4 hr
70668	PT2 Channel Monitor	8 hr
80075	Fiber Optics	4 hr
71177	Account Management	10 hr
77571	Deleted - picked up by CC 13740 or prior training	

Course Lengths

Course	Description	Length
13740	ES/9121 Processor Training	10 days
13899	ES/9121 Processor Training (prior 3090)	5 days
14651	ES/9121 PCE Duplex Training (MP)	2 days

RSC Additional Training

The RSC Representative will be able to perform all of the customer engineer skills. In addition the RSC Representative will be trained to understand the data flow and controls of the Processor Complex and the use of the service language commands. The RSC Representative will have access to and be able to understand and use all available documentation and service aids to help diagnose the cause of a failure and assist in problem resolution.

Education Point of Control

U.S.

All customer engineer training will take place at the Corporate Education Center in Atlanta, Georgia. RSC Training will take place in Kingston/Poughkeepsie, New York.

Training Objectives

The training objective is to teach the customer engineer "How to Fix" the machine rather than "How it Works." Our goal is to have the customer engineer repair and return the machine in the shortest time possible with minimum interruption to the customer. The customer engineer will be trained to effectively utilize the Maintenance Package and the support structure.

Training Matrix

The U.S. will use the service cell matrix rather than a Branch Office matrix. The service cells geographic area should cover a 25 mile radius. The service cell concept is intended to give the Branches flexibility. The Branch Offices are responsible to set up service cells to meet their Service Delivery objectives. Over-training should be avoided.

Machines per Svc Cell	- 1	2	3	4	5	6	7	8	9	10
Customer Engineers Trained	- 3	4	5	5	6	6	6	7	7	7

Note: One customer engineer for every two machines after 10.

Early Training--US/AG/APG

Early training is currently held in the Mid Hudson Valley, New York.

RSC Updates will be on an as required basis in the Mid Hudson Valley, New York.

1.11 Technical Support Strategy and Plans

Technical Assistance Structure

ES/9121 is assigned to Support Category 'A'.

The following technical assistance structure is available to ensure a high degree of customer satisfaction.

Branch Office

The Branch Office provides ES/9121 trained customer engineers.

The Branch Office has overall problem management responsibility for all ES/9121 service calls. Problem management responsibility includes scheduling maintenance time, updating PMRs, reviewing action plans for customer acceptability, and communicating action plans to the customer.

Area

Area Designated Support (ADS) training for ES/9121 is provided. ADSs will receive the Atlanta customer engineer training, plus additional Mid-Hudson Valley education and 'hands-on' activity.

Remote Support Center (RSC)

The mission of the Remote Support Center is to provide technical assistance and guidance to reduce the length of a specific system outage or the impact of a specific intermittent problem.

The RSC has technical responsibility for all calls for which additional

diagnosis is required. Technical responsibility includes creating action plans for problem isolation and resolution.

RSC Structure

The RSC is structured into a multilevel support organization.

1. The Product Group (Level 1) takes all information calls and provides maintenance package and rediscovery assistance to the customer engineer.

2. The Product Support Group (Level 2) has responsibility for all problem calls and provides assistance on any call that cannot be handled by the Level 1 RSC. The Level 2 RSC Group has the responsibility of formulating action plans for all open problems.

3. The System Support Group (Level 3) provides assistance to the Product Support Group for extended outages or special situations.

   The RSC must be contacted when any of the following conditions exist:

   - The maintenance package is exhausted.
   - A maximum of three hours has elapsed from the time the system went down.
   - The maintenance package requests the next level of support.
   - The customer engineer requires additional assistance.

The RSC is notified of all calls in which an automatic service request was performed. The customer engineer must still follow the preceding procedures of RSC notification.

Product Engineering

Engineering is responsible for resolving design faults and problems the RSC cannot resolve.

M&S Large System Support Center (LSSC)

The LSSC is located in Poughkeepsie and is staffed 21 shifts per week while the ES/9121 Processor is a Category 'A' product. The LSSC representative has additional knowledge of the processor. The representative uses all the aids available to the ES/9121 trained customer engineer and also uses the following:

- Additional knowledge and experience in the use of manual controls
- A remote console facility
- The universal remote support facility data bank.

Placing a Call

When placing a telephone call to the RSC, the following information must be

provided:

- Branch Office and security code
- Problem number (if available)
- Machine type/model and serial number
- Caller's name
- Customer name for problem call
- Telephone number of caller.

Placing a Call using Remote Support Facility (RSF) (Auto-Call)

The ES/9121 PCE presents a priority message on the system console requesting the customer to select the RSF authorization frame to allow a service request. The customer inputs call information such as system available for service (Y/N) and authorizes a data link through RSF. The PCE transfers the call information (machine type and serial number, FRUs, part number(s), AQE, REFCODE, and customer input) to an RSF. The URSF automatically opens a problem management hardware (PMH) record that includes all information relating to the problem.

The customer or customer engineer can manually invoke a service request by entering a service request from the PCE.

The problem number generated by URSF is the same number used on the quality service activity reporting (QSAR) when recording the time spent on the problem. Each repair/service action reported by the customer or customer engineer must be assigned a problem number. This number is used to track the problem until resolution, regardless of where or what support organization assisted.

The problem number is assigned to the PMR the first time a service request is allowed for a new problem or the RSC is contacted regarding a problem.

Problem Management Record (PMR) Use by the RSC

The RSC uses PMH to record and track problems reported by the customer/customer engineer. This program allows the RSC to record action plans for the associated call. All actions by the RSC, Engineering, and Service Delivery Planning (SDP) are driven by the call associated with the problem. The PMR is open to indicate action is required and closed to indicate the completion of a repair action.

The target date is set to define the date the next action is to be completed and responsible organizations defined. This date is based on the severity code, but will be the real day the action takes place.

Shift Coordinator

The RSC shift coordinator is available 24 hours a day, seven days a week. The RSC shift coordinator monitors critical situations and is responsible for ensuring that appropriate resources are applied promptly.

When a Field Support Center Specialist (FSCS) is not immediately available

for a machine down call, the shift coordinator is notified. The RSC shift coordinator is assigned technical responsibility for the ES/9121 product and should be called for information or escalation regarding a system situation.

Problem Ownership

The responsibility for managing machine problems and customer situations remains with the field. The RSC provides technical assistance to resolve difficult problems.

The customer engineer or M&S manager should contact the RSC shift coordinator for assistance if they believe a problem is not being addressed properly.

ES/9121 Auto-Open RSC Support Strategy

The PMR auto-open process must be followed on all new ES/9121 repair actions. A PMR will be auto-opened via a service call authorized by the customer. A Type 3 call (manually invoked service call) by the customer/customer engineer also opens a PMR in the RSC. The customer can report a problem and open a PMR by filling in URSF screens on the ES/9121 console. A PMR will be opened on every individual problem and can include multiple symptoms associated with the same failure. The following information must be included in the PMR:

1. The time the machine went down.

2. The severity of the call.

3. All REFCODES if more than one REFCODE was generated at the time of failure.

4. The action plan and repair schedule.

5. An indication of whether a call-back is desired. Refer to the appropriate sections in the remote support reference guide.

An auto-open PMR is initiated by the customer authorizing a service call on the PCE System Console. An auto-open PMR can be opened manually by the customer or customer engineer from the PCE. This transfers the call information to the URSF program and generates a PMR number.

Remote Support Facility (RSF)

Remote support of the ES/9121 processor complex uses service facilities comprised of RSF, URSF, ES/9121 Product Application Program (PAP), and a communications link between them. These facilities provide for:

- Service call routing
- Service data transmission
- Remote service console operation
- Customer engineer dispatching
- Parts ordering information transmission
- Patch distribution
- Data bank searches

- Processor history data collection
- Reference code exception search.

The ES/9121 PCE requires a 5853 modem or equivalent (5858 modem or equivalent for EMEA) (with integrated auto-call and auto-answer capabilities) to accomplish its remote communications. The RSF application is the primary method for a customer to request service for the ES/9121 complex.

Note: If a customer with a status 1, 2, or 3W machine elects not to use the RSF, a message displays requesting the customer to contact the local dispatch for service. The same is true for a status 3 processor.

The ES/9121 RSF provides five modes of operation. They are automatic problem reporting, automatic service update, data bank access, URSF console, and remote console.

1. Automatic problem reporting

   This function allows the ES/9121 RSF PCE application to communicate with the ES/9121 URSF PAP to report machine and customer-detected failures. This mode uses the PCE auto-dial capability to place a customer authorized service call.

   This function is used when the customer engineer needs to open a PMR for install purposes or to create a support center call.

2. Automatic service update

   This function is a machine-initiated auto-call through RSF to test the data link on a weekly basis. Applicable microcode patches are also down-loaded to the machine from the ES/9121 URSF product application. This function requires customer authorization.

3. Data bank access

   This function allows an on-site PCE console to act as a remote technical assistance information network (RETAIN) terminal by offering:

   - TDR/DIAG search and display
   - Symptom fix search and display
   - PMR visibility and add text capability for the machine
   - S/N placing the call only.

4. URSF console

   The customer engineer updates open PMRs with the URSF console function. All PMRs are closed by completing and transmitting service action call completion (SACC) panels under the Customer Engineer Recording Facility (CERF). Closing a PMR with SACC also closes the associated National Services System (NSS) call. Remote calls to the RSC can also be placed for information or assistance with this mode.

5. Remote console.

The connection of an on-site PCE through RSF to an RSC to allow remote control and/or retrieval of data.

a. A customer engineer can dial an activated RSF port selected by the RSC and allow the ES/9121 to be remotely controlled.

b. RETAIN can auto-dial a system.

c. The RSC can dial through to the account.

The following is an example of the procedures to be followed to perform the options mentioned above.

PMR Add Text and Requeue

If a PMR has an extended field engineering (FE) target date the customer engineer can add text to the PMR and have it requeued to the RSC to have the target date updated. The customer engineer is to do the following:

1. Use a remote technical assistance network (RETAIN) terminal (either in the branch or data bank access).

2. Search on the PMR number.

3. When the correct PMR is displayed, press PF6 (ADDTXT).

4. Enter the update (that is, I have hooked up the Biomation, what should I do when I get the next failure?). Enter target date information.

5. Press PF11 to end ADDTXT operation.

6. Enter CG as a command. This requeues the call to the ES/9121 PG queue (the RSC level 1 queue). The RSC reads the PMR and performs the necessary administrative functions (changes the target date and routes the PMR to the responsible party).

Modem and Auto-Call Unit

The ES/9121 PCE uses a 5853 modem (5858 in EMEA) or equivalent. This modem has auto-call capabilities and does not require a separate auto-call unit.

The RSF IBM 5853 modem is ordered separately for delivery with the processor model or supplied by the customer.

Note: EMEA uses an IBM 5858 modem or equivalent V22BIS/V25BIS PTT modem. The IBM RSF modem is automatically plant merged with the system if it is specified at ordering time.

The customer provides a dial-up telephone line, which cannot go through a PBX or be used as an extension phone. If the customer network is a digital system, a standard telephone line must be installed by the customer. The telephone line must be able to work at 2400 baud full-duplex with the 5853

and be terminated by an RJ11. Ref: Guide to Operations GA27-3799-1.

ES/9121 Automatic Service Request Flow

1. ES/9121 detects failure and requests service.
2. Customer authorizes service request.
3. ES/9121 sends service request to RETAIN.
4. RETAIN:

   a. Checks customer access code.

   b. Uses machine type (M/T) and serial number (S/N) to pull common customer profile information.

   c. Pulls error data from ES/9121.

   d. Builds PMR.

   e. Sends PMR to Remote Support Center.

   f. Sends Branch Office (BO) number, customer number, and console phone number to NSS.

5. Customer engineer receives call on PT.

ES/9121 System Security

Customer Security

Security measures are implemented in the PCE to prevent unauthorized use of information and resources designed to service the ES/9121 hardware.

- The customer can choose to give blanket approval for service update and/or problem call reporting. The customer must do it case-by-case for all other data links.

- The customer can differentiate between calls initiated locally by the PCE or a remotely requested link.

- The customer can interrupt the data link at any time.

- The customer can review any data collected for error isolation during running of customer programs.

- Unauthorized connection to the PCE is prevented by a customer-entered access code that resides in the PCE.

- No interface exists between the RSF and the customer SCP. Therefore, no access to the customer data or applications is available through the data link.

IBM Security

The ES/9121 machine type/serial must be registered in the URSF common customer profile facility to allow machine-to-machine connections. Registration is performed at machine installation time by the customer engineer.

The optical tape/disks, provided by IBM, contain licensed internal code and are the property of IBM and must be stored in a secure area.

- Only one set of licensed internal code may be retained for each serial numbered machine. Any duplicate media and prior levels of licensed internal code must be returned to the IBM Branch Office.

- The customer engineer must return all down-level licensed internal code to the Branch Office parts administrator for disposal.

- Independent servicers must dispose of the media in a manner that will not compromise the intellectual property rights of IBM in the licensed internal code.

Large Systems Project Office

The Poughkeepsie Large Systems Project Office (LSPO) is a multidivisional organization made up of representatives from the M&S, U.S.A. Marketing and Services (M&S), and Data Systems Division (DSD). The purpose of the LSPO is to pursue a timely resolution to system problems affecting customer satisfaction that the normal support structure has been unable to resolve. It functions as the focal point for escalation of product issues.

Call your Area Technical Assistance Group to contact the M&S representative in the LSPO if you have questions or concerns.

The objectives of the LSPO follow:

- Provide assistance to account teams to resolve critical large system account situations that **cannot be resolved in a timely manner by the normal support structure**

- Keep M&S, DSD, and M&S executive management aware of account situations and problems

- Provide a single focal point for escalation of large system account problems, concerns, and status.

Also, the LSPO:

- Reports large systems reliability trends and customer satisfaction to executive management

- Identifies, contains, and manages pervasive system type problems

- Acts as a focal point for multiple division solutions to systems problems that **cannot be resolved using the normal support structure**

- Understands customer demands on the system and determines areas requiring focus for both present and future systems.

Large System Customer Satisfaction and Outage Reporting

Customer Satisfaction

Weekly reporting of customer satisfaction is mandatory for all large system installations. The customer satisfaction rating should reflect the customer's satisfaction with all large system components (hardware and software), not just the processor complex. The LSPO reviews all dissatisfied large system accounts weekly with Poughkeepsie Site Management and the DSD president. All account situations reported to the LSPO are presented to the divisional presidents on a monthly basis. The customer satisfaction rating is the joint position as perceived by the account team (both Marketing & Service) and Area management.

Customer Satisfaction Categories

- **Good**
  - The customer is satisfied with IBM products, service, and support.
- **Concerned**
  - The customer is currently satisfied with IBM's actions, but is concerned with problems or exposures in the account.
  - The customer is in the process of implementing action plans or is in a period of stability.

  Note: This is to be used as a pre-exit status only from LSPO.
- **Fair**
  - The customer is moderately dissatisfied with IBM products, service, and/or support.
  - The field needs assistance that the normal support structure cannot provide.
- **Poor.**
  - The customer is completely dissatisfied.
  - Problem resolution is required to prevent the loss of an IBM customer.
  - The field needs assistance that the normal support structure cannot provide.

General Instructions

1. All customer satisfaction ratings (good, concerned, fair, or poor) relating to a system must be entered on Thursday and reflect customer satisfaction as of the end of the local workday on Wednesday. The customer satisfaction report must be sent by the M&S Area Technical Assistance Group via VM to POSECTY at TDCSYS3.

   Exception reporting such as All Accounts Good except XXXXX is acceptable.

2. The rating must represent a joint M&S and M&S position on overall customer satisfaction as perceived by the M&S and M&S account team management. If available and appropriate, this rating is obtained directly from customer management.

3. The M&S account team communicates the customer rating to the designated Area representative. The M&S Area is responsible for the reviewing and transmitting of the customer's satisfaction report to the Poughkeepsie LSPO.

4. All large system installations rated fair or poor must have M&S and M&S situation managers and action plans in place to address the cause of dissatisfaction. The situation managers are the primary Branch Office contacts for the LSPO.

5. The M&S Large Systems Support manager and the M&S Technical Assistance Group manager are the primary Area contacts for the LSPO.

6. Any special LSPO support or specific action(s) are documented in the customer satisfaction reporting mechanism.

Prior to Entry into LSPO

The following conditions must exist before requesting entry into the LSPO:

- The support structure failed to resolve a situation or broke down, or the Area or account team needs assistance in resolving a problem that continues to cause the customer to be dissatisfied.

- M&S and Marketing agree on customer rating.

- Areas (M&S/Marketing) need additional resources (LSPO) to help the account team.

M&S Provides:

The following information/data must be submitted to either the large systems support center (LSSC) or LSPO before Friday noon (eastern time) of the week entering the project office.

- Immediately (on customer satisfaction report)

  - Type/model/serial number

  - Install and upgrade dates

- EC level and date of last patch apply

- Reason for customer dissatisfaction (as agreed by M&S and M&S management)

- Action required to restore satisfaction (as agreed by M&S and M&S management)

- Details of actions taken (include PMR numbers).

o By noon Friday

- Remote hook-up to LSSC
- Customer engineer machine history logs (telecopy to LSPO)
- Customer profile (soft copy) to the LSPO.

o On first conference call.

- Any service concerns.

Marketing Provides:

o By noon Friday

- System IPL data
- New LSPO account - at least the current week of data
- Old LSPO account - previous four weeks of data.

o On any conference call.

- Any marketing situations.

Account Team Provides:

o Immediately (on customer satisfaction report)

- Reason for customer dissatisfaction (as agreed by M&S and M&S management)

- Action required to restore satisfaction (as agreed to by M&S and M&S management).

o By noon Friday

- Any customer letters relating to cause of dissatisfaction (telecopy to LSPO).

o On first conference call.

- Customer perception of problem

- Customer perception of attention being given problem

- Local action plans to restore customer satisfaction
- Any activities taking place in the other project offices
- Levels of IBM management involved in this problem and the actions they have taken
- Any other concerns.

1.12 Tools and Test Equipment

Shipping Group/On-Site Tools

Description	P/N	Act.	Act.	Act.	Qty.
Actuator	2360092	Y	N	Y	1
Pin Aligner	2360424	Y	N	Y	1
Tool Assembly	4134750	Y	N	Y	1
Memory Torque Tool	6422602	Y	N	Y	1
Pin Align Gauge	01F8621	Y	N	Y	1
16" Socket Extender	69F2280	Y	N	Y	1
Cam Tool	04F6935	Y	N	Y	1
1 Card Chan Removal Tool	34F4549	Y	N	Y	1
CB Removal Tool	53F0114	Y	N	Y	1
3/8"-1/4" Socket Adapt	2108746	Y	Y	Y	1
5-Pos Paddle Card Tool	2360340	Y	N	Y	1
Torque Tool(0-150in/lbs)	2515283	Y	Y	Y	1
TCM Cam Checking Gage	28F1885	Y	N	Y	1
3-Pos Paddle Card Tool	89X2425	Y	N	Y	1
Signal Cable Tool	2360349	Y	N	Y	1
Cable Probe Adapter	2360408	Y	N	N	1
Screwdriver Bit	73F5564	Y	N	Y	1
Cable Asm Crossover Arm	5455334	Y	N	Y	4
Crossover Interposer	1794411	Y	N	Y	4
Serv Chan(TAG) Wrap Plug	5445417	Y	Y	Y	1
Serv Chan(BUS) Wrap Plug	6102803	Y	Y	Y	1
TCM Handle	7333093	Y	N	Y	2
TCM Cover	7333160	Y	N	Y	2
Multi-Port 0/1 Wrap Plug	58F1730	Y	Y	Y	1%
Multi-Port 2-7 Wrap Plug	58F1731	Y	Y	Y	1%
78-Pin Wrap (Multi-port)	16F2478	Y	Y	Y	1%
F/O Serv Chan Wrap Plug	5605670	Y	Y	Y	*

Notes: '%' - These tools are packaged and shipped with the PS/2.
'*' - Indicates 1 per fiber port.

Branch Office Tools

No new Branch Office Tools are **required** to support the ES/9121.

However, if 9121 contains Fiber Optic serial channels, review Tools & Test TSL, Group 31, No. 147 for Fiber Optic Test Equipment.

Optical Power Loss Measurement Tools (B/O Level)

The following tools and kits are ordered separately from Mechanicsburg to support problem determination and repair of fiber optic links:

- Power source (60Hz) = P/N 18F6970 (104-126 VAC 60Hz)
- Power source (50Hz) = P/N 18F7007 (90-110 VAC 50Hz)
- Power source (50Hz) = P/N 18F7008 (198-242 VAC 50-60Hz)
- Power Meter = P/N 18F7005
- Optical Mode Conditioner (OMC) = P/N 73F4034
- Field Test Support Kit = P/N 18F6953
- Jumper Cable Repair Kit = P/N 18F6954
- Optional support kit items.

A 220V Convenience Outlet Tool (P/N 69F6561) is available via Mechanicsburg for accounts requiring 220V service outlets. This tool (same for ES/9021) connects to a dedicated outlet inside the frame to be used during customer engineer service maintenance procedures, ECs, MESs, etc. The 220V Convenience Outlet Tool is included in the ship group for all W/T countries, not included in U.S. shipments.

A 110V Convenience Outlet Tool (P/N 83F7909) is available and provides the same capabilities as the above mentioned 220V Convenience Outlet Tool. Refer to online Tools and Test TSLs for PN, description, and availability.

The 220V-to-110V Converter has been removed from plan and replaced by the 110V Convenience Outlet Tool. This tool will not auto-ship with every U.S. 9121. B/Os will order through Mechanicsburg by P/N 83F7909.

Loan Tools

None

New Tools for the CE

None

Installation Tools

In addition to the customer engineer toolbag and 9121 ship group tools, the following tools are required during installation:

- DO NOT OPERATE tag, S229-0237
- Leveling Pad Wrench (P/N 8309875), or equivalent adjustable wrench
- ECOS C7106 Tester Kit (P/N 6339695) - use during Ground safety check
- High Voltage Test Probe Tips (P/N 1749249 and P/N 1749250).

Software System Tools

Software System Tools must be installed, customized and tested after installation or major change activity to ensure their availability and efficiency.

Software tools are categorized as being provided with the System Control Program or ordered separately.

Software Tools Products Not Included with the SCP

The following tools are ordered separately:

1. EREP

   Following are the EREP product numbers:

EREP VM	5654-260
EREP MVS	5656-260

2. ICKDSF

   Following are the ICKDSF product numbers:

ICKDSF MVS/ESA	5655-257
ICKDSF VM	5684-042
ICKDSF MVS/370	5752-VS2
ICKDSF Stand-alone	5655-DS1

3. OLTEP/OLTS.

Tools Provided with the SCP Supported on ES/9121

All these tools are described in the SCP manuals.

- VM/SP HPO CCWTRACE
- VM/XA TRSOURCE
- MVS GTF TRACE
- STAND-ALONE DUMP (provided with all SCPs).

1.13 Parts

Stocking Philosophy

The recommended spare parts (RSP) support for the ES/9121 processor is a strategy-driven process by commodity (for example: TCMs, Power Supplies and COB). During the ES/9121 product life, this strategy will change at a part number level utilizing historical usage/demand information. The field will be notified of these strategy changes via the product newsletters, NSD memos and NSD distribution letters.

The following chart depicts the planned RSP stocking support for the ES/9121 Processor.

COMMODITY	40% F 30MIN	70% F 2HRS	95% F 4HRS	100% F 6HRS	OLD FDC 16 LOC	VRDC 5 LOC
TCM			*	*	X	X
Delay lines						X
TCM Boards						X
COB		X	X	X	X	X
COB Boards						X
PWR Supplies			X	X	X	X
Blowers, Fans					X	X
Cables						X
Relays, CBs				X	X	X
Sensors				X	X	X
Misc/Hardware		X	X	X	X	X

* TCMs will be stocked at preassigned locations. For information pertaining to the physical locations, contact your Area Logistics Manager.

Note: The above table applies to all models of the ES/9121 processor.

Parts System (Optimizer)

May 1989, 3090 began using Large System Optimizer for stocking requirements. This system will also be used for the ES/9121 Processor complex. Three inputs are used to produce required parts sets at each location. They are as follows:

- Spare Parts Master for each machine type and model
- National/local usage
- B/O support settings (PSA)
- Cost per location.

Initial Shipments

The RSP is to be available a minimum of three working days before machine and EC/MES installation. It is a field responsibility to obtain on-site RSPs from the Branch Office when the ship-to address has been designated by the Branch Office.

Mandatory Support Factor Setting (PSA)

To ensure proper RSP support for your machines, support factors must be set by entering required data into PSA.

This should be done:

- A minimum of three weeks before install activity.

- For every machine installation, even for a multiple machine account. Multiple machines in an account only receive a delta shipment.

Entering these support factors for each machine ensures that EC changes, model changes, and feature mixes are supported in the RSP. Each stocking echelon is compared with existing inventory and only those parts not presently stocked are added to the RSP.

Remote Inventory Distribution (RIDS) System

RIDS is the product division function that provides TCM and TCM board spare support directly to all field stocking locations. The replenishment cycle objective to the field stocking location is 24 hours or less.

Mechanicsburg distribution supplies the remaining RSP to the appropriated stocking locations.

Parts Ordering

When ordering parts for a critical machine-down situation, always use Code A Alert. This ensures that the part will be delivered by the fastest available means.

Note: Management approval must be obtained before ordering Code A Alert parts.

The parts ordering strategies developed for the ES/9121 are:

- At the beginning of the service call and prior to traveling to the account, all FRUs called (except for boards and cables) must be ordered by the customer engineer.

- All FRUs that surface as a result of fault isolation or repair validation should be ordered at that time.

Parts Return Procedures

Parts Return Overview

Specific IBM-owned, used or defective parts are eligible for return to meet justified needs of manufacturing and service. Parts returns via normal or expedited means will be based on specific management approved requirements. Accelerated returns will be required with the introduction of new or affected technologies and specific critical parts. The UPR list will show the proper designations (A, X, R, B or N).

Turnaround Time (TAT) Maintenance Parts

Parts identified for return via the DCS Portable Terminal will follow with one of the TAT criteria after the initial 90-day period.

Return TAT criteria will be as follows:

20 Day Return (UPR-B)

- Used for normal return requirements.
- Bulk shipments to Regional sort vendor.
- UPRs on this return status may be terminated or continued for lengthy time periods based on periodic management reviews.

15-20 Day Return (UPR-R)

- Used for early product life failures, reuse parts from ECs, MESs and installed machines.
- Expedite shipments to requesting plants.
- UPRs remain on this status for 90 days, then revert to 15-20 day return status.

5-7 Day Return (UPR-X)

- Used for new technology parts.
  - Use overnight expedite shipments to requesting plants.
  - UPRs remain on this status for 60 days, then revert to 15-20 day return status.
  - All defective parts from ECs, MESs, or new installed machines (includes UPR, non-UPR and EC/MES base parts).
    - -- Keep and ship all defective parts separate from all other returns.
    - -- Attach the bright pink-purple return label to the part or the ESD container and also the shipping container. (Return labels are supplied with the EC/MES or new machine.)
    - -- Complete PRF for ALL UPR and non-UPR parts. Include the defect

and symptom comments.

-- Contact Quality Hotline, 1-800-IBM-LINE before shipping parts.

-- Complete PSS DFU panels and QSAR.

-- Expedite shipment, via Branch Office, for 5-day return to POK.

2-3 Day Return (UPR-A)

o Used for selected critical parts.

- Use overnight expedite shipments to requesting plants.

- UPRs remain on this status for 60 days, then revert to 5-day return status.

Maintenance Parts Credit

All IBM-owned, used, defective maintenance parts will be issued credit in accordance with existing UPR procedures. Parts returned to the plant and accompanied by a Return Material Equipment Report (RMER) and PRF Z150-0406-7 will be issued credit via the normal credit issuance procedures.

Defective Parts Return

To meet our zero defect commitment, failure analysis of all defective parts is essential. As part of the ES/9121 program, all status 1, 2 or 3W ES/9121 Processor Complex parts are to be failure analyzed.

Parts returns are to be accompanied by a PRF and a RMER. If multiple parts are used to resolve one problem, EC or MES should be returned in one container. If this is not possible, separate containers may be used but marked part one of -, part two of -, etc. Place a copy of the RMER in each container. This allows the plant to keep the groups together for testing. Defective and nondefective returns are not to be returned in the same box. All documentation accompanying returned parts must include the machine type. Any additional information by the customer engineer is to be included.

Defective parts will normally be returned to the Branch Office for shipment and RMER preparation. Parts are to be expedited by the branch office via premium collect transportation.

Defective parts return address:

IBM Corporation
Dept. 39X/Bldg. 004-1
South Road
Poughkeepsie, NY 12602

TCM and TCM Boards

Serialized Parts

TCMs, TCM boards, and serialized commodities are an exception and require special control procedures for traceability and security requirements.

These procedures include ordering, receiving, stocking, disbursing, shipping, returning, receiving field credit and maintaining security.

The details of these procedures are defined in the IBM Branch Office Manual, section 17, titled Serialized Parts.

Note: If TCMs, TCM boards or storage cards are replaced in the field, their serial numbers must be recorded in the PMR using the SACC frames. A copy of the PRF must accompany each TCM or TCM board returned via RMER.

TCMs and TCM boards are not to be stocked in the field once the metal quality seal has been broken. These parts are to be returned for retest on nondefective RMERs and are to be accompanied by an PRF. Function code 4 is to be entered on the PRF and Broken Seal Return is to be written in the comment section.

The following procedures remain unchanged:

- Use collect premium transportation for all TCMs/TCM boards returned to Poughkeepsie. These include new/new defective, used defective and TCMs/TCM boards removed during EC/MES activity.

- TCMs/TCM boards are considered as sensitive parts.

- TCMs/TCM board quarterly physical inventory by part/serial number must be taken.

- Old serial number and new serial number must be provided on the PRF when returning TCMs.

EC and MES Parts Return (Nondefective)

To return any serialized parts, fill out the PRF and indicate MES/ECA number, return status and machine S/N. Use the return Bill of Lading that was sent with the EC/MES. Contact the trucking company that delivered the EC/MES for return shipment to the Poughkeepsie plant. The address is:

IBM Corporation
Attn: Serialized Commodity Center
South Road
Poughkeepsie, NY 12602

Cables

All damaged or defective cables must be returned to Poughkeepsie for analysis. If the situation requires repairing the cable to get a system operational, then a new cable should be ordered and installed at the earliest possible time. The defective or damaged cable should be returned using the

procedures described earlier in this section under Defective Parts Return.

Additional Information

- All PCE replacement media (diskettes and/or tapes) can be ordered by part number and EC level. To order these, the GID number, part number, EC level, and REA are necessary. These numbers can be obtained from the label on the diskette that is being replaced.

- When a TCM/TCM board or storage card is replaced, it is mandatory to enter the serial numbers of the defective parts in the PMR by using the service action/call complete frames.

- The Order Confirmation form, with the support factors, must be received by Mechanicsburg Distribution Center a minimum of four weeks before the ES/9121 delivery date.

1.14 Reporting Procedures

Normal Reporting

Both Quality Service Activity Reporting (QSAR), and Customer Engineer Reporting Facility (CERF), are required to be completed by the IBM customer engineer for the 9121 reporting process.

QSAR is used for all hardware service activity reporting by the customer engineer.

The 9121 Remote Support Facility (RSF) enables the collection of additional service information directly from the 9121 system. This process consists of a combination of automatic machine-collected data and manual-inputted information by the on-site customer engineer. Using the CERF reporting function, all hands-on activities are reported by the on-site customer engineer at the service console.

Information is collected by answering CERF questions relating to the service activity just completed. Both the manually entered and the automatically gathered information will be transmitted via the RSF link. All information gathered is maintained in a data base by Poughkeepsie Data Systems Division (DSD). This data is used by DSD to improve machine installability, MES and EC installability, to improve reliability by tracking service history, and to identify and solve quality problems.

Information required for technical problem management by the field, and the hardware remote support center (LSSC), is formatted and placed into the PMR.

The CERF report must be completed to coincide with each Service Code 01 (SC01) QSAR report for both complete and incomplete activities. The CERF report is not required for SC 01 if the customer engineer did not have "hands-on," or did not go "on-site," but does report time on QSAR. All system Installs, Engineering Changes (EC), and Feature upgrades must be reported via

CERF at time of completion. CERF report for Discontinue must be completed and transmitted via RSF prior to disconnecting the modem and removing system complex power.

There are five types of service activity CERF reports:

- Service Action (SC 01 activity)
- Installation Complete
- EC Complete
- Feature Code Complete (MES)
- Discontinue Record.

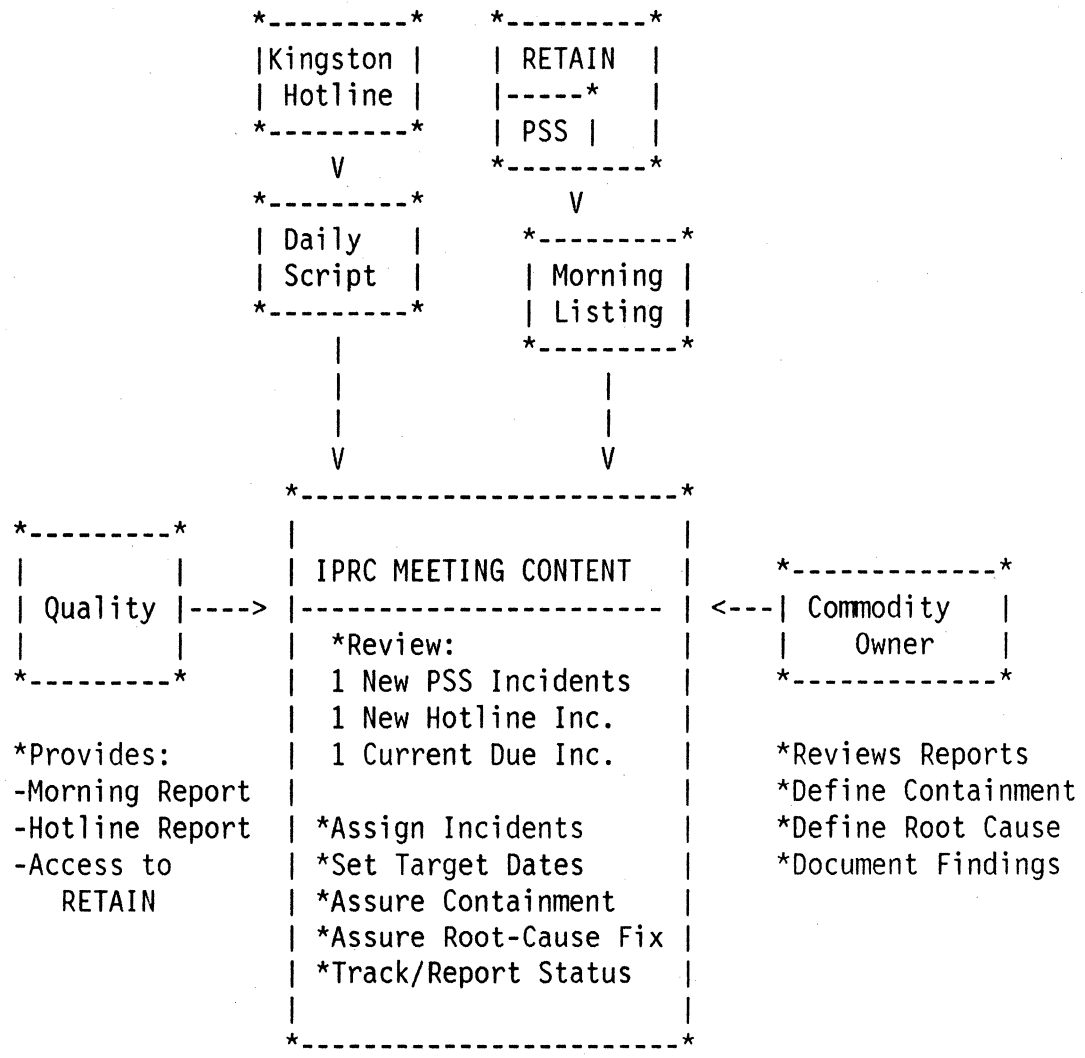
While performing any of the above activities, the customer engineer should make notes on information that will be needed to complete the CERF report (examples: clock times, part numbers, serial numbers, locations, quality problems, PMR number). The RETAIN generated problem number should be used, if one exists, for both the CERF report and the corresponding QSAR. For specific information on CERF reporting, refer to the 9121 Processor Service documentation.

Note: Accounts without RSF must call the Quality Hot Line (QHL) to report EC, MES, Install and Discontinue quality problems.

Install Performance Review Committee

The IPRC meets weekly to review PSS data and Hotline Reports, for the purpose of assigning the reported defects that occur during the initial installation of a machine or an MES to a commodity owner for investigation. The commodity owner is usually a manager that has the responsibility for a specific part or process that goes into building a machine or MES. The assigned owner has the responsibility of defining the root cause of an incident and forming an action plan to prevent future occurrences.

Install Performance Review Committee Flow



PSS Reporting (Installs, Discontinues, MES, ECs)

A Product Support Service (PSS) is required for all 9021 Box Installs and MES upgrades. The data is used by the IPRC Committee to track Defects that are discovered from the time the product arrives on-site until it is installed. PSS is a function under CERF.

Processing times:

- o Start Time
  - The time Machine Assembly, bolting frames together, cabling, plugging cards, etc. began.
- o Mechanical Complete
  - Completion of Machine Assembly.
- o Install Complete
  - Successful IPL of the entire machine.

- Patch Time
  - Amount of time spent installing patches.
- Diagnostic Time
  - Total time spent running diagnostics.
- Non-lost Time
  - Process Time not involved with corrective action.
- Lost Time
  - Total time spent correcting a defect or error.
- Process Time.
  - Summation of non-lost time and lost time.

Reporting Guidelines

In all instances listed below, conditions that caused the defect/error may help determine where the problem is placed for investigation. The IPRC Committee references associated PMHs for additional explanation. Comments concerning the problem should be added in the PMH.

Reporting Defect Parts: Record the part number, the location of the part, and the nature of the defect (such as visibly damaged, electrical or logic failure, etc.). Do not use the PSS panel for "Other." Parts found defective during an MES must be returned using the Pink Label and the Parts Return Forms within 5-7 days of the install. Commodity owners are waiting for the parts to do failure analysis.

Missing or Incomplete Bill of Materials: Missing or incomplete B/Ms reported to the Quality Hotline are cross-referenced to the PSS report. If a Hotline incident is opened and no PSS report is made, you may be notified to submit one. The Hotline incident number should be included in the PSS Panel as a reference aid.

If a B/M is reported missing to the Quality Hotline and is found later, notify the Hotline at once. This will prevent a part from being shipped unnecessarily.

When placing orders with the Hotline for missing cables, supply sequence numbers and B/M that the cable is missing from. This helps identify the vendor and makes it easier to screen stock.

Problems with Installation Instructions: Record the Instruction Part Number/B/M, page and step number, and describe what problems were caused by the written instruction, diagram or cable routing.

Install Team Errors (ITEs)

- Misplugs
- Swapped cards, cables, frames
- Broken or pinched wires and cables
- Not executing the Installation Instructions (I/I) correctly
- Loose connections
- B/Ms and parts ordered and shipped by the Hotline but later found at the customer's site.

Errors committed by the install team are presented in the IPRC meetings and the monthly Quality Review meetings.

Errors discovered during the present MES that were committed on the previous MES or install that caused 0.0 LOST TIME need not be reported.

Note: 0.0 LOST TIME means that no time was lost during discovery and/or correction of the defect/error while installing the MES.

Special Reporting

QSAR Exception Reporting and Technical Activity Codes (TAC) are not used for the 9121 Processor.

A TAC code for reporting repair actions on the fiber optic cables is planned. The machine type associated with this TAC code, when used, should be the device downstream of the 9121 Processor.

Early Reporting

Internal Early Ship Program (IESP) and Early Ship Program (ESP) requirements for reporting are defined separately when a Branch Office supports one of these programs.

1.15 Field Documentation and Information

On-Site (CE) Service Information Manuals

The following On-Site (customer engineer) Service Library books are included in the ship-group:

Title	Form Number
Volume B01: Service Guide	SY27-2609-0
Volume B02: Processor Service Guide 1: General	SY27-2610-0
Volume B03: Processor Service Guide 2: Power/Thermal	SY27-2611-0
Volume B04: Processor Service Guide 3: I/O	SY27-2612-0
Volume C01: PCE Service Guide 1: Procedures	SY27-2613-0
Volume C02: PCE Service Guide 2: Reference	SY27-2614-0
Volume D01: Service Language Commands	SY27-2615-0
Volume D02: Frames	SY27-2617-0
Volume D03: Messages - Part 1 (100 thru 3999)	GA23-0377-0
Volume D04: Messages - Part 2 (4000 thru 6999)	GA23-0378-0
Volume E01: Installation Manual	SY27-2616-0
Volume E02: Safety Inspection Guide	SY27-2618-0
Volume E03: Maintenance Agreement Guide (GA + 1 yr)	SY27-2620-0
Volume F01: Parts Catalog	SY27-2619-0
Volume G01: Cable List (EC Sensitive)	No Form No.
Volume H01: Power/Thermal Logic Diagrams (EC Sensitive)	No Form No.
Volume I01: Safety Notices (EMEA only)	ZZ27-2700-0

Note: A complete list of publications is provided in the PUBS section of HONE.

1.16 Microcode Support Plan

Problem Determination

Microcode failures are handled as hardware failures by the RSC. The on-site customer engineer, with RSC assistance, carries out problem determination until the microcode is suspected or the RSC determines Product Engineering assistance is required. The customer engineer or RSC provides data requested by Engineering for problem resolution. Data required includes EC levels, patches installed, dumps, logs, and visual indications. Vehicles used for data collection can be the Remote Support Facility (RSF), telephone, or the return of dump tapes through the mail.

Microcode temporary fixes (patches) are generated by Poughkeepsie Engineering to correct problems. When generated, a patch enters the Automatic Patch Transmission and Control application through RSF. When the patch is entered, the distribution status is added to the patch control record.

Microcode Engineering Changes (ECs)

Microcode design defects are corrected by the Engineering Group at the time of discovery. The modification of microcode to correct these problems is defined as follows:

- Patch

  A patch corrects or bypasses a single microcode or hardware logic design

error. A patch is an expeditious response to a high severity problem. Strict engineering control is required for each installation until the patch has been verified as the fix for the problem.

- Engineering Change

  A System EC (SEC) is released to pick up a range of patches. All SECs are sequentially released and their installation is mandatory.

A facility is used by the customer engineer to:

- Install/backout microcode patches
- Install/backout microcode ECs
- Enter patches manually*
- Save/restore unique data from the system to tape.

*Manual patch entry is to be used for emergency (SEV1) only.

Patch Severity

The following categories apply:

- Special - Authorized for specific machine serial numbers only.

- Symptom - Authorized for machines that exhibit certain symptoms.

- Pervasive - Corrects a low-severity problem that many machines may exhibit.

- Mandatory - Corrects a high-severity problem. This patch must be installed as soon as possible to ensure reliable performance.

Patch Distribution Status

The following categories apply:

- Manual - transmitted manually by the RSC

- Test - transmitted manually by the RSC and requires Engineering authorization

- General - transmitted by an automatic service level update session (during the weekly service update).

Patch Classification

Patches are classified as disruptive. They cannot be installed concurrently with customer operation. Disruptive patches require a power-on reset (POR) after being applied. POR requires the customer to make the system available to the customer engineer.

Emergency Patch Transmission

The RSC can manually transmit patches in remote console mode in emergency situations. If this cannot be accomplished, the patch(es) are provided over the telephone and the customer engineer manually inputs the patch(es). The alternative is to have PE make a patch tape and transport it to the account by the fastest means available.

Patch Delivery Description

Service Update

The Service Update Function is a machine initiated auto-call to URSF. It will be invoked automatically every seven days by the system. Customer authorization is needed for activation of the Service Update Function.

The Service Update Function provides automatic weekly testing of the RSF data link. An algorithm within the system will be used to avoid RSF call overload. The system transmits to URSF the following:

- EC level
- Patch level
- Features
- Machine type
- Serial number.

The URSF analyzes the data obtained and transmits the required patch(es). Patches are written on the PCE DASD, but not applied. Patches are applied within a maximum time frame of once a month. Customers are encouraged to allow a more frequent schedule. Patches are applied to the system after receipt to eliminate potential customer outages due to rediscovery of known problems.

Note: Use Service Code 33, ECA 933 for time spent applying patches.

Secure Account Customers

General status patches are supplied to these accounts via tape. The customer engineer must contact the RSC requesting the SEC level of the tape to ship. A PMR must be open and contain the following information:

- P/N for the tape
- The SEC number
- Date identifying when this tape was created
- When the patches are applied.

The purpose of the date is to identify the latest tape shipped in case a customer requires another patch update when the SEC level has not changed.

System Dump Tapes

The five spare tapes supplied with the ship group are used for returning dump data to Product Engineering.

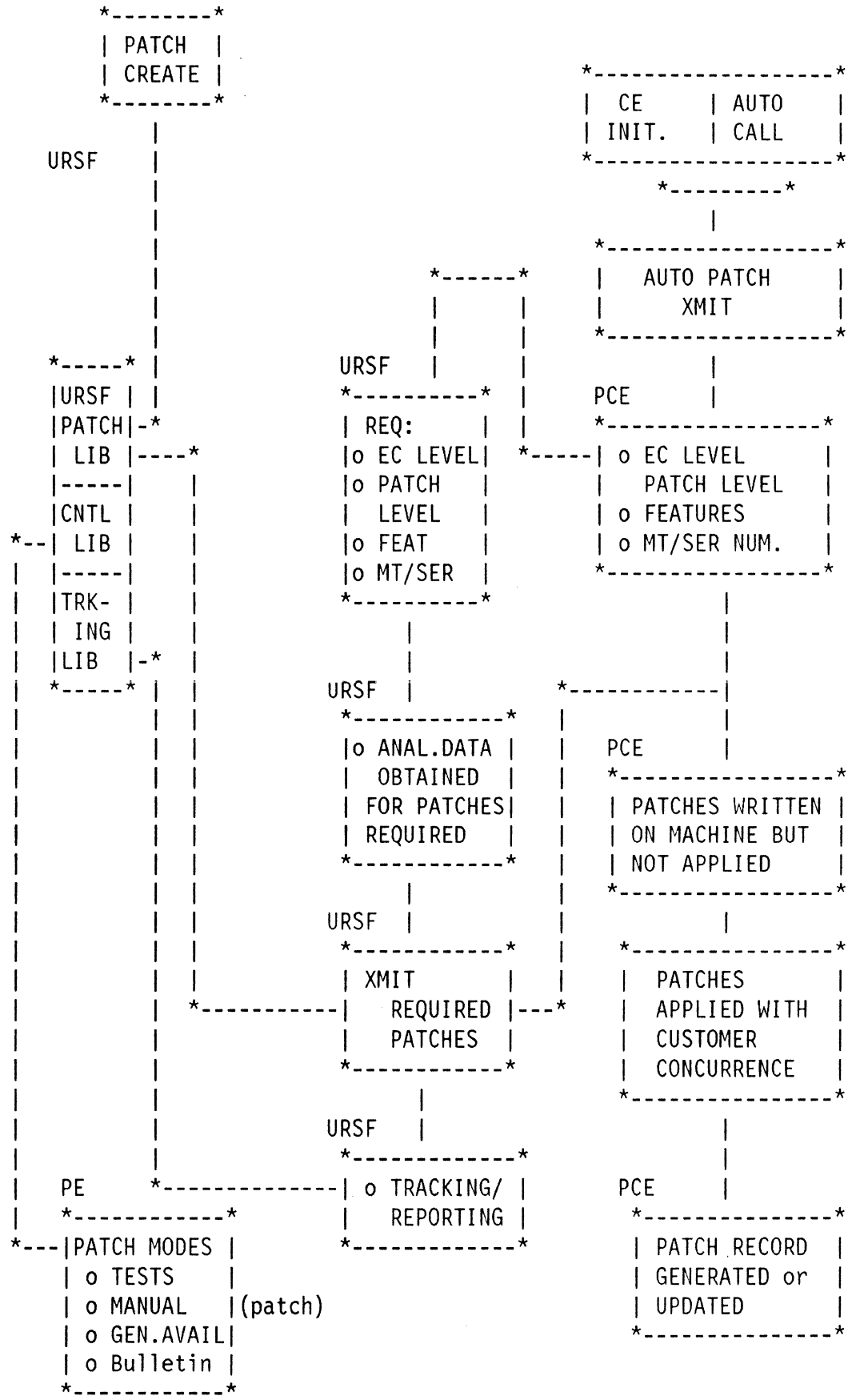
Requested tapes containing dump data should be returned C.O.D. via Federal

Express or the quickest method of available premium transportation to:

IBM Corp.
ATTN: PE Technical Support
Dept. 283X, Bldg. 006-1
South Road
Poughkeepsie, NY 12602

Replenishing spare tapes requires a return address written on the supplied tape label.

Automatic Patch Transmission and Control Flow



1.17 Machine Level Control (MLC)

MLC maintains information on the current level of all systems in the field. The status of the machine leaving the plant of manufacture is input to MLC before shipping. The status is updated at installation by input from field personnel. Data in MLC includes the microcode level including:

- Patches
- Engineering Changes (ECs)
- Features.

Field updating of MLC for patches is accomplished via the service update. These records are updated as patches are transmitted to the customer site.

MLC provides a set of standard outputs. These outputs are categorized either by machine serial number or by machine type.

Machine serial number:

1. Machine EC status records (histories)
2. Logic diagrams table of contents
3. Diagnostic programs table of contents
4. MES orders for automatic shipment of field bills of materials (B/Ms)
5. EC and B/M shipped, but not installed information
6. EC REA file search (upon request)
7. Advanced feature workload notice (AFWN) shipped before MES is shipped.

Machine type:

1. Master EC - B/M cross reference
2. Feature B/M index
3. Master logic table of contents
4. Feature summary with detail.

CE's Responsibilities

- Search HSF TDR (TIP) file for the EC prior to installation.
- Schedule TCM/TCM board type ECs with the customer.
- Confirm installation dates with Area product coordinators.
- Inventory EC on arrival and notify the Quality Hotline of any discrepancies (missing or wrong parts). The Hotline will send the proper items to you.
- Install SEC within 14 calendar days of its receipt.
- Create a CERF for the plant's PSS at the completion of the EC.
- Update the CERF panels with installation times and any quality defects

such as wrong or unclear instructions or missing B/Ms. (See the Reporting/Tracking Procedures section for details.)

- Return all TCM/TCM boards via RMER, in accordance with the procedures outlined in the Serialized Parts section of the Branch Office manual.

- Return all other parts per EC parts disposition instructions.

- Write Service Code 33 complete.

Note: Section 6 of the installation instructions defines the changes and enhancements implemented by the EC. Each trained customer engineer should review these instructions to become familiar with functional and maintenance changes.

Area Product Coordinator's Responsibilities

- Interface with Poughkeepsie Product Planning, Area Branch Offices, and the Data Systems Division (DSD).

- Explain the purpose of the EC and personnel requirements to the Branch Office.

- Provide DSD with an EC installation date (with a minimum of four weeks prior notice) using the VM SEC EXEC to place the order for ECs containing TCM(s) and/or TCM board(s). Kingston then sends the SEC ship date back to the Area Product C.

- Contact the Kingston EC order Help Desk with any changes to an existing order or for any other information or requests regarding the EC order.

- Ensure that the DFU/PSS reporting is done on time and properly reflects the EC installation data. The EC installation panels can be viewed in the RETAIN PMR created by the DFU/PSS reporting procedure.

IBM US Service/Service Delivery's Responsibilities

- Notify Area product coordinators of kit availability to initiate the scheduling cycle for ECs for designated 9121 serial numbers.

- Follow up on all quality problems as reported on the DFU panels. (All field reported EC problems are reviewed at the plant by the MES/EC Product Review Committee (MPRC). The committee assigns the problem to the department responsible for corrective action.)

- Issue ECA numbers.

1.18 Engineering Change Philosophy

A World Wide ES/9121 EC Management Plan is released, please refer to this document for detailed explanations.

The System EC (SEC) concept is used on this system. One SEC is a combination of machine ECs, logic (TCM, COB, Boards), Microcode, Power, Cables, Delay lines, Documentation.

Hardware ECs

All hardware ECs are created and released by Mid-Hudson Valley Engineering and controlled by the Machine Level Control (MLC) department following existing product practices.

ECs will be installed by the customer engineer and will conform to CS-2503.

For TCMs, TCM Board, and Grad COB Board changes, the procedure is to replace the FRU, no rework will be performed.

All logic commodities removed by an EC will be returned to the plant of manufacture as soon as possible for credit.

Glossary

9121 Acronym List

Table X-1. 9121 Acronym List. There are many new acronyms used with the 9121 processor. This list is not to be considered complete.

Acronym	Definition
AQE	Action Queue Entry
BOC	Battery Operated Clock
COB	Card On Board Technology
CMM	Concurrent Maintenance Mode
CPC	Central Processor Complex
HSA	Hardware System Area
IOCDS	I/O Control Data Sets
IOPS	I/O Power Sequencer
IOSP	I/O Support Processor
IPC	Initial Power Controller
LPAR	Logical Partition
LSA	Logical Support Adapter
LSS	Logical Support Station
PCC	Processor Controller Code
PCE	Processor Controller Element
PSP	Primary Support Processor
PTC	Power Thermal Controller
SCSI	Small Computer Systems Interface
TCM	Thermal Conduction Module
TPO	Timer Power Off
USI	Universal Support Interface
VM	Virtual Machine
VT	Validation Test

13740 9121 Student Notebook

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9121 Service Training
(Course Code 13740)

Final Quiz

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Education

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Attention: Tony Braggs (**VNET Node:** ATLEDCTR **User ID:** BRAGGS)

Contents

Directions

Make sure your name is in the upper left hand corner of the answer sheet along with the date, start, and stop times.

Do not turn the page until instructed to do so. Please read this page carefully and then wait for the signal to start.

Read each question carefully, they are in no particular order. Some questions may have more than one correct answer. You may write in this book, but remember to copy your answer to the answer sheet.

Test Arrangement and Time Allotment - This quiz has **20** items and the time allotted is **75** minutes. Each question is worth **5** points and the minimum passing score is **65**. You should have sufficient time to complete all items. However, it is usually advantageous to complete the easier items first and then return to work on the more difficult ones.

Material - The material used during this quiz should be limited to the documentation you will have in the field. This does **not** include your student materials.

Use an ordinary lead pencil to take the test.

Make dark concise marks - complete erasures - no extraneous marks.

The test will be reviewed once everyone has completed it. Discussion is welcome and desired. However, the instructor's decisions are final.

Questions

1. Match each of the following components to its function.

___	CP(s)	a.	Handles the I/O
___	System Control Element	b.	Contains the HSA
___	Storage	c.	Executes instructions
___	Processor Cntl Element	d.	Interfaces with the CPC
___	Channel Subsystem	e.	Establishes request priority

a. cebda
b. ecbda
c. cedab
d. cabde
e. debca

2. ___ T F Before initiating a 'Restore Full' to the DASD, run the "Backup Customer Data" utility on a separate tape.

3. Match each of the following Control Panel Indicators/Switches to its description.

d	PCE Power Available	a.	Operating in CMM
g	PCE IOSP Power	b.	Causes 8's to be displayed in Index/Refcode
b	Alarm Reset/Lamp Test	c.	Works in conjunction with Refcodes
a	PCE IOSP Disconnected	— d.	On when Power is available at the IPC
c	Advance	e.	System Power On switch disabled
e	PCE Service Switch Enabled	f.	Turned on by PCC
—	Controlling System	g.	Turned on and off by the IPC

a. dgbcaef
b. fdbcaeg
c. gdbacef
d. dgbacfe
e. dgbacef

4. What function will the PCE Power Off pushbutton on the Control Panel Assembly perform with the following conditions?

- The PCE Service Mode switch is ENABLED.
- The Controlling System indicator is ON.
- The IOSP Disconnected indicator is BLINKING.

Function performed:

a. Switches off IOSP Power only.
b. Switches off IOSP, PSP, and System Power.
c. No function is performed.

5. Arrange the following items in the proper sequence to perform a channel swap.

3 1. Turn SERVMODE on

6 2. Place the CHPIDS online

4 3. Enter CHSWAP XX YY

2 4. Swap the interface cables

5 5. Turn off SERVMODE

1 6. Place the CHPIDs offline

a. 614532

(b.) 641352

c. 461352

d. 613524

e. 645312

6. T (F) The IOSP must be powered off and on before it can be successfully reconnected from CMM.

7. What is the farthest outbound point in which an AQE can be generated on an ES Conversion mode channel?

a. Channel card

b. Channel tailgate

(c.) 9034 ES Connection Converter, not including the Parallel Bus and Tag interface cables

d. the physical Parallel Bus and Tag interface cables

8. Match each Jack to the plug location on the board as it relates to the PCE.

b	USI G/L cable plugs into the IPC at	a.	J1
		b.	J2
c	Power Control Interface plugs into the Control Panel at	c.	J3
		d.	J10
e	PSP Interface plugs into the PSP at	e.	J12
	Rotation Good plugs into the IPC at		
d	USI X/G cable plugs into the IPC at		

a. dceab
b. baecd
c. bcead
d. cabed
e. bcdea

9. What Service Language Command is used to provide a concurrent service configuration for CHPID diagnostics?

a. SERVMODE
b. SERVPART
c. CHDIAG
d. Both A and B

10. Match each of the following elements to its description.

a	Support Processor for the PSP	a.	IPC
e	Inteface between IOSP and Fixed Disk	b.	IOSP
d	Interface between the PCE and CPC	c.	PSP
___	Provides interface to control panel	~~d.~~	Service Channel
b	Provides support to the CPC	~~e.~~	SCSI interface

c

a. bedca
b. ~~aedbc~~
c. bedac
d. ~~bdeac~~
e. ~~aedcb~~

80
4-30

11. When performing the Optical Power Measurement on an ESCON Channel the power reading (output of the channel card) should be no less than _____.

a. -15.0 dBm
b. -20.0 dBm
c. -21.0 dBm
d. -22.0 dBm
e. -25.0 dBm

12. Using the procedure in the maintenance document, arrange the following steps in the proper sequence to place the PCE in Concurrent Maintenance Mode.

3 1. Press the Disconnect switch.

1 2. Set Service Mode switch to the enable position, indicator lights.

4 3. Disconnected indicator is on solid.

2 4. Check the IOSP Disconnected (off), IOSP Power (on), and Controlling System (on) indicators.

5 5. The IOSP can now be serviced.

a. 42153
b. 41352
c. 52134
d. 24135
e. 31245

13. IFCCs have occurred on a CVC channel CHPID 14. When looking at the Channel Summary log an IFCC reason Code of 40 is indicated. What is the error description (reason)?

a. Multi-intag error
b. Bus-in parity error
c. Control in-tag active
d. Bus-in parity error during data transfer
e. Control select-in time-out

14. Arrange the following in the proper sequence to Power Up the PCE from the turn on of the "wall circuit breaker." (Note: system CB's are on.)

3 1. Pick K2

2 2. System Power-on pushbutton

3. PSP Internal Code Load (IML)

4 4. PSP Self test/IOSP runs POST

1 5. IPC initialized, run self test

6. IPL of the PCC (Load PCC)

(9) 7 7. Power on CPC

a. 5214637
b. 5213467
c. ~~2154367~~
d. 2514367
e. 5214367

15. What is the maximum number of parallel channel cards that may be plugged on the 01F board?

B04
2-7

a. sixteen
(b.) twelve
c. eight
d. four
e. none

16. A Customer reports that CHPID 12 is getting IFCC's. What is the location of the channel card related to that CHPID?

B04
2-12

a. 01FA1K2
(b.) 01PA1K2
c. 01GA1K2
d. 01NA1K2

C01
3-22

17. (T) F The IOSP records PCE hardware and CPC hardware exceptions in the IOSP history log.

18. Arrange the following items in the proper sequence to perform ***single channel service***.

1.	Place the CHPID offline.	1
2.	Turn SERVPART off	6
3.	Enter SCS XX OUT	5
4.	Place the CHPID online	7
5.	Run diagnostics	4
6.	Turn SERVPART on	2
7.	Enter SCS XX IN	3

a. 4675312
b. 1675324
c. 1675342
d. 1635742
e. 1275346

19. T F The customer is responsible for loading the IOCDS on an initial install.

HINT: the information needed to answer the following question is in C01.

20. When running the service channel wrap tests during service channel problem isolation, a reference code of 108E9332 00200000 is generated. What PCE address bit is failing?

a. P
b. 0
c. 1
d. 2
e. 3
f. 4

