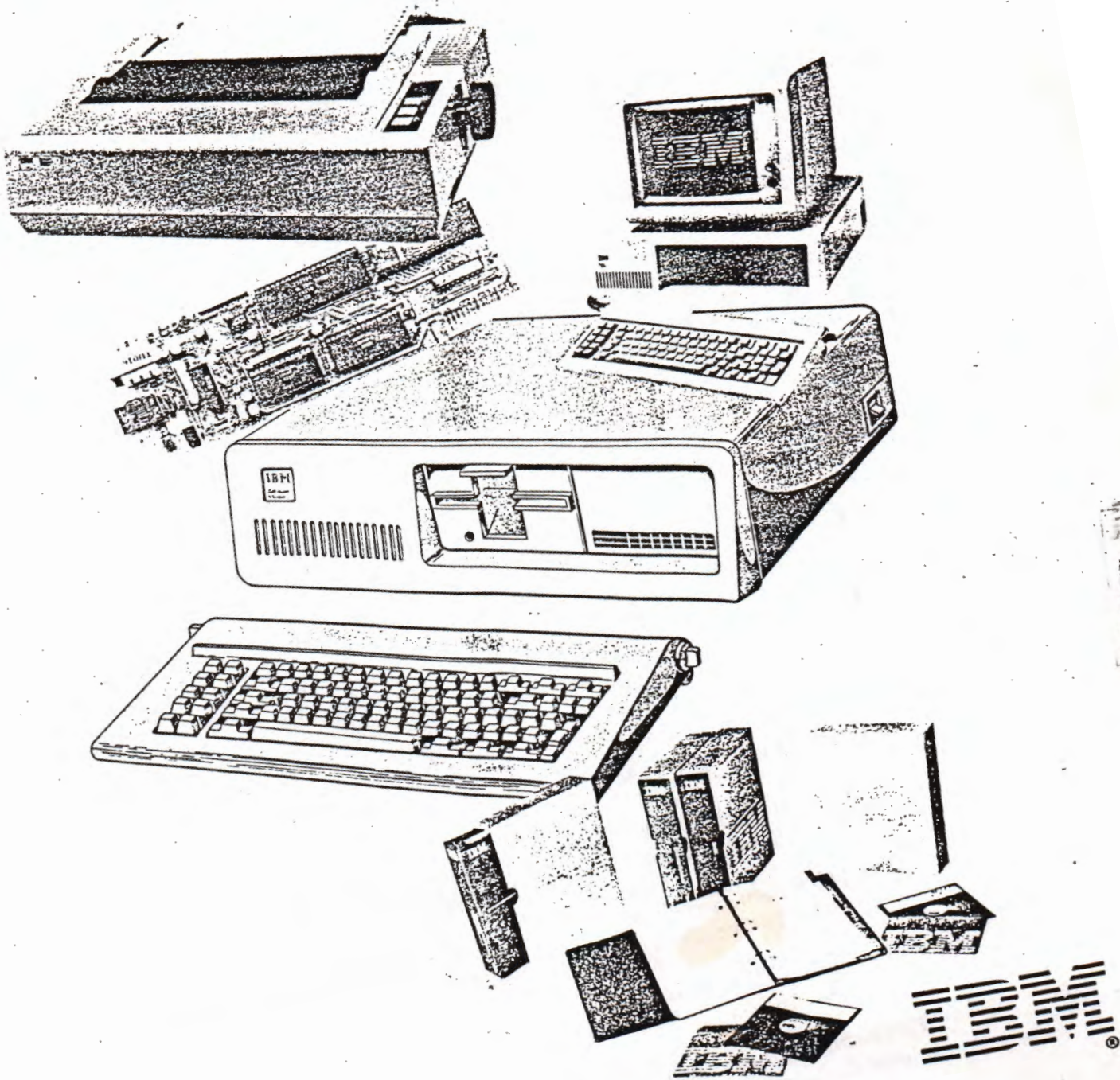# Related Products Development Planning Guide

IBM

First Edition (June 1984)

Changes are periodically made to the information herein; these changes will be in the form of updates or revisions to this publication.

This publication can only be obtained from the *Related Products – Product Planning* department at the following address:

Dept. 2N4/237-3
Boca Raton

This document is classified "IBM CONFIDENTIAL" by the nature of the information contained within.

Preface

The Related Products Development Planning Guide is intended to provide assistance to product development groups who are designing a product which is based on the IBM Personal Computer (PC). The Entry Systems Division (ESD) is organizationally aligned to maximize the efficiency of getting a high-volume, low-cost product into the marketplace. Therefore, its procedures and processes are somewhat different than those utilized in other IBM divisions. Obtaining an insight into the PC environment is critical for groups involved in the related product development/manufacturing cycle.

This publication is general in nature and designed to help product management, planners, engineers and support organizations. It offers a basis for common understanding and answers many of the initial questions.

Unique requirements and specific questions which apply to a new product may fall outside the scope of this document and should be negotiated directly with appropriate ESD Related Products personnel.

The Planning Guide consists of the following 19 chapters:

A figure listing and glossary are included.

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Notes:

CONTENTS

LIST OF FIGURES

CHAPTER 1. INTRODUCTION TO RELATED PRODUCTS

Definition of a Related Product

A related product is any hardware or software offering that attaches to, or utilizes the IBM Personal Computer as the basis of its design. The product can be a system unit, option card, I/O device or software package. These are products that are typically developed by a remote site or division in which the developer maintains product ownership. In some cases, after the initial evaluation, Entry Systems Division (ESD) deems the product appropriate to fit in the base product line; in this case an agreement would be reached with the development laboratory for the product to become an ESD offering. Otherwise, the product may become a related product. Currently, there are *four categories* of related products:

- Category 1 is a *Workstation* that is an entire system unit (pancake) manufactured in Related Products Manufacturing. An example of this would be the Personal Computer XT/370 in which the base PC function is preserved along with new capabilities.

- Category 2 is an *Attachment* or *I/O device* that could be an attachment card and its associated I/O device, a card only, or an I/O device only, such as a printer.

The basic premise of the products in categories 1 and 2 is to provide an increased value add to the base PC. This function will allow the customer to operate his system in a new and enhanced mode while preserving the basic successful concepts which have proven themselves in the PC line. These concepts include the preservation of PC DOS, the BIOS system, vendor technology and flexible modular I/O along with the high volume manufacturing techniques which are currently employed in ESD Manufacturing.

- Category 3 is a *Controller* that is a stripped down variation of a base PC product shipped as a Common Subassembly (CSA) and is not dependent on the DOS operating system.

- Category 4 is *typically a Software* offering for the ESD family of products.

  Note: It is important to note that in each of the four categories, the product is evaluated based on its compatibility to the overall ESD Strategic Product Plan.

Related Products Mission/Responsibility

- The Related Products organization was established to provide guidance to remote development groups that are designing products based on the Personal Computer. This assistance is intended to ensure that Related Products complement existing and future ESD product offerings and maximize total revenue potential for IBM. Within the ESD Related Products organization, Product Planning, Marketing, Business Evaluation, Development, Architecture and Manufacturing personnel provide technical advice and information to potential users.

- Related Products has the responsibility to be the initial interface for ESD to the Developing Laboratory.

- Individuals throughout the Related Products organization are thoroughly familiar with base ESD strategies within their area of expertise. Their prime responsibility is to evaluate, support and guide potential related products while protecting the integrity of the base PC product line.

Related Products Organization

- The Related Products (RP) organization, under the Director of Related Products, has *three* major functional areas as illustrated in the organizational diagram.

```
                    ┌────────────────────────┐
                    │ Director, Related Products │
                    │        Dept. 9N1        │
                    └────────────────────────┘
```

RP Architecture & Manufacturing Dept. 9N4	RP Development Dept. 9J2	RP Product Evaluation Dept. 2N6

RP Advanced Mfg. Planning Dept. 2N5	RP Arch/Design Dept. 9N0	RP Systems Dev. Dept. 9N5	RP Prod. Plng. Dept. 2N4	RP Mkt. Planning Dept. 2N7	RP Bus. Evaluation Dept. 2N8

RP Software Engineering Dept. 9N7	RP Hardware Engineering Dept. 9N6
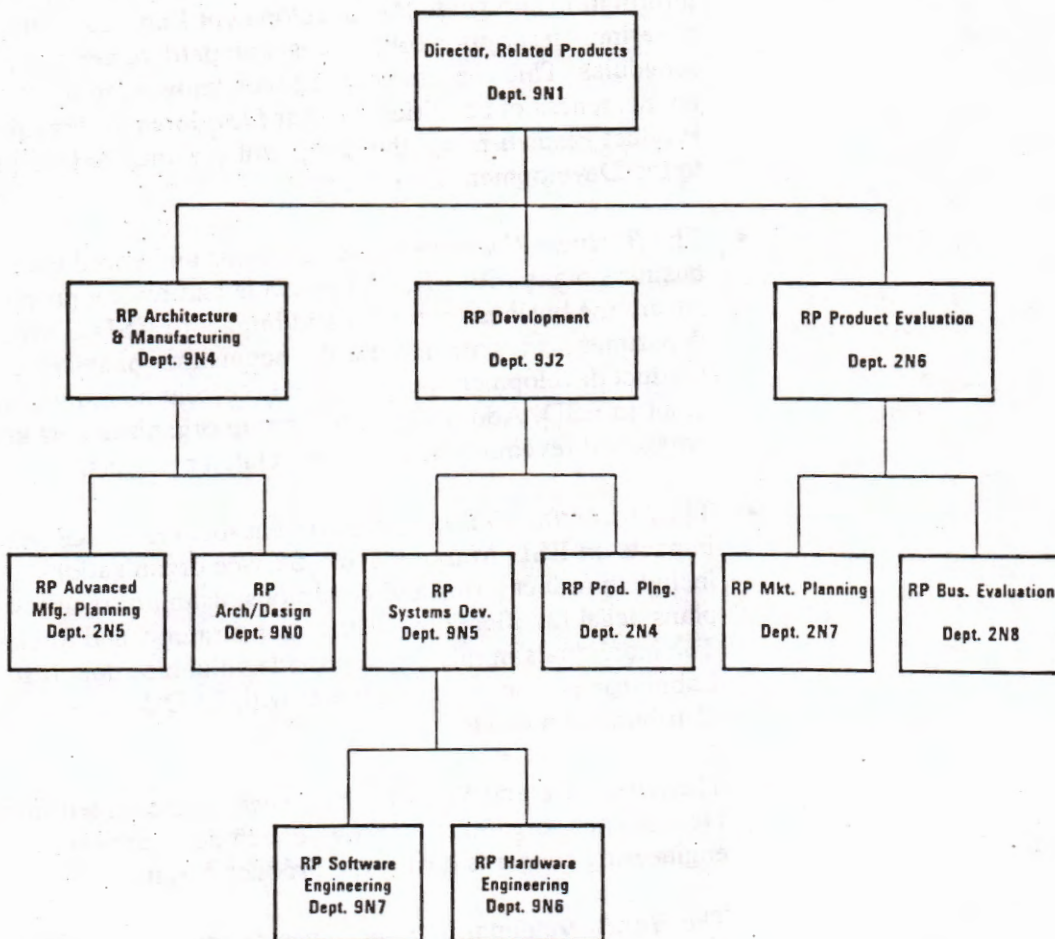
Figure 1. Related Products Organization

The structure of the organization closely represents an Advanced Product Development group with functional areas covering Planning, Engineering, Business, Manufacturing and Marketing. This type of alignment is required to provide a concentrated, high level interface between Entry Systems Division and the Development Laboratory organizations.

Organizational Activities

- The *Product Planning* group provides the initial interface between the Development Lab and Related Products. They set up the preliminary information exchange meetings and select appropriate individuals from RP to assess the plans presented. Information concerning the RP organization, identification of ES dependencies and securing commitments to satisfy them are accomplished by this group. They will collect product information and guide the Development Laboratory in the areas covering: description, objectives, competitive analysis, costs and schedules. This process is based on a knowledge of ESD Strategies and an awareness of activities in other Development organizations. As the Product Plans firm up, the group will continue to be a prime focal point to the Development Laboratory.

- The *Business Evaluation* area assesses and coordinates RP product business plans with ESD. They guide and review proposed plans to ensure the business potential and impact to ESD is evaluated. The department is responsible for the acquisition of systems to be used for product development purposes and the volume requirement dependency input to ESD. Additionally, this group organizes cost kickoffs, transfer prices and revenue plans for new related products.

- The *Marketing Planning* department focuses on RP plans and their impacts on ESD Marketing and Service organizations. Areas addressed include: product terms and conditions, usability requirements, support plans, legal ramifications, distribution strategy, and forecast assumptions. The individuals in this group provide valuable support to Development Laboratories who are not familiar with ESD Marketing, service and distribution channels.

- The *Hardware* and *Software Engineering* groups within the RP Systems Development organization provide technical support for a vast array of engineering concerns during the product design process.

  The *Hardware* department provides design requirements, specifications, EVT/DVT Test plans, and the agency approval criteria for unannounced products. Additionally, this group provides answers to engineering questions concerning the operation of future PC products.

  The *Software* department provides similar support covering software for the existing and future PC product line. They also address compatibility testing and RAS requirements for new approved related products.

  Note: Both Engineering groups participate in technical product reviews and assist development personnel in designing new products compatible with the Personal Computer.

- The *Advanced Manufacturing Planning* organization ensures that new product plans fit the high-volume low-cost manufacturing methods utilized in ESD. To ensure this objective is met, the department evaluates new products early in the approval process assessing: hardware/software/publications manufacturing, quality requirements, test philosophy, technology dependencies, logistics requirements and distribution strategy. Support is provided to the Development Laboratory until the manufacturing plans are established. After this period, and if the product is to be manufactured by RP Manufacturing, a New Products Administrator will be assigned to the Product.

- The *Architectural/Design* group provides education and advice to the Development Lab concerning: interface requirements, compatibility and the strategic direction of ESD products from a hardware and software point of view.

Related Products Initial Contacts

- The *Product Planning* department within the RP organization is the initial interface for the Development Laboratory to ESD. This group is staffed with individuals experienced in the analysis of early product plans and their potential relationship to ESD strategic activities.

- It is the responsibility of the Development Laboratory to contact this organization and to provide an awareness of their product plans. Product Planning will organize an initial exchange meeting with the proper technical individuals to assess the product plans presented. This meeting will also provide an opportunity for the developing laboratory to obtain information concerning the ESD Related Products environment.

- An assigned product planner will assist in the generation of preliminary documentation required to enter the interlock process.

New Product Management Process

Overview

- The Related Product Management process consists of six distinct phases called "interlocks." These phases constitute defined check points for the overall support of a potential related product. The check points provide coverage from the initial ESD contact by the Development Laboratory to the end-of-life for the product.

Interlock 0

```
┌─────────────────────────┐
│  Initial Product Proposal │
└─────────────────────────┘
            │
            ▼
        ╱─────────╲
No Re-Evaluate ◄── │    RP       │ ──► No Rejected
        │ Review Initial │
        ╲  Proposal   ╱
         ╲─────────╱
            │
            ▼
┌─────────────────────────┐
│        Start            │
│ Related Products Evaluation │
└─────────────────────────┘
            │
     Category Selection
```

┌──────────────┐ ┌──────────────┐ ┌──────────────┐ ┌──────────────┐
│Related Product│ │ I/O and I/O │ │Related Product│ │ESD Interface &│
│ Workstation │ │ Attachment │ │ Controller   │ │Planning Support│
└──────────────┘ └──────────────┘ └──────────────┘ └──────────────┘
       1   2   3   4

```
┌──────────────────────────────┐
│ Project Document of Understanding │
└──────────────────────────────┘
            │
            ▼
          ( 1 )──►
```

Figure 2. Related Products Management Process (Sheet 1 of 2)

① 1

Interlock 1

Related Products Proposal

No Re-Evaluate ← **RP Director's Review** → No-Rejected

Interlock 2

No Re-Evaluate ← **RP Charter** → No-Rejected

Change In Product Definition

Accepted

Interlock 3

Product Development and DOU's

Continue to Next Review

New Products Meeting

Interlock 4

Enter ESO Release Ann/Cycle

Interlock 5/6

Monitor Progress/ End-of-Life

Figure 2. Related Products Management Process (Sheet 2 of 2)

Interlock 0

This is the initial meeting between the Development Organization and ESD Related Products. A *Preliminary Agreement* will be signed to solidify cooperation between ESD Related Products and the Developing Laboratory.

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PRELIMINARY AGREEMENT

ESD agrees to release appropriate information to the _____ Project and will work with them on the development of a mutually agreeable plan to ESD and to support _____ which:

You further understand that this Preliminary Agreement does not constitute Related Products' agreement to execute a plan.

Project agrees:

1) The information acquired from ESD through documents, presentations and ongoing interactions will be treated as IBM Confidential-Restricted and shared with only those in your organization that have a compelling need to know. Information will not be divulged to anyone outside your Project without prior ESD approval.

2) Documents, drawings, hardware or other information provided by ESD will not be duplicated and all materials acquired from ESD will be kept available for return to ESD upon termination of this Agreement.

3) To review your plans with ESD prior to a division or group review and execute a formal DOU (Document of Understanding) with ESD Related Products prior to making plan commitments that have a dependency on ESD or assumption about ESD plans.

Director Related Products   Date Signed

Product/System Manager   Date Signed

RELATED PRODUCTS MEMO BLANK-1

Figure 3. Preliminary Agreement Form

Interlock 1

At this point, a complete definition of the product plan will have been made, including all assumptions and dependencies on ESD. The plan, called a *Project Document of Understanding* (DOU), is written by the ESD Related Products Organization with input from the Developing Laboratory. This document provides the basis for ESD's understanding of the product and any associated dependencies. The Director of Related Products will approve or reject this DOU based upon strategic impact to IBM and ESD. Information for this DOU is derived via the following worksheet.

```
                                                    IBM CONFIDENTIAL
                                                    (WHEN COMPLETED)


    THIS DOCUMENT WILL BE USED TO DESCRIBE PRODUCT INFORMATION ABOUT THE CANDIDATE
    RELATED PRODUCT AND THE NECESSARY RELATIONSHIP AND RESPONSIBILITIES BETWEEN
    ESD RELATED PRODUCTS AND A NON-ESD DEVELOPMENT LABORATORY.




                            PROJECT INFORMATION WORKSHEET



    PRODUCT NAME:        _____


    SPONSORING LABORATORY:     _____


    PRODUCT MANAGER:     _____
                                      (NAME, TITLE, PHONE)


    PRODUCT PLANNER:     _____
                                      (NAME, TITLE, PHONE)


    PLANNING MANAGER:    _____
                                      (NAME, TITLE, PHONE)


    ENGINEERING MANAGER:     _____
                                      (NAME, TITLE, PHONE)


    BUSINESS MANAGER:    _____
                                      (NAME, TITLE, PHONE)


    PRODUCT DESCRIPTION:  (Hardware, software, applications, operating systems and
    include diagrams/schematics and attach additional pages as needed.  Also include
    number of models, configuration and options.)  CONFIRM THAT YOUR PRODUCT DOES
    NOT DEGRADE THE PC FCC CLASS B PROFILE.
```

Figure 4. Project Information Worksheet (Sheet 1 of 4)

IBM CONFIDENTIAL
(WHEN COMPLETED)

_____ PROJECT INITIAL BUSINESS PROPOSAL

PLANNED ANNOUNCED DATE: US _____ WT _____

PLANNED FCS: US _____ WT _____

BUSINESS VOLUME FORECAST: PSE _____ FORECAST _____ (CHECK ONE)
(GIVE BREAKDOWN BY DECIMALS WHERE APPLICABLE)

US: FY84 _____ FY85 _____ FY86 _____ FY87 _____ BEYOND _____
WT: FY84 _____ FY85 _____ FY86 _____ FY87 _____ BEYOND _____

BUSINESS SCHEDULES: (testing schedules, manufacturing schedules if
applicable, etc.)

IBP: _____

PHASE 1: _____

PHASE 2: _____

PHASE 3: _____

IS _____ PROJECT FUNDED? _____ AND IN YOUR DIVISION
PLAN? _____

CURRENT PHASE LEVEL: _____

TARGET PRICE: _____

Figure 4. Project Information Worksheet (Sheet 2 of 4)

_____ PROJECT ASSUMPTION

DEPENDENCIES ON ESD FOR TECHNICAL SUPPORT:
(Include documents, drawings, presentations, etc.)

DEPENDENCIES ON ESD FOR DEVELOPMENT HARDWARE/SOFTWARE:
(Description and quantity needed and date required.)

WHAT ARE YOUR MANUFACTURING ASSUMPTIONS? DO YOU HAVE ANY DEPENDENCIES ON ESD
MANUFACTURING--IF SO, WHAT?

IF YOUR DEPENDENCIES ARE FOR ESD TO MANUFACTURE, PROVIDE THE FOLLOWING
INFORMATION:

     ☆   HARDWARE DEFINITION
        -   COMMON PARTS
        -   UNIQUE PARTS
        -   SOURCING ASSUMPTIONS
        -   PUBS

     ☆   SOFTWARE DEFINITION
        -   HOW MANY TYPES (MEDIA AND PUBS)
        -   SOURCING ASSUMPTIONS

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Figure 4. Project Information Worksheet (Sheet 3 of 4)

DEPENDENCIES ON ESD AND PLANS FOR SERVICE SUPPORT:
(Warranty? Parts supply? Maintenance coverage?)

WHAT ARE YOUR PLANNED MARKETING CHANNELS?

DO YOU HAVE DEPENDENCIES ON ESD FOR MARKETING? _____ IF SO, WHAT?

DO YOU HAVE DEPENDENCIES ON ESD FOR T&Cs?

DEPENDENCIES ON ESD AND PLANS FOR DISTRIBUTION AND SUPPLY MANAGEMENT:
(Warehouse? Other?)

DEPENDENCIES ON ESD FOR TRANSFER PRICE:

ANY OTHER ANTICIPATED REQUIREMENTS OF OR DEPENDENCIES ON ESD:

Figure 4. Project Information Worksheet (Sheet 4 of 4)

Interlock 2

This is the presentation of the *Project DOU* for the Charter Committee review. The Committee is comprised of the Directors from Related Products, Investment Strategy, Marketing Programs, Business Evaluation, Related Products Manufacturing, and Systems Assurance. The approval by the Committee will constitute an ESD commitment for the related product and the corresponding dependencies on the division. If the product falls in category 1, 2, or 3, RP Manufacturing will begin working directly with the Development Laboratory.

Interlock 3

This is the implementation phase in which numerous areas within ESD will participate in the development and implementation of product plans. Depending on the ESD dependencies involved, DOU's and plans are developed and approved in areas such as manufacturing, distribution, marketing and service. Additionally, volumes, supply management and cost estimates are generated at this time. The successful conclusion of these activities, that correspond with the exit from DVT, completes this interlock.

Interlock 4

This is the final preparation and approval for the product announcement. The product enters the ESD Release Cycle with review of the product performed by the ESD Review Board. At this point, RP Manufacturing is capable of volume production.

Interlock 5

Volumes, quality, and cost will be monitored monthly by Austin RP Manufacturing and ESD RP Advanced Manufacturing Planning. This is an ongoing activity that ensures the original manufacturing plan objectives are met.

Interlock 6

As the product enters end of life, this interlock is in place to ensure that Product Engineering support is in place and part supplies are maintained.

Allocations/Information Distribution

- At the successful conclusion of *Interlock 1* of the new products management process, the Related Products organization will determine the level of support it will provide to the Developing Laboratory. This support may include an allocation of systems from the ESD announced or unannounced product line to be used for product development purposes. New product plans and technical information, including engineering workbooks, may be made available to the Development Laboratory. The *Preliminary Agreement* details the ground rules for releasing documents, hardware and technical information to the Developing Laboratory. DUE TO THE SENSITIVE NATURE OF THIS INFORMATION, RELATED PRODUCTS DEVELOPMENT WILL PROVIDE PRODUCT INFORMATION ON A "NEED TO KNOW" ONLY BASIS. ESD SECURITY PROCEDURES FOR CLASSIFIED INFORMATION WILL BE IN EFFECT.

Note: Related Products reserves the right to limit the amount of hardware and publications made available to all developing laboratories based on commodity or manufacturing constraints.

Development Laboratory Responsibilities

- The Development Laboratory has the responsibility to make the initial contact with RP Product Planning for establishment of a technical exchange and program review meeting. During the meeting, the Developing Laboratory should be in a position to describe in detail the technical aspects of the proposed product, the business case, the marketing assumptions and any interdivisional relationships which may exist. Following this meeting, the Developing Laboratory will be asked to sign a *Preliminary Agreement* which is the letter of intent for cooperation and information dissemination between ESD Related Products and the Developing Laboratory.

- Next, the sponsoring group will be asked to complete a *Project Document of Understanding Worksheet* which will be the basis of planning activities for the specific product. Included in this worksheet is the description of the product; key technical and business contacts; the business proposal with key dates, schedules, costs; and a list of dependencies on ESD for hardware and software, manufacturing, service, and marketing support. Ongoing dialogue will take place to firm up the plans and understandings between the two locations required to complete the *Project Document of Understanding*, written by ESD RP Product Planning.

- After *Interlock 1*, management from the Developing Laboratory may be asked to attend future meetings to solidify understandings between ESD and the Developing location. A series of documents will be generated by the Developing Laboratory and Related Products to consolidate assumptions and ground rules for development, manufacturing, distribution, marketing and business. Generic examples of many of these plans are listed in the appendices of this document.

- In the development stages, the Developing Laboratory will be responsible for all normal development activities including: hardware/software designs, compatibility testing, diagnostic and RAS software, publications development, translation plans (for world wide products), coordinating EVT and DVT, and release into the ESD-MAPICS system if the product is to be manufactured by Related Products.

- Until Product Engineering responsibility transfers to ESD, the Developing Laboratory will be responsible for all engineering change activity including hardware and software support to Manufacturing.

Plant of Control Responsibilities

- The Plant of Control (POC) has responsibility for sourcing, logistics, volume, product planning, and quality conformance. As negotiated in the *Project Document of Understanding*, RP Manufacturing or the developing plant may have Plant of Control responsibilities. If the Plant of Control is not RP Manufacturing, it has responsibility for sourcing of all parts and components except the System Unit (pancake) built by RP Manufacturing. This includes tracking of parts, vendor payments, and coordinating receipt, ship and delivery schedules.

- The distribution logistics, may or may not be subcontracted to another organization. Field Engineering Division (FED), ensures that customer orders are acknowledged, products are configured to order, and shipments are properly organized and completed in a timely manner.

- Through the development cycle and throughout the product life, the Plant of Control has responsibility for total product planning and allocation. This includes supply and demand negotiations for the product and all of its components.

- A detailed quality plan must be established early in the manufacturing process to ensure product quality objectives are met. A quality feedback mechanism must be in place to track the system performance in its marketplace.

Summary

- Fundamentally, the Plant of Control maintains ownership throughout the product life.

RP Manufacturing Responsibilities

- The Related Products Manufacturing organization has the responsibility for sourcing and manufacturing system units and unique option cards. The basic strategy involves early entry involvement with the team of new products administrators, test engineers and manufacturing process personnel. RP Manufacturing will get involved with the Development Laboratory in defining the manufacturability and test requirements for the new product (Early Manufacturing Involvement (EMI)). Since the RP Manufacturing line is based on the base PC manufacturing operation, it is key to assure compatibility with the base products.

- Related Products Manufacturing will assist the Development Laboratory in releasing the new parts into the ESD-MAPICS system. Additionally, they will work with card and component vendors to qualify parts and to set up processes for the manufacture of new hardware. The RP Manufacturing Procurement organization is in place to purchase unique non-PC based parts used on related products. RP Manufacturing will provide input to the cost kickoff to determine the manufacturing cost of the new related product. Any engineering parts used for the DVT test process will be ordered by RP Manufacturing and they will provide populated cards for this test.

- Plans will be developed with the Development Laboratory for the development of unique diagnostic software which will be used to test the final product and unique cards. Early machines will be built and shipped to the Development Laboratory location for DVT testing.

- After the classical test processes have been completed, RP Manufacturing will enter the early ship program and begin production manufacturing. The goal of RP Manufacturing is to ship a zero defect product and they will arrive jointly at a quality plan with the Development Laboratory to meet that objective. RP Manufacturing is responsible to ship the product at a previously agreed upon product build schedule.

- As negotiated, in the *Project Document of Understanding*, RP Manufacturing may elect to assume PE responsibility after announce. RP Manufacturing has no responsibility for unique software except hardware RAS diagnostics which has been developed for the new related product.

Machine Types and Models

- Due to the high volume nature of ESD Manufacturing, certain control mechanisms that are used throughout IBM, such as machine-level control and build to order, are not used. Although Related Products Manufacturing produces many different types of systems, the base manufacturing and logistics concepts are derived from the base Personal Computer manufacturing lines. It is key during the initial planning stages of a new product to minimize unique configurations and to maximize function within a given product.

- Currently, Related Products Manufacturing is producing file related models for a given type of machine. An example is a System Unit with one diskette drive, two diskettes, or one diskette drive and a hardfile. For each model, a unique compliment of cards may be plugged into the expansion slots of the system board. No further customization is allowed and each model must comprise at least 20% of the base product volumes. These ground rules are in place so the high volume manufacturing techniques currently employed will not be jeopardized. Unique customer configurations must be done in the customer's location or in the distribution center.

- If the production schedule for a particular machine/model is low, RP Manufacturing may elect to build, in a bulk basis, and ship when economically feasible. This, however, would be negotiated with ISG.

- The unique machine type provides a mechanism for field tracking during the warranty period and for logistic control during manufacturing.

Volumes Process Planning

- ESD volume planning is generated each quarter. The Related Products planning process is accomplished in the following manner prior to product announcement. The Development Laboratory product planners provide input by the first of the month for a new quarter to ESD Related Products Business Planning. The ESD Related Products organization then works with ESD Finance for the related products portion of the entire ESD allocation. ESD Finance requires, by the 10th day of the first month for the quarter, the finalized requirement. By the 30th day of the same month, the system manager will receive communication confirming his portion of the entire allocation.

- There is a minimum three month leadtime before any commitment for a new product volume can be provided. This leadtime is determined by the point in time at which a developing laboratory's volume dependencies are identified via the Interlock process. A committed forecast for the next three months is provided based on the product allocation. The current quarter's commitment cannot be altered. Following the committed quarter, the next two quarters are the estimated requirements and may be adjusted during the following quarterly forecast cycle.

- During this next plan period, the yearly forecast line will shift one quarter. A new quarter will be committed and a new estimated 4th quarter will be added on the end. This is a continuing process that takes place throughout the product life.
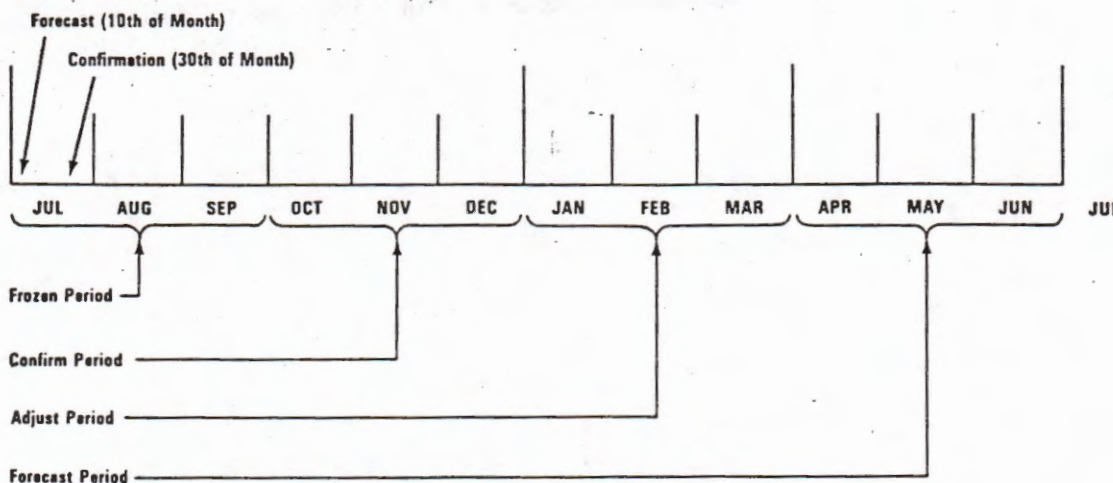
Figure 5. Quarterly Forecast Cycle

- After product announcement, volume forecasting will be provided quarterly by the channels directly to ESD Marketing. (Refer to Chapter 17.)
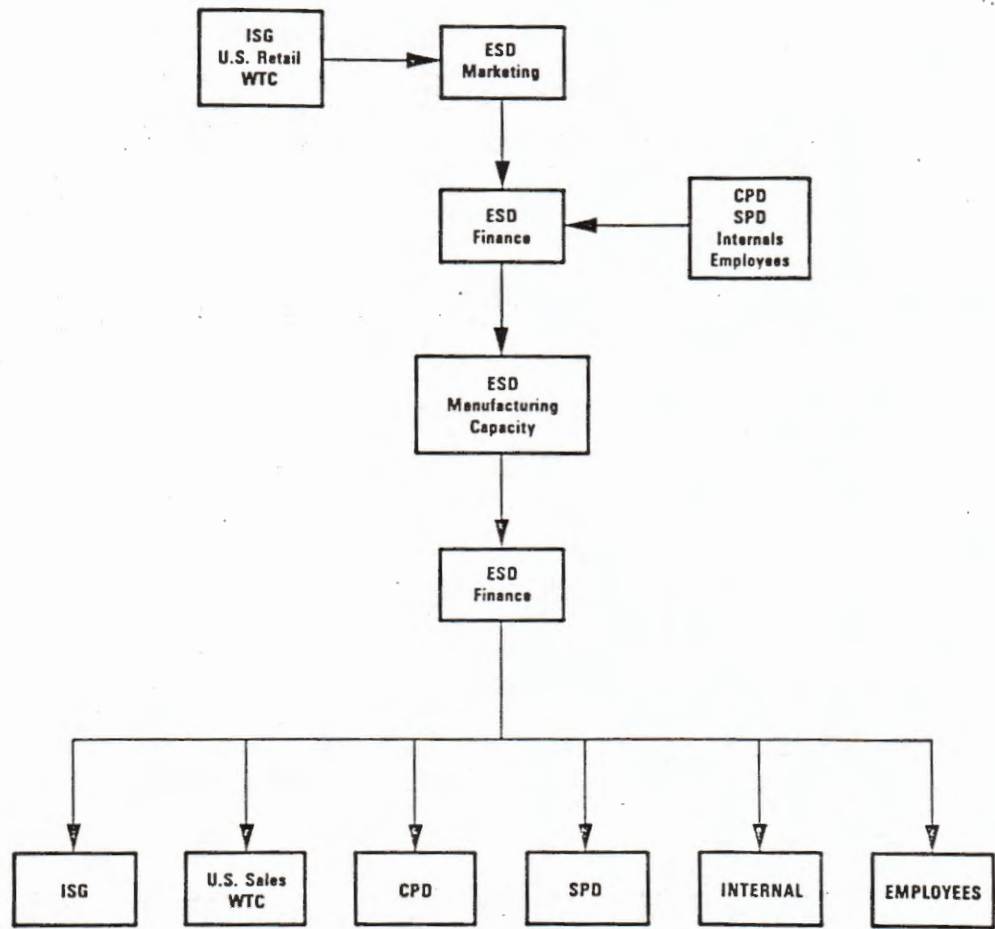
Figure 6. Channel Forecast Quarterly Flow

RP Manufacturing Organization

Overview

- The RP Manufacturing organization is aligned in a manner to best support a multitude of similar PC based products. Manufacturing is organized in the following *four* major functional areas: RP Business Planning, Technical Services, Quality Assurance, and Operations.

```
                          ┌──────────────────┐
                          │ Related Products │
                          │       PMC        │
                          │     001/988      │
                          └──────────────────┘
                                   │
     ┌──────────────┬──────────────┼──────────────┬──────────────────┐
┌──────────┐  ┌──────────┐  ┌──────────────┐  ┌──────────┐
│ Business │  │   Tech   │  │ Project Office│  │ Quality  │
│  Plng.   │  │ Services │  │     Boca     │  │  Assur   │
│   03T    │  │   41T    │  │     02T      │  │   40T    │
└──────────┘  └──────────┘  └──────────────┘  └──────────┘
```

New Prod	Mfg Plans & Controls	Process Engr	Card Engr	Prod Engr	Procurement Q E	Process QA
04T	05T	194	17T	14T	38T	39T

Operations
01T
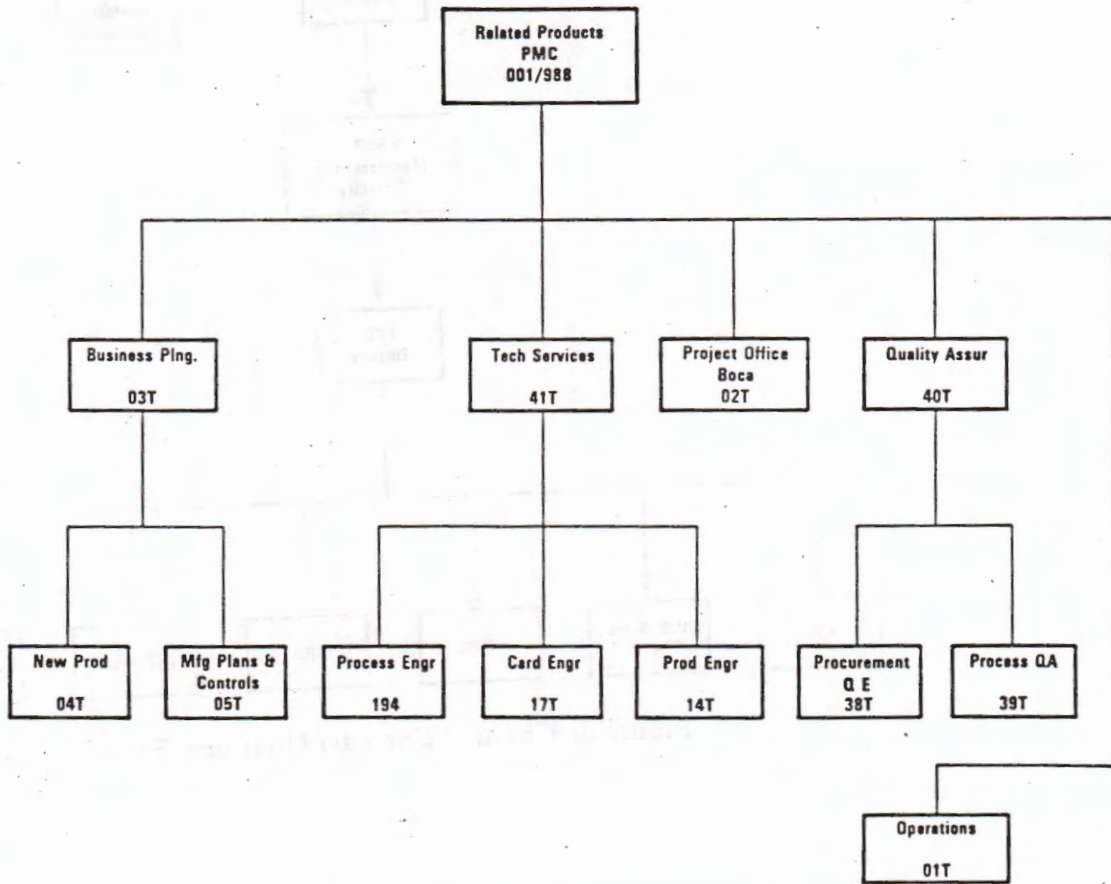
Figure 7. Related Products Manufacturing Organization

- The *New Products* Department provides early support starting after *Interlock 1* and coordinates the manufacturing activities through first customer ship. The New Product Administrators in this group coordinate the release and manufacturing activities to assure all key events are met and problems are addressed.

- The *Plans and Controls* Department provides numerous support functions for RP Manufacturing. Product cost estimates are coordinated, and financial planning and tracking is accomplished by this group.

- *Product Engineering* is the prime interface between Engineering and the ESD Records group. Bill of Materials are structured for the new product and released. Throughout the product life ECs are coordinated and tracked by individuals in this department. Additionally, all unique hardware, diagnostics and hardware publications are supported after formal transfer from the Development Laboratory. During this period, when the product is in volume production, the *PE Department* provides in-plant/field engineering hot-line support and initiates ECs, if required.

- *Process Engineering* provides support to the manufacturing process. This group is comprised of process engineers who plan and implement the manufacturing process including line layout, equipment specifications and strategic planning to support future products and volumes. Manufacturing routings and support documentaiton is also generated to assist in the assembly process. The *System Test Engineering* group interfaces extensively with the Development Laboratory and Manufacturing to assure in-house test processes, software and equipment are in place to support the unique configuration associated with the related product.

- *Card Engineering* group works very closely with RP Procurement and card vendors. Their role includes analysis of card designs and associated diagnostics, vendor selection, and test process development.

- The *Quality* organization is responsible for the quality plans and field performance for the new products. The organization supports in-house and vendor manufacturing activities. Vendor support includes the generation of plans to ensure zero defects, source inspection, certification, and the establishment of an ongoing feedback system for problem determination and resolution. The internal support group assures that the manufacturing line is qualified and plans and tests are in place to ensure a high quality product. This organization has responsibility to interface with base ESD for common parts, distribution channels and the Development Laboratory from the initial product development through volume production.

- The *Operations* group contains production control, distribution, purchasing and manufacturing. The organization is responsible for the manufacture of the product to committed volume and quality levels.

New Product Status Meetings

- These regularly scheduled meetings are coordinated by the Manufacturing New Product Administrator and are used to track the programs status and provide feedback, information, and work assignments to various individuals responsible for the final release and manufacture of a new product. Key areas that are addressed during these meetings include: dates, schedules, publications, purchasing, card testing, system testing, packaging, production control, quality, system assurance, and manufacturing. The meetings are a very effective tool for management to track the overall status of a new product.

End-of-Life Management

- It is the role of RP Manufacturing *Product Engineering* (RPPE) to provide ongoing support throughout the life of the program after Development Engineering has released a stable product to manufacturing. This responsibility typically transfers to RP Manufacturing four (4) months after first customer ship.

- It is not the intent of RPPE to overlap responsibilities with the base ES Product Engineering group that has responsibility for common parts and subassemblies. Related Products does, however, have responsibility for the unique parts used in the product. Software that has been written for the related product is not part of their responsibility.

- Prior to the formal transfer of Product Engineering responsibility, RP Manufacturing *Product Engineering* works very closely with the Development Laboratory, Systems Assurance and Manufacturing to understand and assist in hardware development. Additionally, RPPE monitors the status of DVT and MVT activities and coordinates documentation and release activities through the ESD-MAPICS system.

- When the formal transfer does occur, RPPE has responsibility for engineering records, including response to suggestions; initiation, tracking, coordination and control of engineering changes. RP Product Engineering has responsibility to maintain unique hardware and software RAS packages, including updates and changes to hardware publications and RAS microcode that is unique to the related product. They provide a technical support service to the Manufacturing organization, including coordination of functional changes, the interpretation and disposition of changes from Manufacturing and Procurement and failure analysis testing of systems and cards.

- Finally, they provide ongoing customer support via answering questions and simulating problems as requested on the service hot-line.

CHAPTER 2. ESD PRODUCT DEVELOPMENT CYCLE (EVT – DVT – MVT TESTING)

Introduction

Entry Systems Division (ESD) has no formal product development cycle and it varies from product to product. The major difference is in the phase reviews. Formal Financial Reviews are performed at phase 1 and phase 3. The technical aspects of the product are normally reviewed at three month intervals as organized by System Assurance. The activities during the product cycle follow the basic format of the IBM development cycle with the exception that announce/ship usually occurs at the same time. The following is a description of the IBM Product Development cycle with modifications for ESD.

Product Cycle

The normal Product Cycle is divided into six phases with well defined boundaries. Phase 1 and 3 end with a phase review for agreement to exit to the next phase. The phases are numbered from 0 to 5 and are defined as *Propose, Definition, Design, Release, Announce/Ship,* and *Quality/ Maintain.*

Phase 0 – Propose

The Propose phase is an informal phase with few people involved and little money expended. The goal in this phase is to establish a requirement for a product that will perform defined functions for a given cost range based on three areas: customer demand, follow-on, and new technology.

Phase 1 – Definition

The Definition phase is where risk funds are made available and design goals and cost objectives are made to development management. The initial planning and design strategy is set into place which includes consideration of all site resources such as space, manpower, and support. Product objectives describing what the product capabilities will be are defined. Cost estimates for development, manufacturing, sales and service are created based on previous products and assumptions for the future.

Phase 2 – Design

The Design phase is where the technology development is decided on and committed and the design activity occurs. Phase 2 should end with EVT test in progress.

Phase 3 – Release

This phase is where firm commitments are made by all functions. Hardware/Software costs are finalized for product pricing including service cost estimate and maintenance cost pricing.

The Design Verification Test (DVT) is performed by System Assurance to verify that the proposed product will perform all functions that are announced to the customer. Phase 3 ends with all plans, pricing and test results being reviewed by the corporate management.
With their approval the product can be announced to our customers and manufacturing begins building internal units for use by IBM groups for additional development work.

Phase 4 – Announce/Ship

This phase is where all functions are committed to the First Customer Ship Date (FCS). Plant activities build rapidly in this phase in anticipation of full production. Part sourcing is finalized with vendors in and out of IBM. Manufacturing routings are written and used to build machines for demonstrations, testing, and application development. The product and all processes are fully tested as are publications and usability. Manufacturing Verification Test (MVT) should occur during this phase. This phase will end with the public announcement and availability.

Phase 5 – Quality/Maintain

This phase begins at FCS and ends at product withdrawal, first from marketing then from service. Cost and product performance are traced closely against pricing estimates. Cost improvements and product improvements are carried out until product objectives are accomplished.

EVT Logbooks

An EVT Logbook is maintained by the responsible engineer for each functional unit. The EVT logbooks will be incorporated into the EVT notebook. The Logbook will contain all of the data gathered during EVT for that functional unit such as:

- Daily System Logs
- Timings
- Logic Analyzer/Oscilloscope Photographs
- Program Loops written to test specific hardware
- Printouts
- Any notes taken during testing
- Description of problems during testing

EVT Notebook

Engineering maintains an EVT Notebook which will consist of the Engineering Workbooks, the EVT Logbooks and the test for each functional unit. Each test has separate sections consisting of three forms: the *Objectives Form*, the *Procedures Form* and the *Results Form*.

A Problem Coordinator is designated by Engineering to respond to problems and provide a single point interface between System Assurance, Development Engineering, and other functions. Problem tracking starts with the start of EVT.

Objectives Form

The Objectives Form states the configuration required, entry requirements and basic objectives of its test. It also specifies the engineer(s) responsible for the test and the date(s) on which the test is planned to occur.

Procedures Form

The Procedures Form specifies the testing parameters and the procedures for the test.

Results Form

The Results Form is used by the engineer performing the test to record the test results. At the completion of the test the results are summarized from the Logbook and recorded on the Results Form of the EVT Logbook. The Results Form will contain the following information:

- Resolution/Disposition of all problems encountered during testing.

- Detailed description of the changes required to satisfactorily complete the testing.

Component Specifications

Specifications for each component used in the functional unit will be available for use in EVT testing.

Minimum Requirements for EVT Entry

1. System Assurance concurrence with EVT plan
2. Engineering Workbooks for each functional unit
3. Review of Product Level as defined by:
   a. Bills of Materials
   b. Logic Diagrams
   c. Mechanical Drawings
   d. Component Specifications and Purchasing Specifications
   e. Engineering Workbooks
4. Review of RAS Criteria
5. Design Reviews completed

Hardware Requirements for EVT

All hardware is tested to insure it meets functional definitions and requirements as stated in the Engineering workbooks, with all known problems documented and approved action plans in place prior to EVT entry.

- Cards/Electrical Assemblies – The cards/assemblies can be built by Engineering using standard components (no specially screened engineering prototypes). The cards should be representative of the average assembly.

  Note: RP Manufacturing will support EVT level card fabrication.

- Mechanical Parts and Enclosures will be fabricated parts.

Test Definition

The following sections briefly describe the various tests that should be performed during EVT. A detailed procedure for each test should be in the EVT Notebook. The amount and results of the testing will determine if the product should enter DVT-1 or DVT-2.

Functional Analysis

This test is performed to assure that the unit meets the functional criteria as described in the Engineering Workbooks, Component Specifications, and Procurement Specifications and at a minimum should include the following:

- Unit (Bench) Testing
    - Functional Testing – verification of workbook
    - Power Dissipation
    - DC Margins
    - Power Distribution
    - Timing Verification – major sections or buses

- Guard Band Design
    - Analysis
    - Stress to failure testing
    - Weakness identification and repair

- System Testing – Configuration to include all units to be shipped as a system.

Classical Evaluations

This testing is performed to ensure that the product meets its objective for home or office use in the following areas:

- Electromagnetic Compatibility (EMC) – This test is performed to ensure that the product complies with applicable corporate standards and FCC rules in the area of Electromagnetic Compatibility to include:

  - Electromagnetic Interference (EMI)
  - Electromagnetic Susceptibility (EMS)
  - Radiated Electromagnetic Susceptibility (RES)
  - Radio Frequency Interference (RFI)
  - Powerline Transients (PLT)
  - Powerline Disturbance (PLD)
  - Electrostatic Discharge (ESD)

- Power Analysis

  - AC Margins

- Acoustics

- Vibration (Class V2)

- Temperature/Humidity (Class B)

- Stress Evaluation

Fragility Test

This test is performed to ensure that the components of the system are not degraded and are error free when vibration levels are applied.

Safety Standards Review

This review will be conducted during EVT to ensure the product meets the following:

- Legal – The product will meet all legal requirements of the countries in which it is to be marketed.

- Safety – The product will conform to the product safety standard as stated in the test plan.

- Conformance – The product will conform to National Requirements. Any areas of nonconformance will be assessed against the needs of the market place and the requirements of Corporate Instruction 105 C. This assessment will be used by the Product Manager to make a business decision.

Serviceability Test

This test is performed to ensure compliance of the RAS Workbook.

Reliability Test

This test should use an Engineering exerciser to ensure that the reliability requirements are achieved. Test procedures and criteria for reliability measurement established by Engineering will appear in the EVT Notebook.

Minimum Requirements for EVT Exit

- All testing described under the heading "TEST DEFINITION" must be completed, documented and reviewed prior to EVT exit sign – off.

- Component Validation plans complete or in place.

- Satisfactory resolution/disposition, or an approved action plan, of all problems occurring during testing or found in Design Reviews.

- At completion of EVT a formal statement of EVT completion will be signed by Engineering and distributed to other groups involved.

- Satisfactory completion of Serviceability Test or an approved action plan in place.

- Satisfactory completion of Safety Review or an approved action plan in place.

Non-EVT Tests

The following are not EVT tests but should be performed during EVT to provide a complete product review.

Manufacturing Review

System Assurance performs an audit of all Engineering Formal Release Packages. Manufacturing will review and concur with the release packages. Manufacturing must provide a Fragility, Packaging and distribution assessment and material analysis report.

Publications Review

All product publications (both Hardware and Software) are reviewed by Engineering for content and accuracy. Engineering provides Engineering EVT Workbooks and ship group definition to publications.

- Ship Group documents are reviewed by Engineering for content and accuracy.

- The publication organizations publish a plan, with schedules, for Ship Group Documentation.

- Engineering monitors this schedule for providing inputs to Publications and reviewing documents when ready.

Industrial Design Review

The product is reviewed by the Industrial Design group. Any problems are resolved, or an action plan in place prior to acceptance of the product.

Human Factors Review

An overview of the product is conducted by Human Factors Engineering.

Design Verification Test, Part 1 (DVT-1)

This test may or may not be performed by System Product Assurance depending on the amount of testing done during EVT. The requirement for entering DVT-1 is that solutions to all EVT problems be demonstrated and implemented. The hardware used during DVT-1 may be built by Development Engineering or Manufacturing. If Manufacturing builds the DVT-1 hardware, the necessary documentation would have to have been released and implemented prior to beginning build activity.

Design Verification Test, Part 2 (DVT-2)

This test is performed by System Product Assurance using systems and cards produced by Manufacturing. DVT-2 is a complete reverification of the hardware/software design combined with the verification of the manufacturability of the hardware. The Documentation needed to build and ship the unit must be released and at the correct level. The Manufacturing process must have been fully qualified and supported by Quality Assurance and System Product Assurance.

Design Verification Test Plan

The Design Verification Test Plan defines the requirements for entry into DVT, the testing to be performed during DVT and the requirements for exiting DVT.

The DVT Test Plan should include the following:

- Entry Requirements
- Hardware Requirements
- Documentation Requirements
- Publication Requirements
- Problem Tracking
- Test Activities & Schedules
- DVT Exit Requirements

DVT-2 Entry Requirements

- All EVT and regression testing complete.

- All EVT problems resolved or suitable action plans in place.

- Team Safety Review and Safety Review Board activities satisfactorily complete and all problems resolved or acceptable action plans in place.

- UL inspection complete.

- All DVT entry products must have Quality Assurance support.

- Microcode must be in ROS.

- Hardware must be built by Manufacturing using the latest released documentation and represent ship level hardware.

- DVT Plan in place and approved by System Assurance.

- Successful product review

Hardware Requirements

The hardware requirements are defined by System Assurance and should represent the system being shipped.

Documentation Requirements

The following documents are required for review:
- CI 105 Approved Statement and Comparisons
- EVT Engineering Notebooks
- Engineering Workbooks
- Logics/Drawings for all cards
- Manufacturing Process and Test Plan
- Quality Assurance Plan
- Market Support Plan
- Maintenance Plan
- Publications Plan

Publication Requirements

The following ship-level publications (U.S. version) are required in their updated final draft form for review:

- Guide to Operations
- Technical Reference manual
- Hardware Maintenance and Service manual
- Installation Instructions

Problem Tracking

The Problem Tracking and Distribution System (PTDS) is used to track all problems during DVT. Problem will be written and answered by the person responsible for the test.

Problem Definition

- Status

    - Open – The time between which a problem occurs and a fix is developed and verified.

    - Answered – The time from when a fix is received to the originators verification of the fix.

    - Closed – After the fix is verified.

- Severity Classification

    - #1 – Further testing is not possible. Problem must have temporary fix within 24 hours and final resolution must be complete prior to completion of the test.

    - #2 – Testing continues but corrections must be evaluated and the problem resolved prior to test completion.

    - #3 – Test not affected but resolution required prior to test completion.

    - #4 – Recommendation.

Test Activities and Schedule

Classical Testing

Temperature/Humidity – Testing is performed to verify that the system will meet Class B operating and nonoperating (ship shock and hot/cold start) environment.

Vibration – The system is tested for conformance to Class V2 Vibration Standard.

Acoustics – Acoustic measurements are taken to verify the system (US and World Trade) conform to CS-1-1710-006, product Class 3 Standards.

Power Analysis

AC Margins – The AC input voltages and frequency of the system (US and World Trade) will be varied to their specified tolerances during different operations in a T/H chamber.

DC Margins – The DC voltages of the system are varied to the limits of the specification and the system monitored during different operational modes in a T/H chamber.

Power Distribution – Measurements are taken to verify that all voltages are within specified limits at all extremities of the system board, peripherals, and feature cards.

EMC Testing

The following tests are performed on the system to verify FCC Class B requirements.

- EMI – Electromagnetic Interference
- RFI – Radio Frequency Interference
- PLT – Powerline Transients
- PLD – Powerline Disturbance
- ESD – Electrostatic Discharge
- EMS – Electromagnetic Susceptibility
- Radar Susceptibility

Functional Testing

System Assurance examines all data obtained during EVT for any potential functional problem areas resulting from hardware changes made during EVT. The results of this analysis will determine the extent of the functional testing performed during DVT. In the identified problem areas the hardware will be tested to ensure that the ship level product meets Engineering Specifications.

Reliability Testing

The System Assurance basic exerciser program is used to tabulate operational counts and errors of the System. The information obtained will be used to verify the reliability and performance of the system and its components. The total number of operational hours needed to assure a reliable product will be obtained from the products RAS criteria, as stated in the specifications and the service cost estimate.

Compatibility Testing

The system is tested for Hardware and Software compatibility.

Software Compatibility – Various software applications are run
to verify compatibility with as stated in the specifications.

Hardware Compatibility – All I/O options currently available
for the system are included in the configuration tested unless specifically
excluded.

Regression Test

Any DVT testing which needs to be repeated or performed more in-depth
will be done at this time. Fixes for all problems found during DVT will also
be verified.

DVT Exit Requirements

In order to exit DVT the following requirements must be met:

- The final product must meet its functional and performance
  requirements.

- All planned DVT testing must be complete.

- All DVT problems must be resolved and resulting EC's implemented.

- Final shipping/handling/packing tests must be complete.

- Usability tests must be complete.

- CI 105 criteria satisfied.

- Field/Factory failure analysis plan defined.

- Worldwide manufacturing volume capability assessed.

- MVT plans approved.

- MVT World Trade Plans approved.

- TAAF verified.

- UL/CSA approval.

- Customer and CE publications must be at "Production Level".

- Final Ship Group complete (excluding Publications).

- FCC Certification complete.

Manufacturing Verification Test (MVT)

The Manufacturing Verification Test is performed to assure Manufacturing's capability to produce the product in quantities required to support the anticipated market and to assure the integrity of the manufacturing volume build process.

Manufacturing Verification Test Plan

A Manufacturing Verification Test Plan is developed by System Assurance which includes MVT entry requirements, description of the verification process and the criteria for exiting MVT.

MVT Entry Requirements

The following criteria must be met for entrance into MVT:

- Final Ship Group Publications

- DVT and Regression testing complete.

- Approved procedures for tracking and analyzing line and field returns.

- Quality Plan approved.

- Products entering test must be at the final volume shippable level as defined by System Assurance and Engineering.

- Volume build must be at the minimum full production levels.

Area Requirements

MANUFACTURING must provide the following:

- Updated manufacturing build plan and schedule.

- Manufacturing Off-Spec/Deviation handling procedure.

- Procurement Plan for Common and Unique Commodities.

- Tour of the Manufacturing Facility outlining routings, test procedures, and Off-Spec/Deviation handling procedures.

- Product Sample Plan (modeled)

- Test space in manufacturing for product Quality sampling.

- System Test Plan

ENGINEERING must provide:

- A letter defining the customer ship level.

- Fragility Test Report

- Product Safety Approval Report

- Compatibility to Base PC Report

QUALITY must provide:

- Updated Quality Plan.

- Support for Product Quality Sampling as stated in the Quality Plan.

- Tour of the QA facility outlining failure analysis and problem tracking procedures for tracking and analyzing line and field returns.

- Product sample criteria, procedures, schedules and data.

- Quality Process Certification letter.

PRODUCTION CONTROL must provide:

- Stock and parts availability plans to support the volume build.

- Letter assuring continuing parts supply.

MVT Exit Requirements

- All planned tours, testing, and documentation reviews complete.

- Defined Test Criteria met.

- Letter from Production Control stating the ability to support projected volumes with parts for manufacturing.

- Summary of test data recorded during the product sampling from Quality Assurance.

Notes:

CHAPTER 3. MAPICS RELEASE PROCESS

Introduction

- This chapter is intended to provide an overview of the MAPICS Release System used in Entry Systems Division (ESD) for Personal Computer based products. *All* related products that are built by RP Manufacturing require release via this system.

- The Manufacturing Accounting Production Information Control System (MAPICS) is used by ESD due to its' low overhead and rapid turn-around capabilities. The system operates on the S/34, S/36, and S/38 family of products and provides numerous manufacturing control and accounting functions including: requirements/capacity planning, inventory management, order entry, invoicing, costing, and accounts payable/receivable.

- The ESD Engineering Records department (9G5) controls the release information into the MAPICS system. Various organizations throughout ESD will then use the system to support the manufacture of the product.

Release Process

Pre-Release Activities

- Electrical components that have not been previously released on MAPICS or certified by a remote site CQRL must be qualified.

- Top level Bills of Material (B/Ms) including machine types, models, and options must be detailed in a *Release Plan* for the new product. This plan established by the Development Laboratory, RP Manufacturing PE and ESD Engineering Records, provides the basis for the product entry into the records system.

- The Development Laboratory must utilize ESD Document and Design Standards to prepare the product for release.

- The Development Laboratory and RP Manufacturing Product Engineering (PE) will jointly establish the content for the EC package including "Item Master" and "Product Structure" forms.

- A Change Review Board meeting will be held for preliminary analysis of the proposed change. This meeting has representatives from any area affected by this product release. Typically, Development, Product Engineering, Manufacturing Engineering, Procurement, Production Control, Test Engineering, and Quality Engineering attend this meeting to assess the impact of the change. These organizations will provide input to the release coordinator prior to formal release. The Change Review Board meeting also provides a mechanism for early warning of a pending change to Remote Manufacturers (Greenock).

Note: Initial releases of new products can be optionally inputted into the MAPICS System Development File for product costing purposes only. This input consists of "Item Master" and product "B/M Structure" forms.
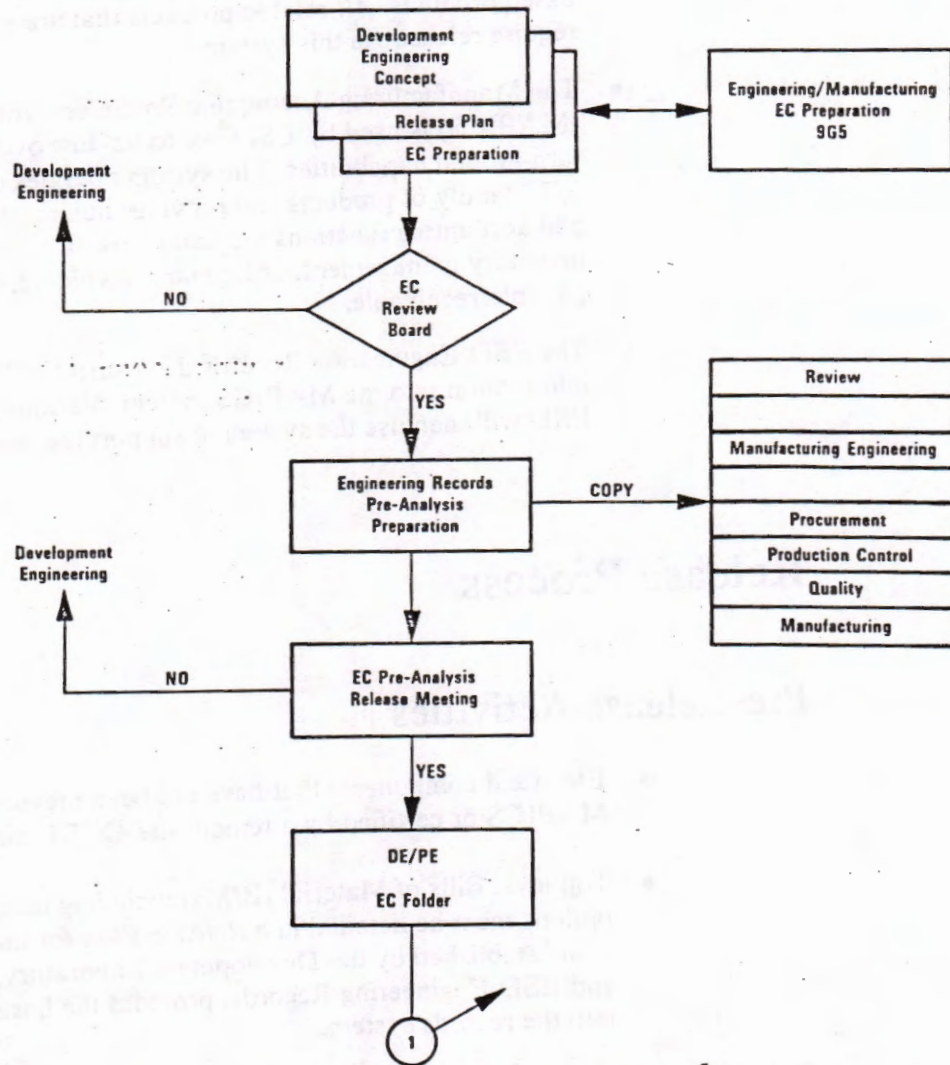
Figure 8. Engineering/Manufacturing EC Release Flow (Sheet 1 of 2)
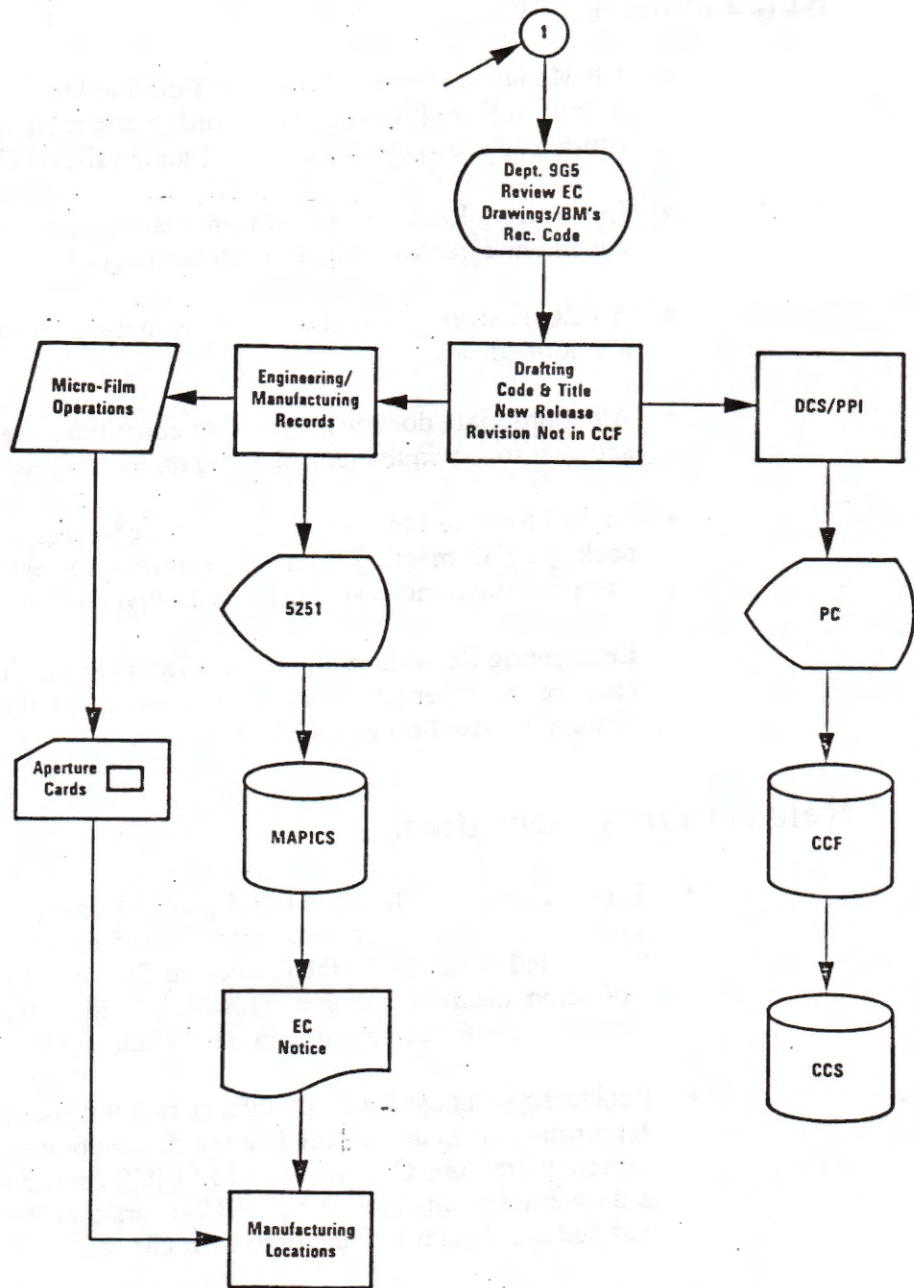
Figure 8. Engineering/Manufacturing EC Release Flow (Sheet 2 of 2)

Release Activities

- RP Manufacturing PE with input from the Development Laboratory will submit to ESD Engineering Records a complete release package containing drawings, logics, bill of materials, specifications, etc..

- Engineering Records will perform a verification to ensure documentation content and quality is appropriate for release.

- An EC Distribution List will be developed to ensure all areas affected are notified.

- All appropriate documentation that constitutes the change will be copied and sent to key individuals that are on the Product Sign-off team.

- An EC Release Meeting will be held for final sign-off on the change package. This meeting is intended for final review and sign-off only, since any differences are normally resolved prior to this meeting.

- Engineering Records will perform a final verification of the change package, documentation distribution, and an update to the MAPICS System for use throughout ESD.

Release Documentation

- The Corporate Central File (CCF) will be updated in parallel from the parts affected page of the engineering change. When this data is transmitted to the CCF, the Corporate Custom System File (CCSF) will automatically be altered. This file provides standard product nomenclature for use on international shipment bill of ladings.

- Engineering change hardcopy information will be distributed to all appropriate areas as indicated on the distribution list. Included in this hardcopy are the EC Notice and MAPICS Input forms. This document is the formal notification to MAPICS users that the system has been updated to reflect a product release or change.

- The master document distribution is the formal distribution on aperature cards or prints of the technical information required to manufacture the product. This information will be sent to remote sites involved in manufacture of the product.

Documentation Requirements

- "EC Notice", "Item Master", and "Product Structure" input forms must be completed to reflect the purpose and content of the release.

- All product drawings must be Class A Master quality or CADAM produced. If CADAM is utilized a DOU is required between ESD and the Developing Laboratory that specifies the data base for the product will not be altered.

- Logic Card Release documentation must comply with the criteria specified in Chapter 4. Card Design Guidelines.

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PRIORITY	E.C. QUALIFIERS PREANALYSIS	IF NO, SIGNATURE REQ'D.	E/C NOTICE PURPOSE/APPROVAL		E.C. NUMBER
EMERG	☒ YES ☐ NO				123456 A

E.C. CLASSIFICATION (CHECK ONE)			DATE RELEASED	MACH. TYPE
☐ X – PRE-ANNOUNCEMENT ☒ 0 – RELEASE	☐ 1 – DESIGN REFINEMENT ☐ 2 – FACTORY SERVICE	☐ 3 – COST REDUCTION ☐ 4 – FIELD SERVICE ☐ 9 – CUSTOMER ORDER	☐ N – NOTICE ONLY ☐ S – SAFETY ☐ T – TRANSFER	2-3-84	3150

ORIGINATING GROUP	SAFETY REVIEW REQUIRED (CK. ONE)	NO ☒	YES ☐	IF YES, SAFETY APPR.	APPROVALS REQUIRED PRIOR TO RELEASE (CK. ONE)	YES ☒	NO ☐	IF NO, SIGNATURE IS MANDATORY SIGN

PRODUCT ANALYST

MACHINE AFFECTED   5150.001   5150.164   5160.164 _____ _____ _____

SYSTEMS AFFECTED   5150.   5160.   _____ _____ _____

PRE-REQ E/C   NONE   _____ _____ _____ _____

CO-REQ E/C   NONE   _____ _____ _____ _____

TRANSMIT* | | | | | | 1 | | | | | A C D E F G K L S W

A = Austin
C = Charlotte
D = Dayton
E = Endicott
F = Fishkill
G = Greenock
K = Kingston
L = Local
S = Shelly
W = Wangaratta (Australia)

ROUTING	NAME	SIGNATURE	DATE	RELATED PRODUCTS/OTHER MACHINE			
DESIGNER/ ENGINEER	J. DOE			GROUPS AFFECTED	YES ☐	NO ☐	
PROJECT ENGN. MGR	M. DOE			MACH TYPE	NAME	SIGNATURE	DATE
M.E. BOX ENGN/COORD	J. SMITH						
PRODUCTION CTRL	M. JOHNS				A. DOUGLAS		
QUALITY ASSURANCE	J. JOHNS				J. SMITH		
PROCUREMENT	J. J. JOHNS						
OTHER							

REASON/EXPLANATION FOR E/C

PURPOSE   THIS E/C IS FOR TEST PURPOSES TO REFLECT DETAILED PURPOSE AND EXPLANATION FOR PROCESSING

EXPLANATION   REQUIRES A "SHORT STORY"

Figure 9. EC Notice Form – Sample

INPUT FORM

ITEM MASTER   FILE MAINTENANCE

NAME		DEPT	BLDG	PHONE	DATE		SHEET	OF		EC NO. 123456-A

LINE	REC	PART NO.	BASIC NAME	ITEM DESCRIPTION	LAB	CTRL	PLNCD	CHARC	DOC	DCS CODE	STAC	DES	DISP	M/C	ENGINEERING DRAWING NO. NEW P/N	EC NO	SUF
1	4	1234567	CABLE A	CPU FINAL	72			A 3	1	2345	A	F		C		123456	A
2																	
3	6346723 8		FRAME A	CPU	72			A 3	2	3456	A	F		C		123456	A
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	

	UM	PLANNER	TYPEC	DEPT MACH	ITEM	CLASS	VAL	DWG SIZE A B C D E G	A/C COUNT	PK CD	MLIC	PREV. EC	SUFFIX	REASON
1	EA	99	1	PC1	RR		1			01	P	345678	B	RELEASE
2	EA	100	1	PC2	PO			J		02	M	345678	B	REVISE
3														
4														
5														
6														
7														
8														
9														
10														
11														

Figure 10. Item Master Form – Sample

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MAPICS 3-7

IBM-G-148   IBM-G-198   IBM-G-115

PRODUCT STRUCTURE FILE MAINTENANCE

EC NUMBER
123456 A

Item No.
|7|6|5|4|3|2|1|

SAME AS __ __ __ __ __ EXCEPT

MOD QTY	CHG EFF TO	ADD/EST EFF FR	DEV. DELETE	Component Item No.	Quantity per	Effective date from	Effective date to
X				|6|5|4|3|2|1|7|	|1|•|0|0|0|	|0|1|1|1|0|8|4|	
		X		|4|5|6|7|8|9|1|1|	•		|0|1|1|1|0|8|4|
			X	|5|6|7|8|9|9|	•		
			X	|6|7|8|9|8|8|	•		

Figure 11. Product Structure Form – Sample

IBM-G-115
IBM-G-148

Responsibilities

Development Laboratory

- Provide early notification by developing a Release Plan for the new product.

- Provide all documentation required by ESD.

- Interact with RP Manufacturing PE and ESD Engineering Records to complete documentation and support sign-off meetings.

RP Manufacturing Product Engineering

- Coordinate documentation requirements with the Development Laboratory.

- Coordinate Change Review Board and release meetings.

- EC and Master Document Distribution.

ESD Engineering Records

- Verify data contained within EC package for quality and completeness.

- Answer release questions and concerns in support of process.

- Process the EC and update all appropriate records, data bases, disaster files, etc..

- Distribute pre-analysis and final EC package to individuals and remote areas affected as indicated on distribution list.

Notes:

CHAPTER 4. CARD DESIGN GUIDELINES

Introduction

This chapter contains design guidelines to assist in the development of unique option cards for the PC Product Family. Included are: Documentation Requirements, leadtimes and specifications for the Raw Card and Assembly processes. Adherence to these guidelines will ensure manufacturing cost and quality objectives will be met.

Computer Aided Design (CAD)

Documents Required for CAD Vendor:

- Logics
- Component Prints
- Print of Basic Raw Card (physical size)
- ESD Ground Rules for Card Layout
- Layer structure
- List of documents needed from CAD Vendor

Request for Quotation (RFQ) Cycle

Documents Required for RFQ

- Complete card documentation package
- Test plan
- Quality plan
- Quantities

Activity	Lead Time
Quote Preparation	2 Weeks
Quote Cycle	4 Weeks
Vendor Selection	2 Weeks

Production Cycle

Sequence	Activity	Current Lead Times
1.	Order Components	
	• LSI Memory	30 Weeks
	• Generic	14 Weeks
	• Raw Cards	12 Weeks
2.	ITL Lab for LSI and Memory	4 Weeks
3.	Establish and implement efficient production process	4 Weeks
4.	Establish and implement quality program	4 Weeks
5.	Develop and implement incircuit test programs	6 Weeks
6.	Develop and implement functional tester on line	12 Weeks
Note:	Shipment of product in quantities after the above has been accomplished – 4 Weeks assuming unique manufacturing is not required.	

Raw Card Specification

General Artwork for High Technology Boards

- The artwork must be produced on a Gerber Plotter or similar equipment which is capable of maintaining .076 mm (±.003 in.) accuracy at 1:1 ratio.

- Holes must be located on a .635 mm (.025 in.) grid.

- (Optional) The artwork for all boards classified as high technology boards must be glass artwork.

- Pads will be square for pin 1 of components and round for all other pins and patterns.

Holes, Pad and Conductor Sizes

- For "1 line per channel" artwork (single conductor passing between two holes spaced on 2.54 mm (.100 in.) centers) the following dimensions are required:

  - Maximum hole size: 1.02 ±.076 mm (.040 ±.003 in.)
  - Pad size: 1.52 mm (.060 in.) square pin 1 and 1.68 mm (.066 in.) round all others
  - Conductor size: .304 mm (.012 in.)
  - Minimum conductor spacing: .279 mm (.011 in.)

- For "2 line per channel" artwork (two conductors passing between two holes spaced on 2.54 mm (.100 in.) centers) the following dimensions are required:

  - Maximum hole size: 1.02 ±.076 mm (.040 ±.003 in.)
  - Pad size: 1.52 mm (.060 in.) square pin 1 and 1.52 mm (.060 in.) round all others
  - Conductor size: .203 mm (.008 in.)
  - Minimum conductor spacing: .203 mm (.008 in.)

- Land patterns on the solder side of the board *should* run perpendicular to the axis of Dual In-Line Package (DIP) module rotation. Parallel lands next to DIP leads may cause solder bridges.

- All connections to inner planes must be provided with thermal breaks similar to but smaller than specified for ground planes in the "copper patterns" paragraph of the artwork section of this document.

- The clearance pads for internal layers on unconnected holes must be at least .888 mm (.035 in.) larger than nominal hole diameter.

- The fabrication drawing for multilayer boards must included a cross sectional drawing of the multilayer stack including dimensions and tolerances between layers.

- All card edge tabs *must* have a pad on .100" grid next to tab for testing.

- Add test pad, where easy, on all nets, pads to be on .100" grid.

- Any net going between non-.100" component pins must have a via/pad in the net on .100" grid.

- All I/O connections must have a test pad on .100" grid at enter/exit point.

- There should be no copper or holes within 2.54 mm (.100 in.) of the raw card edge.

- Minimum spacing between conductors and adjacent hardware shall be 1.52 mm (.060 in.).

- Clearance pads in soldermask artwork should be 0.30 mm (.012 in.) larger than the copper pad size, .006 on each side.

- Holes for components or VIAS near DIP packs should be located in a way that would prevent dips from being mislocated by one or more hole positions.

- When a hole is located in a ground or voltage plane or large copper conductor, the hole pad should first be located so it is electrically isolated by a minimum of .76 mm (.030 in.) from the surrounding copper, then the pad should be connected to the surrounding copper with two to four .38 mm (.015 in.) thick radial conductors.

- All power and ground traces must be minimum .050" traces with the following exceptions:

  - Stub less than 2.00" may be minimum .025" traces

  - Tie up and tie downs to signal pins may be minimum .008".

- Component signal pins which are tied up or down with power or ground *must not* go to internal planes directly, but be wired from an internal plane via to the pin as a surface trace (allows later rework if required).

- The width of a conductor attached to a pad shall be no larger than 1/2 the diameter of the pad and shall attach to the pad in a radial line. On square pads the conductor should exit at 90° or from the corner of the pad.

- Conductor-pad must not result in angles less than 90°. All unnecessary angles should be eliminated.

- All signal lands begin and end at pads. No "T's" are allowed.

- Do not outline the P.C. board in the artwork, only define the corners and edge connectors. P.C. edge connector pattern should extend .51 mm (.020 in.) beyond finished board edge to prevent shorting when trimmed.

- A conductor connecting two hole pads should not be totally covered by a component.

- There should be no mounting holes for components that permit the body of the component to be less than 2.54 mm (.100 in.) from the card edge.

- Tooling holes that are free of components are required at diagonal corners of card.

Assembly Layout Specifications

- All six, eight and ten pin cans (T0-5, T0-T6 and T0-100) must be mounted with a 10/16 to 15.24 mm (.4 to .6 in.) expanded pin circle, or formed to mount in a DIP pattern (preferred). All pad areas must be circular or square.

- All three pin transistors must be mounted with the center lead offset to form a circle pattern with the two outside leads (except T0-220 transistors).

- All components should be mounted on a .100" grid. If components, particularly connectors, require something other than .100" grid, pin 1 shall be on .100" grid.

- When mounting axial lead components next to each other, every attempt should be made to locate the mounting holes in a row. For example, if mounting several 1/8 watt resistors next to each other, the resulting hole pattern would be two rows of seven holes with the rows separated by 10.16 mm (.400 in.) and the holes within each row separated by 2.54 mm to 3.81 mm (.100 to .150 in.).

- All axial lead components should mount parallel to the "X-X", or "Y-Y" axis. Put all components in the same axis if possible as two axis insertion increases cost.

- All polarized components of the same part number must be oriented with the polarized pin pointing the same direction.

- All DIP packages should be perpendicular to the "X" axis with pin 1 on every module closest to the "X" axis. A line from pin 1 to pin 2 of the DIP package must be perpendicular to the "X" axis.

- Minimum mounting clearances for DIP packages are 2.54 mm (.100 in.) side-to-side and 5.07 mm (.200 in.) end-to-end.

- Minimum mounting clearance for DIP sockets .200 mm side-to-side and .200 mm end-to-end.

- All glass diodes must have a minimum mounting span of 12.7 mm (.500 in.) distance between mounting holes.

- All Single In-Line Packages (SIP) packages should be perpendicular to the "X" axis with pin 1 farthest from the "X" axis.

- All components of the same part number and/or body size should have the same span (distance between mounting holes).

- All axial lead components must have a minimum space from the end of the component body to the centerline of the mounting hole as follows:

Wire Diameter		Minimum Distance	
mm	in.	mm	in.
.381	.015	1.905	.075
.508	.020	1.905	.075
.762	.030	2.286	.090
1.016	.040	2.921	.115
1.270	.050	3.048	.120

Note: All spans should be in increments of 2.54 mm (.100 in.). Use maximum body dimension for span calculation.

- The clearance from the centerline of any component mounting hole to the nearest part of any other component should be 1.91 mm (.075 in.) minimum; to the board edge should be 2.54 mm (.100 in.).

- The clearance from the card edge to any part of a component body must be a minimum of 2.54 mm (.100 in.).

- Vertical mounting of axial lead components is not allowed.

Labeling

General

- The layer identification should be included in the artwork (i.e., component side, solder side). The artwork should be laid out with all holes located on a .635 mm (.025 in.) grid. The part number (PN XXXXXXX) should be included in the solder side artwork. No artwork designations or prefixes should be used in the raw card part number. The artwork part number should be placed in the title block of the artwork.

- P.C. edge connector contacts should have the pin designations of the first and last contacts labeled in the artwork on both sides of the board and should be keyed if others are used in vicinity.

- Eteched part number or letters shall be 2.54 mm (.100 in.) minimum height.

- Mark end positions of connectors and card edge tabs with pin identification as shown on outline drawing.

Component Side (Front)

- The nomenclature silkscreen artwork should include component body outlines, schematic designation and polarity or component orientation. The nomenclature artwork must not overlap onto any solderable surfaces. Nomenclature must be applied over the solder masked areas only.

- The component location screen must indicate the following on the component side of card.

    - Component outline

    - Component identification code ("type" from B/M)

    - Orientation of component (notch or pin 1) identified

    - Diodes anode/cathode indicated

    - "T" indicating polarity of polarized capacitors

    - Card name as per outline drawing

- If at all possible, component prime pin designations should be included in the artwork (i.e., diode and capacitor polarity, DIP pin 1, transistor emitter pin, connector pin 1, etc.) on both solder and component sides.

- Mark all polarized decoupling caps with "+" to most positive side of component.

Solder Side (Back)

- Place IBM etched part number (PN) on card. Minimum character height is .100". This number is provided on outline drawing.

- Mark end positions of connectors and card edge tabs with pin identification as shown on card outline drawing.

- A space should be provided in the solder side artwork for the vendor to etch his company U.L. logo and a four digit week-year manufacturing date code. This is to include 94V-0 marking.

- Only the raw card part number should be included in the solder side artwork. The EC number should not appear in the artwork. No artwork designations or prefixes should be used in the raw card part number.

Additional Manufacturing Documentation

Hole Location List

- The hole location list must include the following information for all holes: hole number, hole size and the X-Y coordinates in English. All holes must be specified as plated, non-plated or optional and have positive X-Y coordinates. The holes must be consecutively numbered starting with the plated holes and continuing through the non-plated and optional plated holes.

Net List

- The net list must list the circuit nets by names (alpha or numeric characters) and list the hole number or hole X-Y coordinates which are connected in each net. All end points or branches of nets including connector contact tabs must also be listed in the net they are connected in.

Drill Graphics Artwork

- Drill templates should show the location of all holes in the drill listing. The size of the holes on the drill template should be indicated by different symbols for each hole size. Also indicate Plated Through Hole (PTH) and Non-Plated Through Hole (NPTH).

Solder Mask Artwork

- The solder mask must allow *all* plated through holes to be solder-filled (card vacuum required at text fixture).

- On the solder side of the card, the solder mask shall not be less than .010" from the pad edge for 270°, any may extend to .003" of the hole for the remaining 90°.

- On the component side of the card (front), the solder mask may extend to the edge of the hole at any point but 50% of the pad area must be free of the mask.

Notes:

CHAPTER 5. COMPATIBILITY TESTING

Introduction

Related Product Compatibility Testing is the structured evaluation that is performed during the Design Verification Test (DVT) to determine if existing applications and previously released products can successfully function without changes.

This chapter summarizes the Compatibility Test guidelines for related product development. It also outlines the Compatibility Test responsibilities of the Developing Lab, and defines areas of support from ESD Related Products Software Engineering. *These are guidelines only*. You may run the Compatibility Tests for your product in any manner you wish. However, by utilizing these guidelines, we are assured of a common approach to fulfilling your Compatibility Test requirements.

Compatibility Guidelines for Related Product Development

Using the same language and the BIOS and DOS interfaces go a long way in achieving product compatibility. However, there are still several factors which need to be taken into consideration:

- Timing Dependencies
- Unequal Configurations
- Hardware Differences

Timing Dependencies

Programs may run faster or slower on different Personal Computers depending if they are running in RAM or ROM. This may or may not cause a difference in execution time depending on the application. Most applications are very I/O dependent in which case the execution time is not the critical factor and may not be noticeable. In other cases, the application runs the same but merely take a different amount of time.

If your application has critical timing dependencies, any timing differences (faster or slower) may adversely affect its usability. Using an application's program execution speed to achieve a desired timing can affect the application. In these cases, the application may need to be modified.

Performance of specific I/O devices may also differ between the different members of the PC family. You should also avoid using timing of any I/O device as a dependency for your product.

Unequal Configurations

In designing an application product to run on all members of the PC family, you need to make sure that the required hardware configuration is available on all machines. This means the application's minimum requirements are met by all Personal Computers.

Hardware Differences

To be able to run on any PC without change, an application utilizing a specific I/O device must have access to identical devices, or devices with identical operating characteristics and interfaces. The Personal Computer family has compatible I/O device capabilities. The hardware differences may lead to incompatibilities at the application level. Once again, if your application maintains an interface to the PC family at the BIOS and DOS interrupt levels, then all hardware differences are handled transparently to your application. If your application goes below the BIOS level and directly addresses the hardware, then there could be an incompatibility.

Development Laboratory Responsibilities

The Related Product Developing Laboratory is responsible for:

- Developing the Compatibility Test Plan.

- Including compatibility testing in the DVT.

- Performing the tests.

- Ensuring that the announced PC compatibility statements are supported by their Compatibility Test Plan.

- Verification and testing of all maintenance and future enhancements to the product, on current or additional PC compatibility statements.

- Designing test buckets, where available test buckets do not sufficiently test and verify the related product's compatibility statements.

DVT-Compatibility Testing

- A sample scenario of the Compatibility Test portion of DVT is as follows:

Entry Requirements

1. Initial checkpoint and reviews with ESD Related Products Software Engineering and System Assurance.

2. Schedule of events of compatibility testing, such as start of test (date), milestones, and test completion will be reviewed.

3. Functions to be tested such as languages, application and operating system will be defined.

4. Copy of the test plan with criteria made available.

Exit Requirements

1. All problems are fixed and verified.

2. All problem reports are closed.

3. All test cases are successfully completed on the same level code.

4. All concerns resolved or have action plan.

5. System Assurance concurrence.

6. ES Related Products Software Engineering review and approval of Final Report.

RP Software Engineering Compatibility Test Support

The ESD Related Products Software Engineering Group will support the Development Lab's approved PC Compatibility Test Plan by providing available test tools, education, guidance and assistance as needed.

The ESD Related Products Software Engineering Group will keep the Development Lab informed of new operating systems or applications as they are developed and become available.

Compatibility Test Tools

The following compatibility test tools are available from the ESD Related Products Software Engineering Group. Many of these tests are fully automated with complete operating instructions. As these tests are updated or new compatibility tests are made available to us, they will be distributed as needed.

Operating Systems

- DOS 1.10
- DOS 2.00
- DOS 2.10

Language Tests

- BASIC 1.00
- APL 1.00
- PC*jr* BASIC 1.00

Application Tests

- Multiplan 1.10
- VisiCalc 1.20
- *pfs: file* 1.00
- *pfs: report* 1.00
- PeachText 1.00
- Professional Editor 1.00
- Personal Editor 1.00
- Diskette Librarian 1.00
- Word Proof 1.00
- FileCommand 1.00

Hardware Test

- BASIC Exerciser

Notes:

CHAPTER 6. CI105 RELIABILITY

Introduction

- Reliable products are commonplace in our industry, and customer dependency on information processing causes quality and reliability to be a fundamental requirement in our products (both hardware and software). IBM's continued success is dependent on our ability to provide products and services superior to others.

- Corporate Instruction 105 provides the direction to all operating units with regard to RAS characteristics required by IBM products and programming. ESD complies with the intent of CI105 and requires all operating units utilizing the IBM Personal Computer, its parts, peripherals, and software as part of their application (product) to do likewise.

- The RAS performance specifications are numbers which describe in industry recognizable and comparable terms, the RAS characteristics of the IBM product. *The performance of the new product at general availability must be superior to currently available products in the industry.*

Instruction Overview

- Corporate Instruction 105 outlines the responsibilities of the product development manager, Manufacturing, Marketing, and Service in the definition of the RAS criteria for any new IBM product. A summary of these responsibilities follows (for details of responsibilities, refer to CI105).

Development Engineering

- Defines the RAS performance requirements.

- Sets and implements aggressive objectives, specifications, and quality requirements consistent with the RAS performance requirements.

- Obtains concurrence to the RAS objectives and specifications from appropriate Manufacturingements.

- Obtains concurrence to the RAS objectives and specifications from appropriate Manufacturing, Marketing, and Service organizations worldwide.

- Concurs with the Service organization's Service Plan for the product.

Manufacturing

- Responsible for providing and maintaining effective quality programs that are compatible with RAS performance specifications.

- Specifies quality targets.

- Establishes tracking and measurement programs.

Marketing

- Provides market RAS requirements input to the Development Laboratory.

- Concurs with RAS performance objectives and specifications produced by the Development Laboratory.

Service Organization

- Provides service environment and serviceability requirements input to the Development Laboratory.

- Concurs with RAS performance objectives and specifications produced by the Development Laboratory.

- Creates and implements the plan necessary to maintain the products within RAS specifications.

Related Products Conformance

- The Personal Computer product line was designed to compete (quality, reliability and cost) in specific markets. The vendor sourcing strategy, in-house manufacturing process, and quality plans reflect ESD's commitment to produce a *high quality-low cost* product.

- The manufacturing strategy for Related Products is based on volume procurement of common PC components and similar assembly and test processes. Therefore, reliability projections for these common parts (i.e., power supplies, cards, diskette drives, etc.) will be compatible to ESD Manufacturing Service Cost Estimates (SCE).

- Service Cost Estimates for announced and unannounced ESD products are available to approved Related Products. This information is distributed on a "Need to Know" basis by ESD Related Products Software Engineering.

- Unique hardware (cards) associated with a Related Product may be 'hardened' to improve reliability. However, it must be understood that this will increase cost and/or have schedule impacts.

- It is the responsibility of the Developing Laboratory to develop reliability targets for any unique additions to the Base PC.
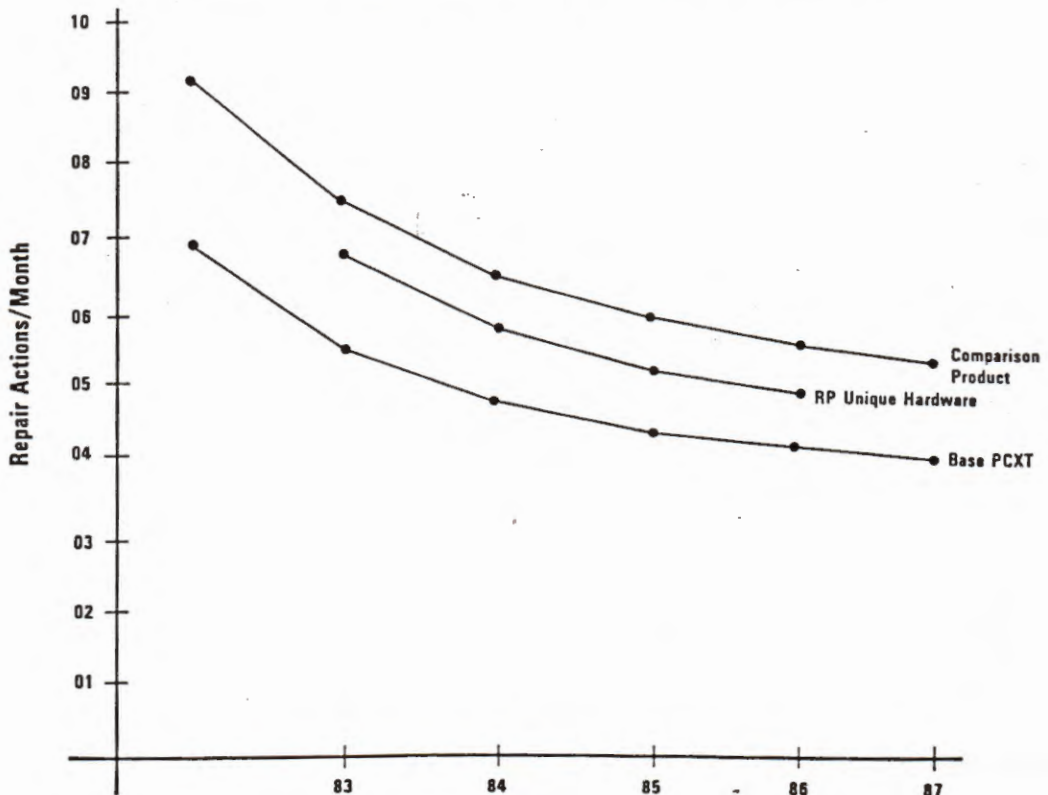
Figure 12. Related Products CI105 Comparison

Notes:

CHAPTER 7. PRODUCT SAFETY

Introduction

- This chapter provides an overview of the design requirements and associated responsibilities to ensure Related Products meet all required safety standards. It is especially important that these standards are upheld in a marketplace that allows the customer access to hardware under the product covers.

IBM Position on Product Safety

- No products will be manufactured that pose a safety hazard for their intended use.

- No products will contain or emit hazardous compounds or materials.

- All products will meet or exceed legal requirements in their market areas.

- All products must have a visual mark (label) of approval by the appropriate test agency.

- Products will be designed with safety as a key parameter.

- IBM bears primary responsibility for the entire product including vendor subassemblies that are incorporated into our systems.

Agency Requirements for Approval of a New Machine Type

- One unit characteristic of production level hardware.
- Letter of Application from Product Safety.
- Complete product description of product:
  - Intended application/functions provided/environment of use.
  - Physical dimensions and weight of unit.
  - Material enclosure is fabricated from.
- List of components used in product:

  - Primary Power
  - Safety Circuits
  - Plastic Parts
  - Hazardous Voltage
- Complete schematics of power system.
- Data from compliance tests:
  - Enclosure – flammability/impact/warp
  - Component critical temperatures
  - Input and leakage current
  - Dielectric strength (HI-POT)
  - Abnormal conditions (single fault testing)
  - Stability for floor standing units.
- Photographs of product:
  - Overall view
  - Interior view
  - Detail views of power supply.
- Label used for power rating (UL/CSA/TUV).

Agency Requirements for Approval of Feature (Card)

- Manufacturer's name producing raw card.
- Current load of card (all voltages).
- Operating temperature of any power devices.
- Artwork and assembly drawings of card.
- Machine type(s) that use the feature.
- Product manager: name, department, phone number.

  Note: Product Safety requires a complete ship level feature for bonded stock prior to MVT Product Safety Sign-off.

Site Product Safety Responsibilities

- Apply to appropriate agencies for listing and certification.
- Schedule agency examinations of product.
- Interpret/clarify agency standards.
- Provide data to appropriate agencies.
- Assist Development Laboratories with testing.
- Arrange for product photographs.
- Maintain a report file for all agency listed certified products.
- Update agency listing/certification reports as changes are made.
- Escort service inspectors during audits.
- Coordinate the resolution of variations resulting from product non-compliance.

Development Engineering Responsibilities

- Development Engineering has the overall responsibility to design the product in adherence with IBM Safety Standards. Additionally, development must perform safety evaluations and provide Product Safety with test results and design information as stated in the preceding sections.

Product Engineering Responsibilities

- Product Engineering is responsible to ensure the product safety requirements are maintained throughout the life of the product.

Compliance Standards Reference

- U.L. 478 – Information Processing and Business Equipment
- U.L. 114 – Office Appliances and Business Machines
- U.L. 94 – Tests for Flammability of Plastic Materials
- U.L. 796 – Electrical Printed Wiring Boards
- U.L. 746C – Polymeric Materials Used in Electrical Equipment
- CSA C22.2 #0-1975 – Definitions and General Requirements
- CSA C22.2 #143-M1975 – Office Machines
- CSA C22.2 #154-M1983 – Electronic Data Processing
- IEC 380 – Safety of Electronically Energized Office Machines
- IEC 65 – Safety Requirements for Mains Operated Electronic and Related Apparatus for Household and General Use

Note: Various additional Standards are referenced in the above list.

CHAPTER 8. RELIABILITY/AVAILABILITY/ SERVICEABILITY (RAS)

Introduction

- This chapter contains a detailed description of the RAS characteristics associated with the Personal Computer. The intent is to give the reader an appreciation for the entire maintenance philosophy, of which the Related Product is built upon.

- Since the manufacturing process utilizes a version of the advanced diagnostics, there is a section of this process and associated requirements.

- Generic RAS requirements that the Development Related Product Programmer will need to interface with the base system are included. Specific requirements are available upon request to approved Related Product Development organizations by contacting *ESD RP Software Engineering.*

Maintenance Philosophy

- The maintenance strategy for Related Products is based on customer detection of system and I/O device errors. Visible failing components (i.e., display screen blank), coded speaker tones, and error messages displayed by system and application programs will indicate an error condition to the customer. The maintenance strategy consists of customer problem determination procedures, CSD service, IBM authorized dealer service and repair center/depot service.

- A ROM resident test within the CPU, the Power-On Self Test (POST), is executed at each power-on of the system. This test verifies operation of the base system including the display monitor, keyboard, diskette drive, hardfile and I/O expansion interfaces. Additional diagnostic aids that will be available for error analysis and repair are; Customer Problem Determination Procedures, diskette resident diagnostic programs, Problem Isolation Charts, and service information. All diagnostic tests except the Power-On Self Test will be executed in offline mode. There is no plan for concurrent maintenance.

Minimum Hardware Configuration

- The minimum hardware configuration that is required to service a Related Product system unit and its related I/O devices is as follows:

  - System Unit with 64KB memory minimum

  - Display Adapter in System Unit with appropriate Monitor

  - Keyboard

  - Diskette Drive with adapter in System Unit

Customer Problem Determination

- The customer's ship group will include a copy of the Customer Problem Determination Procedures (PDP) and a Diagnostic Diskette. The PDPs provide a set of procedures that the customer is expected to follow whenever an error is detected. These procedures consist of simple steps and illustrations that direct the customer during problem determination. They provide isolation to a Customer Replaceable Unit (CRU). A CRU is defined to be a unit consisting of one or more Field Replaceable Units (FRUs). A CRU is generally an entire box or unit (i.e., System Unit, Expansion Unit, Keyboard, Display or Printer). A FRU is an assembly that is exchanged in its entirety when any one of its components fail (i.e., card, cable, etc.). The problem determination procedures will isolate to a FRU within the system unit where possible, however the customer will be directed only to the CRU.

- The system is to be powered off/on before the customer retries the operation. The POST will be executed when the system is powered on. In the event the POST detects an error before the display monitor is initialized the error condition will be identified by a series of beeps, otherwise an error code will be displayed. If the POST fails to detect a problem, the PDP will instruct the customer to execute the test routines on the diagnostic diskette. More extensive testing of the base system and I/O attachments is performed. These programs will require some operator intervention. If a hardware error is not detected by the problem determination procedures, a software error or an operator procedural error will be assumed.

Implementation Details

- The following section describes the RAS elements that are included in the maintenance package. It addresses elements designed for customer's use and those designed for trained service personnel.

Diagnostic Support

- *Two levels* of diagnostic support are provided by the PC RP maintenance package. *Diagnostic Aids* are specifically designed for customer use. They may also be used by other service personnel. *Advanced Service Aids* are designed for trained service personnel. However, they may be purchased by the customer, as they are contained in the *Hardware Maintenance & Service* manual – a saleable item.

Power-On Self Tests

- The Power-On Self Test is ROM resident and is initiated automatically with each power-on of the system. It verifies correct operation of the base system. The tests are self-configuring and memory size is displayed on the monitor. If any errors are detected, the error messages are displayed and the system stops and waits for the operator to take action to continue (press the F1 function key). If any errors have occurred, two short beeps are sounded at the end of POST, otherwise a single short beep is sounded. Upon successful completion of the POST or go-ahead from the operator, the POST attempts to boot the system from the diskette. If no diskette is present or an error is encountered, the POST attempts to boot the system from the hardfile. If the hardfile has not been properly initialized or has an error, the POST passes control to the BASIC interpreter. The POST is also executed (with the execption of the memory test) when a system reset is requested.

System Tests

- The following system functions are tested by the POST.

System Board

- Minimal 8088 Instruction set test
- Flag set/reset test
- Register data wrap test
- Address and data lines verified
- DMA address and count registers test
- ROM checksum tests
- 8259 interrupt controller test
- 8253 timer test

RAM

- Write/Read/Verify data patterns FF, AA, 55, 01, and 00
- Verify correct addressing

Video

- Video RAM test
- CRT Interface lines test

Keyboard

- Verify Keyboard software reset function
- Check for stuck keys

Diskette

- Diskette attachment interface test
- Primary diskette functional test (recalibrate)

Hardfile

- Hardfile adapter interface test
- Hardfile operational check

I/O Expansion Unit

- Verify bus data path and unit powered on

Power-On Self Test Error Reporting

- Errors are identified using the three following methods: system halt, error beep, and error codes. The system is halted for all critical errors encountered (i.e., 8088 instruction set test failure). An error beep is given if the primary display adapter fails. Once the display has been tested, error codes are displayed for all additional errors detected. The system continues with execution for all non-critical errors that are detected.

Note: The customer should refer to the Problem Determination Procedures for all errors detected.

Diagnostic Aids Overview

- The Diagnostic Aids are provided in the customer's ship group. They consist of the following:

  - Problem Determination Procedures (PDPs)

  - Diagnostic Aid Diskette

- The PDPs provide easy-to-follow steps that the customer is to follow when an error is detected. The PDPs will differentiate between operator procedural errors and hardware errors. It directs the customer when to load and execute the problem determination diagnostics which reside on a diskette. A menu is displayed when the diagnostics are loaded. The Diagnostic test routines provide more extensive testing of the system and will require some operator intervention. The PDPs instructs the customer to remove all non-IBM cards, modules, and external devices before beginning problem determination. The problem determination procedures will usually isolate to a CRU. In some cases FRUs will be isolated. Only CRUs will be identified by name to the customer. All CRUs and FRUs detected will be identified via codes that the customer can relay to the service personnel when requesting service.

Diagnostics Aids Diskette Test Routines

- The Diagnostic Aids test routines are contained on a Diagnostic Diskette.

  Note: There is no plan to support the diagnostic programs being resident on the hardfile.

- The following programs are included:

  - Diagnostic Control Program

  - Diagnostic Test Programs

  - Utility Programs

Diagnostic Control Program (DCP)

- This program provides the following support functions for all programs loaded from the Diagnostic Diskette:

  - Program Selection/Load

  - Message Display

  - Keyboard inputs

  - Interrupt Handling

- The DCP is loaded when powering on the system with the diagnostic diskette in drive A. The primary menu is displayed initially.

```
SELECT AN OPTION

0 — RUN DIAGNOSTIC ROUTINES
1 — FORMAT DISKETTE
2 — COPY DISKETTE
9 — EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED ?
```

Diagnostic Test Routines

- To execute the Diagnostic test routines, the operator must select *Option 0* of the above primary menu. An installed devices menu is then displayed as shown:

```
THE INSTALLED DEVICES ARE

    SYSTEM BOARD
    xxxKB MEMORY
    KEYBOARD
    MONOCHROME & PRINTER ADAPTER
    COLOR/GRAPHICS ADAPTER
    x DISKETTE DRIVE(S) & ADAPTER
    PARALLEL PRINTER ADAPTER
    ASYNC COMMUNICATIONS ADAPTER
    ALT ASYNC COMMUNICATIONS ADPT
    GAME CONTROL ADAPTER
    MATRIX PRINTER
    SDLC COMMUNICATIONS ADAPTER
    BISYNC COMMUNICATIONS ADAPTER
    x DISK DRIVE(S) & ADAPTER
    EXPANSION OPTION, SW= ?

IS THE LIST CORRECT (Y/N) ?
```

- If the system configuration is determined to be correct, the operator should reply with a "Y". A system checkout menu is then displayed as follows:

```
SYSTEM CHECKOUT

0 — RUN TESTS ONE TIME
1 — RUN TESTS MULTIPLE TIMES
2 — LOG UTILITIES
9 — EXIT DIAGNOSTIC ROUTINES

ENTER THE ACTION DESIRED
```

- The diagnostic programs are executed in sequence when *Option 0* of the system checkout menu is selected. Messages indicating successful testing of each option are displayed as well as any errors that are detected. Control is returned to the menu when all options have been tested.

- To loop the diagnostic programs the operator should select *Option 1* of the system checkout menu. *Option 1* allows looping the diagnostics indefinitely or a defined number of times as selected by the operator. Operator intervention is not required once the initial set up has been done.

- When *Option 2* is selected, the menu is displayed. As suggested by the menu, error logging and listing is provided as well as a time of day clock. *Option 9* returns control to the system checkout menu.

  UTILITIES

  0 – START ERROR LOG
  1 – STOP ERROR LOG
  2 – LIST LOG
  3 – SET TIME OF DAY
  4 – DISPLAY TIME OF DAY
  9 – RETURN FROM UTILITIES

  ENTER THE ACTION DESIRED ?

Format Diskette

- *Option 1* of the primary menu allows the operator to format a diskette. The operator is prompted with the message "WHICH DRIVE CONTAINS DISKETTE TO BE FORMATTED?" when *Option 1* is entered. The valid drive identifiers are the same as those accepted by DOS. DCP will continuously prompt the operator for the Drive ID until a valid drive is specified.

  Note: Formatting of the hardfile is not supported by the DCP.

Copy Diskette

- *Option 2* of the primary menu allows the operator to copy one diskette to another. It is not necessary to format a diskette before copying it. The operator is prompted with the following messages:

  WHICH DRIVE CONTAINS SOURCE DISKETTE ?
  WHICH DRIVE CONTAINS TARGET DISKETTE ?
  INSERT DISKETTES – PRESS ENTER ?

Exit to System Diskette

- *Option 9* of the primary menu allows the operator to boot another diskette when inserted in Drive A. The operator is prompted with the following message:

Insert system diskette in Drive A and press enter?

- The normal boot-strap process is then executed.

Advanced Service Aids Overview

- The Advanced Service Aids will not be a part of the customer's ship group. They are designed for trained service personnel usage. They consist of the following:

  - Diskette resident diagnostic tests

  - Problem Isolation Charts

  - Service information

Advanced Service Aids

- The Advanced Service Aids are contained on the Advanced Diagnostic Diskette. The following programs are included:

  - Diagnostic Control Program

  - Diagnostic Test Programs

  - Utility Programs

  - Diagnostic Control Program (DCP)

  - Diagnostic Test Routines

- To execute the diagnostic test routines, the operator must select *Option 0* of the primary menu. The installed options menu is then displayed. The list of options installed is the same as the customer diagnostics list with the addition of the diagnostic device numbers.

- Only those options installed on the system from the above list will be displayed. *Options 0 and 1* of the system checkout menu prompt the operator for the options to be tested. The numbers of the options to be tested are entered, separated by spaces or commas. Simply pressing the Enter key selects all options. Messages indicating successful testing of each option are displayed as well as any errors that are detected. Control is returned to the checkout menu when all options have been tested.

- Problem Isolation Charts (PICs) will be used to guide the user through the various system test procedures. They will instruct the user to select and run certain diagnostic programs or perform removal/adjustment/replacement procedures. Each option PIC provides theory of operation for that option. Prior to using the Advanced Service Aids package, the Power-On Self tests and the Diagnostic Aids test routines should have been executed. The user is directed to a specific PIC based on the error code(s) given by these tests. For all No Trouble Found (NTF) errors the user is directed to begin with the Start PIC.

- The service information (*Hardware Maintenance & Service* manual) includes parts information, removal procedures for FRUs, component IDs, and pin, socket, and board location information. These items will all be provided in one binder with a holder for the diskette.

Error Reporting and Logging

- Status indicators are provided by the hardware for software error handling routines. Optionally, error logging may be selected while running the diagnostic programs.

    Note: Refer to "RAS Specific Requirements".

Intermittent Error Strategy

- The diagnostic test routines provide the capability to log diagnostic errors and to loop the diagnostic test routines. The documentation will direct the user in the use of these functions when troubleshooting an intermittent problem.

- In the event that parity errors occur, the BIOS ROM will attempt to isolate the error address to the failing 32K block of RAM. The address will be displayed on the screen.

Documentation

- Several manuals are provided to support the maintenance of PC RP system. They are described below.

Customer Documentation

- The *Guide to Operations* manual containing Problem Determination Procedures is contained in the ship group. They provide a method whereby the customer can perform problem determination prior to requesting service.

Trained Service Personnel Documentation

- Support information that is included in the Advanced Service Aid package is as follows:

  - Hardware Maintenance and Service manual

  - Problem Isolation Charts (PICs)

  - Service Reference Information

Hardware EC Philosophy

- There will not be any mandatory Field Engineering Changes. Functional changes will be "phased in" on the manufacturing line only. Changes that affect the function or form of the machine will generate a part number change to the affected part. Changes that do not affect form or function will not cause a change in the part number. There are no provisions for "EC levels" on the product.

Tools and Test Equipment

- Special tools are not required for Customer Setup. A multimeter which is a standard CE tool and an industry available tool is required for the Advanced Service Aids. A parallel printer adapter plug is included in the Advanced Service Aids package for diagnosing printer problems. One wrap plug for the Bisync, SDLC, and Async adapters will also be included in the Advanced Service Aids package. The 9-pin to 25-pin adapter cable shipped with each PC RP and/or combo card will be required for wrap testing the asynchronous communications function of the combination card.

Maintenance Package Effectiveness Plan

- The performance of the PC RP maintenance package will be verified by extensive testing. Updates to the package will be made as required until the overall effectiveness requirements are met. The effectiveness of the maintenance package will be measured to the CRU and FRU levels. The effectiveness will be measured by applying single, solid faults, misadjustments or loose parts to the system. The fault will not be considered valid unless a demonstratable system or unit failure is shown.

- During problem isolation, the fault or bug must be isolated within *thirty minutes*. The time limit applies from the time the service person starts using the maintenance package until the proper FRU has been identified. Times specifically not included in the time limit are customer interface prior to starting the maintenance procedure, repair/replace times, verification of fix time, and miscellaneous cleanup activities. No time limits will be specified for CRU isolation.

- The maintenance package will achieve a 95% detection of valid bugs. The detection will apply to the overall system only.

- The maintenance package will achieve an effectiveness of 95% isolation to a single CRU with a 90% confidence factor for the overall system. The maintenance package will isolate to a single FRU with an effectiveness of 85% for the overall system with a 90% confidence factor. To measure the effectiveness, a minimum of 400 bugs should be applied to the overall system. The bug distribution and/or weighting should be based on the ratio of the FRU Repair Action (RA) to the overall system RA. Bugs applied to an FRU should be distributed and/or weighted based on the ratio of probability of failure of the component to the overall FRU. RA numbers should be obtained from the latest approved service cost estimate.

- For the following FRU groups, the effectiveness of the maintenance package will achieve better than 70% isolation to a single FRU within the FRU group with a 90% confidence factor.

  1. System Unit and Expansion Unit with option cards

     - System board
     - 64K memory upgrade kit
     - 64K/256K memory expansion
     - Diskette adapter with cable
     - Monochrome with parallel printer adapter
     - Color/graphics adapter
     - Asynchronous communications adapter

- Alt asynchronous communications adapter
- Game control adapter
- Parallel printer adapter
- Bisync communications adapter
- SDLC communications adapter
- Hardfile adapter with cable
- Extender/Receiver cards

2. Diskette drive

3. Printer with cable

4. Power supply

5. Display

6. Keyboard

7. Hardfile

PC RP Maintenance Plan Summary

- Built on PC Base.

- Supports both PC RP, PC and PC XT.
  - BIOS Extension support
  - Faster R/W memory test with feedback
  - Expansion option post
  - Hardfile post
  - Stops for operator intervention on post error
  - Parity errors attempt to identify failing locaiton

- Customer/service diagnostic strategy is the same.

- Expansion unit with cable is defined as a CRU.

- Diagnostics changed to identify the location of the failing FRU (System Unit or Expansion Unit).

- Effectiveness targets are the same.

  - 95% isolation to single CRU for the overall system
  - 85% isolation to single FRU for the overall system
  - 70% isolation to single FRU for defined FRU groups
  - All numbers measured at a 90% confidence level

RAS Diagnostics Used in Manufacturing

- The basic philosophy of RP Manufacturing is to utilize as much of the existing PC diagnostic structure as possible. Unique diagnostics that are written for the Related Product will be incorporated in the overall test.

Objectives

To attain this philosophy the following objectives are currently being implemented by manufacturing:

- Structure and uniformity in Related Products diagnostics.

- A single Manufacturing Diagnostic Control Program (MDCP) for the system test process.

- Modular card diagnostics that may be included or excluded from the MDCP with ease.

- Card diagnostics that are "plug compatible" with the customer, advanced and manufacturing DCP's.

- Compatibility with existing PC RAS diagnostic code (to the extent possible).

- A single level of diagnostic source code to maintain.

- Minimization of Related Products' development, maintenance and life cycle costs.

- Guaranteed level of test coverage.

Test Process

- The Manufacturing System Test Process (MSTP) consists of four test stations: screen test, run-in test, final system test and rework/repair.

Screen Test

- This test verifies that the System-Under-Test (SUT) is operational before the Run-In test. Included in this test is a presence test for each FRU required for the particular SUT.

Run-In Test

- This test loops PC and Related Products RAS diagnostics for a specified time. It provides a reliability test for early life and intermittent system failures.

Final System Test

- This is the last system test prior to customer shipment. Its purpose is to:

  - Run a subset of RAS diagnostics for the PC Related Products system that tests the external I/O ports.

  - Identify the failing component for offline rework and failure analysis.

  - Record/format the system error log from screen, run-in and FST onto a master log to maintain a quality history.

Rework/Repair

- Replace the failing FRU identified from any test station. Report all activity and route the repaired system back to screen.

ROS Diagnostic Requirements for Manufacturing

- All ROS modules that are executed by BIOS during Power-On Self Test and contain any I/O dependencies must be supplied with a manufacturing hook within the software to bypass the I/O device. This may be accomplished by the addition of a wrap plug in place of the I/O device that returns an acceptable code indicating the unit is in a manufacturing environment.

- In the case of a standard PC, BIOS issues a reset signal to the keyboard and awaits an 'AAH' response indicating that the keyboard is present and operating correctly. However, with the addition of a simple wrap plug which ties the + Keyboard Data line to ground, a code of '00H' is returned to BIOS. BIOS correctly interprets this code as an indication that the unit is in a manufacturing environment, no error code is issued and program execution continues.

- Any wrap plug utilized for replacing an I/O device in the manufacturing environment must be very small, simple and inexpensive with the ability to be manufactured in large quantities. All such devices must be approved by a manufacturing representative before being incorporated into the product.

- Manufacturing must be supplied with updated listings of the ROS code as each new level is released. Any interim copies that could be supplied before release would be useful for the Manufacturing team.

Summary

- Due to the nature of the Manufacturing process, the Run-In station requires the system unit to be tested without any I/O devices connected, and at the Final System station to be tested with simulated I/O. This requirement works well with the unattended and attended modes of operation, since during run-in no operator intervention can be allowed, and during Final System Test, operator intervention can be simulated.

- A Manufacturing hook allows the diagnostic, in conjunction with the Unattended/Attended modes of operation to determine the appropriate code to execute at each unique test station. This hook eliminates the need for the Manufacturing team to re-write each card diagnostic interface with the MDCP for each test station and, in accordance with the current PC structure, allows system manufacturing to meet all the objectives stated earlier.

RAS Generic Requirements

- The generic diagnostic approach consists of a module containing all the common routines which are now accessed by software interrupt calls. Common variables are at known locations within the stack segment.

- The next distinct module is the Diagnostic Control Program (DCP) containing only minimal dependencies on the device tests. The DCP will search the directory for files with a specific extension identifier. As each file is loaded, the DCP identifies which device number it is and keeps track of where the code resides in memory.

- Each device test is a separate and distinct module. This facilitates updating by adding the module to the diskette. This also provides variable size by the DCP loading modules until memory is full. The device test modules are loaded in the order in which they occur in the directory. When there is no more room for loading device tests, no more are loaded. At present there is no automatic way to load any test that would not fit. This is based on the assumption that tests which need large amounts of memory to run, normally will be placed at the end of the directory. The generic diagnostic approach also allows for easy customization by deleting and/or replacing device test modules.

- To be able to react quickly to an ever changing environment, the manufacturing team requires the source and object code for all Related Products card diagnostics. In order to contain the many software options available, manufacturing requires the software to be written in PC Macro Assembler.

Note: Any deviations from the requirements specified in this document must be negotiated with Manufacturing on an individual basis.

CHAPTER 9. EMC CRITERIA

Purpose

- The IBM Personal Computer (PC) is used both for home and business applications and must be classified by the FCC as a Class B Device. The PC cannot radiate or conduct electromagnetic emanations that will interfer with receiving devices such as TV's, radios, etc.. All Related Products must also have *Class B* certification.

- This chapter highlights general rules and regulations, requirements, responsibilities, and procedures to obtain certification for a Related Product.

Federal Communications Commission (FCC) Rules and Regulations

Electromagnetic Emanation from Computing Devices

- The Federal Communications Commission (FCC) Rules and Regulations Vol. II, Parts 2 and 15 (maintained by the SPA/EMC departments) governing electromagnetic emanations from computing devices/data processing equipment are established as the requirements that must be met by all commercial/personal computing products marketed in the United States. This standard presents information/ requirements pertaining to definitions, measurement parameters, equipment labels, user information and responsibility of the manufacturer that appears in the above document. For more detailed information in these categories as well as other requirements such as equipment authorization, administration procedures, reports and FCC methods of measurement, the FCC Rules and Regulations should be consulted.

- The FCC Rules and Regulations apply to any computing/electronic device or system that generates and uses timing signals or pulses at a rate in excess of 10,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that utilizes digital techniques or any device or system that generates and utilizes radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer.

- Computer terminals and peripherals (i.e., Input/Output devices for computers) that are intended to be connected to a computer, non-specialized medical devices marketed through retail channels for use by the general public, and computers used for recordkeeping or any purpose not directly concerned with medical treatment are considered computing devices.

- Pending resolution of the proceeding in FCC Docket No. 20708 and related proceedings dealing with restricted radiation and computing devices, the following computing devices are exempt from complying with other requirements of Subpart J of the FCC Rules and Regulations Part 15 but remain subject to the noninterference requirement of Section 15.803 of the rules and regulations.

  - A computing device utilized in any transportation vehicle including motor vehicles and aircraft.

  - An electronic control or power system utilized by a public utility or in an industrial plant.

  - Industrial, commercial, and medical test equipment.

  - Computing device utilized in an appliance, e.g., microwave oven, dishwasher, clothes dryer, etc..

  - Specialized medical computing devices (generally used at the direction of or under the supervision of a licensed health care practitioner) whether used in a patient's home or a health care facility. Non-specialized medical devices marketed through retail channels for use by the general public are not exempted. This exemption also does not apply to computers used for recordkeeping or any purpose not directly concerned with medical treatment.

References

IBM Standards

- C-S 0-5103-004, IBM Machine Products. Types of Production.

- C-S 2-0001-002, EMI Limits for Commercial Products.

- C-H 2-0001-007, Electromagnetic Interference (EMI) Test Practice.

- C-S 2-0001-036, Federal Communications Commission (FCC) Rules and Regulations.

Federal Standards

- Refer to FCC Rules and Regulations, Vol. II, Parts 2 and 15 for details covering the following:

  - Computing Device definitions

  - Compliance requirements

  - Radiation limits

  - Conduction limits

  - Labelling requirements

Responsibilities

Development Laboratory Responsibilities

- Testing and design refinements required to bring all emissions under required levels.

- Design of product to meet ESD and Local Site System Assurance standards.

- Obtain Local Site and Corporate Legal position on the product's FCC classification certification.

- Provide ESD with EMC Test Data as required.

ESD Responsibilities

- Provide Development Laboratory EMC Test Data on current products within the ESD line.

- Review and approve test data provided by the Development Laboratory.

- Provide personnel and facilities to support the Development Laboratory, if required.

  - Normal FCC certification requires 12 weeks.

    Note: Model number changes to the Base PC require *recertification* from the FCC.

Requirements

General

- IBM products classified as Class A or B computing/electronic devices or data processing equipment marketed in the United States must comply with the FCC Rules and Regulations, Parts 2 and 15 (maintained by the SPA/EMC departments) the technical portions of which specify limits on the conduction and radiated emanations.

- Independent of these limits the operator of a computing device may be required to stop operating his device upon a finding that the device is causing harmful interference and it is in the public interest to stop operation until the interference problem has been corrected.

- Class B computing devices certified* by the FCC: Prior to certification, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease) or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any such radio frequency device. However, the advertising or display of a device, that has not been certified, will not be deemed to be an offer for sale if such advertising contains, and the display is accompanied by, conspicuous notice worded as follows:

  "This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained."

  *Note: Certification of Class B products must be coordinated through the Corporate Legal Department.

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- Class A and Particular Class B computing devices verified by the manufacturer: Prior to verification, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease) or import, ship or distribute for the purposes of selling or leasing or offering for sale or lease, any such radio frequency device.

- However, the announcement and offer for sale of a computing device that is in the conceptual developmental, design or pre-production stage is permitted prior to verification of compliance, provided the prospective buyer is advised in writing at the time of announcement or offer for sale that said equipment is subject to FCC Rules and that said equipment shall comply with the appropriate FCC Rules prior to final delivery to the buyer or to the centers of distribution.

- Manufacturers of Class A computing devices shall have the option of ensuring compliance with applicable technical specifications at each end user's location after installation, provided that the purchase or lease agreement includes a provision that such a determination of compliance be made and is the responsibility of the manufacturer of the equipment.

- Where customer acceptability of a Class A computing device cannot be determined at the manufacturer's premises because of size or unique capability of the computing device, a Class A computing device may be operated at the user's site during development, design or pre-production states for evaluation of production performance and determination of customer acceptability.

Compliance Requirements

- IEH 2-0001-001 Power Line Transients (PLT)
- IEH 2-0001-005 Electrostatic Discharge (ESD)
- C-B 2-0001-019 Electrostatic Discharge (ESD)
- D-S 2-0001-405 Electrostatic Discharge (ESD)
- C-S 2-0001-012 Radiated Electromagnetic (RES)
- C-S 2-0001-022 Communication Line Lightning Serge
- C-S 2-4700-003 Power Line Disturbance (PLD)
- C-S 2-0001-002 Electromagnetic Interference (EMI)
- C-S 2-0001-036 Federal Communications Commission
- N-B 2-0001-400 Interference Suppression, EC RFI
- N-B 2-0001-401 Interference Suppression, Country Laws

Notes:

CHAPTER 10. SYSTEMS ASSURANCE

Overview

- The System Assurance (SA) organization performs the role of an independent product and process evaluator to ensure new IBM products meet the required levels of performance and customer satisfaction. This responsibility is supported by System Assurances' approval rights on EVT, DVT, MVT and Product Announcement.

- System Assurance is involved early in the development cycle to ensure that the proper processes are in place to develop, manufacture, service, and market the product. Assurance is also responsible for evaluating test procedures and data for all tests conducted during the development, manufacturing, and field acceptance of a product.

Organization

- The Related Products System Assurance (RPSA) Department (95R) reports to ESD Systems Assurance. This group was established to ensure that the PC compatibility and integrity is maintained by Related Products.

- RPSA works very closely with the Developing Laboratory SA organizations, who have the responsibility for the overall assurance position on their particular product. Typically DOU's are written to formalize dependencies, responsibilities, and overall test strategies for this joint System Assurance relationship. Additionally, the RP Manufacturing Assurance organization and World Trade Assurance groups are involved on numerous products that have dependencies on those areas.

Responsibilities

Related Products Systems Assurance

- Assure PC compatibility and integrity is maintained throughout total product line.

- Assume support position on each phase of product development/manufacturing cycle.

- Evaluate system compatibility as defined in system objectives throughout product cycle.

- Provide requirements and guidance to other organizations early in product definition phase and throughout the development/manufacturing cycles.

- Generate/concur with assurance plans for associated test activities, responsibilities and completion targets.

- Review and evaluate test activities as defined in assurance test plan.

- Provide a common interface to remote assurance organizations associated with development and manufacturing of systems integrating the PC.

- Assure that IBM's external commitments are met (schedules, performance, etc.).

Developing Location System Assurance

- Assume total system assurance position for product in environment used.

- Understand Base ESD environment and product that the Related Product is a part of.

- Incorporate RPSA requirements into total test plan for product.

- Assume support position on each phase of product cycle.

- Assure IBM's external commitments are met.

- Incorporate appropriate assurance activities to support World Trade, establish DOU's and communication channels with World Trade Assurance organizations.

World Trade System Assurance

- Define test requirements for product in World Trade environment.

- Define assurance dependencies on other areas.

- Establish communication channels with domestic assurance organizations.

- Assume support position on World Trade product offering.

Related Product Assurance Activities

- Provide education to non-ESD Assurance groups on ESD products/process.

- Input to system test plans to verify PC integrity/compatibility.

- Evaluate system test results.

- Provide ongoing support to assurance organizations throughout product cycle.

- Determine assurance requirements and dependencies that are required for product:

  - Design/test
  - Manufacturing process
  - CI105
  - Quality
  - Documentation
  - Service
  - Distribution process
  - Marketing
  - Field tracking

Notes:

CHAPTER 11. QUALITY ASSURANCE PLAN

Scope

- This chapter defines the Quality Assurance (QA) plan for a Related Product. It encompasses the System Unit, I/O options, FRU's, packaging, software and publications. The intent is to provide a comprehensive plan for the integral parts of the product from source to field performance. In addition, this plan defines the responsibilities of supporting organizations.

- The general philosophy of the Quality program is to produce a quality competitive product that is superior to comparable marketed products.

- All unique component specifications as defined by released Engineering documentation, will be maintained on a sample audit basis as outlined in this QA Plan.

- For the purposes of this document Common Parts are those that are present in both the PC and the Related Product. Unique Parts are those that are present in the Related Product and are not present in the PC.

Schedule

- Begin production
- Begin DVT
- End DVT
- Begin MVT
- End MVT
- Begin System MVT
- End System MVT
- First Volume Ship

Procedures/Standards Reference

MOPS #	Quality Procedures
12.2	RP Visual Inspection/Diskette Care/Card Handling
12.4	RP Product Sample (PS) Procedure
12.8	RP Disposition of Non-Conforming Material
15.20	RP System Test Data Report (STDR) Procedure
15.21	RP Manufacturing Problem Report (MPR) Procedure
15.22	RP Request for Quality Investigation (RQI) Procedure
15.23	RP Request for Engineering Action (REA) Procedure
15.24	RP Non-conforming Material (NCM) Procedure
15.25	RP Off-Specification Permit (OFF-SPEC) Procedure/RWT

Sourcing Plan

Overview

Vendor Quality

- ESD Procurement Quality Assurance and Related Products
  Procurement Quality Assurance will be responsible for vendor quality.

Components and Sub-Assemblies (Common)

- ESD Procurement Quality Assurance is responsible for all components
  and sub-assemblies common to the PC and the new product.

Components and Sub-Assemblies (Unique)

- Related Products Procurement Quality Assurance is responsible for all
  sub-assemblies unique to the System Unit. Component Analysis at the
  development location, is responsible for all components unique to the
  System.

Program Responsibilities

Related Products

- Related Products Manufacturing will be the plant of manufacture for the System Unit final assembly.

Engineering/PQA

- Engineering/PQA are responsible for the initial certification of components. Included is the responsibility to specify all functional and reliability requirements via released documentation.

RP Manufacturing Quality Assurance

- QA is responsible for maintaining the reliability performance of all specified hardware during system integration, from IBM final assembly, test and into the FE Distribution Center. This will be assured as follows:

1. Periodic update and review of the overall Quality Plan.

2. Early life performance report coordination, analysis, and reporting.

3. Review and approve applicable documentation for completeness and product exposures:

   – Engineering drawings and specifications.
   – Engineering/Manufacturing plans.
   – Manufacturing Test/Process procedures.
   – Manufacturing routings and checklists.
   – Procurement Quality plans.
   – Test equipment certification plans.

4. Define, provide and support quality data collection for Manufacturing.

5. Provide in-house Manufacturing inspection procedures.

6. Certify and support Manufacturing build/test process.

7. Provide process and participate in failure analysis.

8. Develop and execute the Product Sample plan.

9. Develop and track Customer Quality data collection.

10. Interface with PCXT and Developing Location.

11. Focus on incoming vendor, Manufacturing and field quality problems.

12. Monitor adherence to product safety requirements.

13. Develop and support Reject Parts Return plan with the Distribution Center.

14. Coordinate DVT/MVT quality problem resolution, as appropriate.

15. Document ship status of DVT/MVT systems.

16. Provide vendor on-site audit.

ESD PQA and RP Manufacturing PQA

- ESD PQA and RP Manufacturing PQA are responsible for monitoring the functional and reliability performance of all vendor supplied hardware and subcontracted Manufacturing operations for zero defects. This will be assured as follows:

1. Maintain contractual requirements.

2. Develop and support vendor audit program.

3. Report vendor survey results.

4. Resolution of vendor hardware performance problems.

    a. Ensure vendors are capable of complying with all specifications outlined by Engineering documentation.

    b. Adhere to reliability goals for major subassemblies in Mean Time Between Failure (MTBF).

    c. Ensure workmanship to approved standards.

5. Develop and support vendor parts return plan.

6. Independent Test Laboratory (ITL) contracts for testing of critical components.

7. Interface with PC and the Developing Location functional organizations.

Development Location Responsibility

- Development of RAS Diagnostic Code for the unique hardware, related to the product. RP Manufacturing has a dependency on this diagnostic code for developing card and system test software.

RP Manufacturing Technical Services Responsibilities

- Develop and support Manufacturing assembly/test processes.

- Develop and support test equipment certification plans.

- Support QA in investigation and resolution of Manufacturing line and field problems.

- Interface with PC and Product Development organizations.

- Perform failure analysis activities with Quality.

- Develop process to determine effectiveness of card test.

Quality Targets

Incoming Vendor Quality Levels (%)

- All vendor products will be functionally tested, and inspected for defects by the vendor prior to shipment to IBM.

- By implementing stringent source inspection at the vendor, product integrity can be maintained. Therefore, excluding "infant mortality" or possible ship damage, "Zero Defects" will be achieved.

- Projected ultimate (2nd QTR 85) SPQL goal leaving vendor functional verification test (FVT) but prior to stock is 0.0%.

	4Q83	1Q84	2Q84	3Q84	4Q84
Common Cards					
Enhanced PC Planar 256KB Card	0.15	0.1	0.0	0.0	0.0
Diskette Adapter Card	0.0	0.0	0.0	0.0	0.0
Unique Cards					
Special Interface Card	2.0	1.0	0.5	0.2	0.2
Note: Representative data only, not actual.					

Manufacturing Overall System Test Fallout Targets (%)

	4Q83	1Q84	2Q84	3Q84	4Q84
New Product System Unit					
Screen	20.0	15.0	12.0	9.0	8.0
Run-In	15.0	11.25	9.0	6.75	6.0
Final Verify	5.0	3.75	3.0	2.25	2.0
Hi-Pot	0.0	0.0	0.0	0.0	0.0
Note: Representative data only, not actual.					

SPQL Targets (%)

- Projected SPQL targets at customer ship for System Unit. Does not include shipping or handling damage.

4Q83	1Q84	2Q84	3Q84
2.0	1.0	0.5	0.0
Note: Representative data only, not actual.			

Field Reliability Targets

	MTBF	
New Product System Unit	23.3 Mos.	3030 Hrs.
POH definition: 130 hrs./mo.		

Field Defect Reliability Targets

Projected Data for Model 5555068

Configuration

- 320KB Diskette Drive (1)
- 256K Planar Board
- 130W Power Supply
- Diskette Adapter Card
- Display Adapter Card
- Keyboard Adapter Card

Target

- Installation   .0200
- 1st 30 Days   .0462
- 2nd 30 Days   .0403
- 3rd 30 Days   .0358
- I & 90 Days   .1423

Note: Representative data only, not actual.

PQA Card Quality Plan

- ESD PQA is a Project within ES Quality and Reliability and Related Products PQA is a Department reporting to the Related Products Manufacturing. These areas provide technical support to ES and Related Products Procurement in the Quality Assurance discipline and their primary task is to assure that all supplier products are in conformance to requirements.

Vendor Card Test

Raw Cards

- All raw cards will be 100% end point tested for "shorts" and/or "opens".

Card Assemblies

- All card assemblies will be functionally tested.

- All card assemblies will be "in circuit" tested.

- Engineering, Manufacturing Engineering, Tech Services, and Procurement Quality Assurance will support ES Procurement and Related Products Procurement in vendor sourcing these test functions.

- Unique cards will be dynamically burned-in if required to meet quality levels.

Related Products Card Quality Verification

Audit on Vendor Premises

- IBM will conduct an audit operation on vendor premises of the manufacturing process. The vendor quality department submits cards in 300/500 lots to the IBM resident manager or designated representative for lot sample inspection prior to shipment.

- The IBM representative will select a sample from the submitted lot in accordance with MIL-STD-105D. The sample is then functionally tested and visually inspected for defects.

- One (1) defect rejects the entire ship lot. The vendor will then 100% test for defect characteristic, correct any defects found, and resubmit the lot for re-audit.

- The vendor will retest the entire ship lot under the observation of the IBM representative, if a functional failure is found.

- This audit operation is effective until the intent of "Zero Defects" program is achieved. At that time Procurement Quality Assurance and the Related Products Procurement Quality Assurance (RPPQA) will conduct periodic audits to ensure sustained vendor quality level.
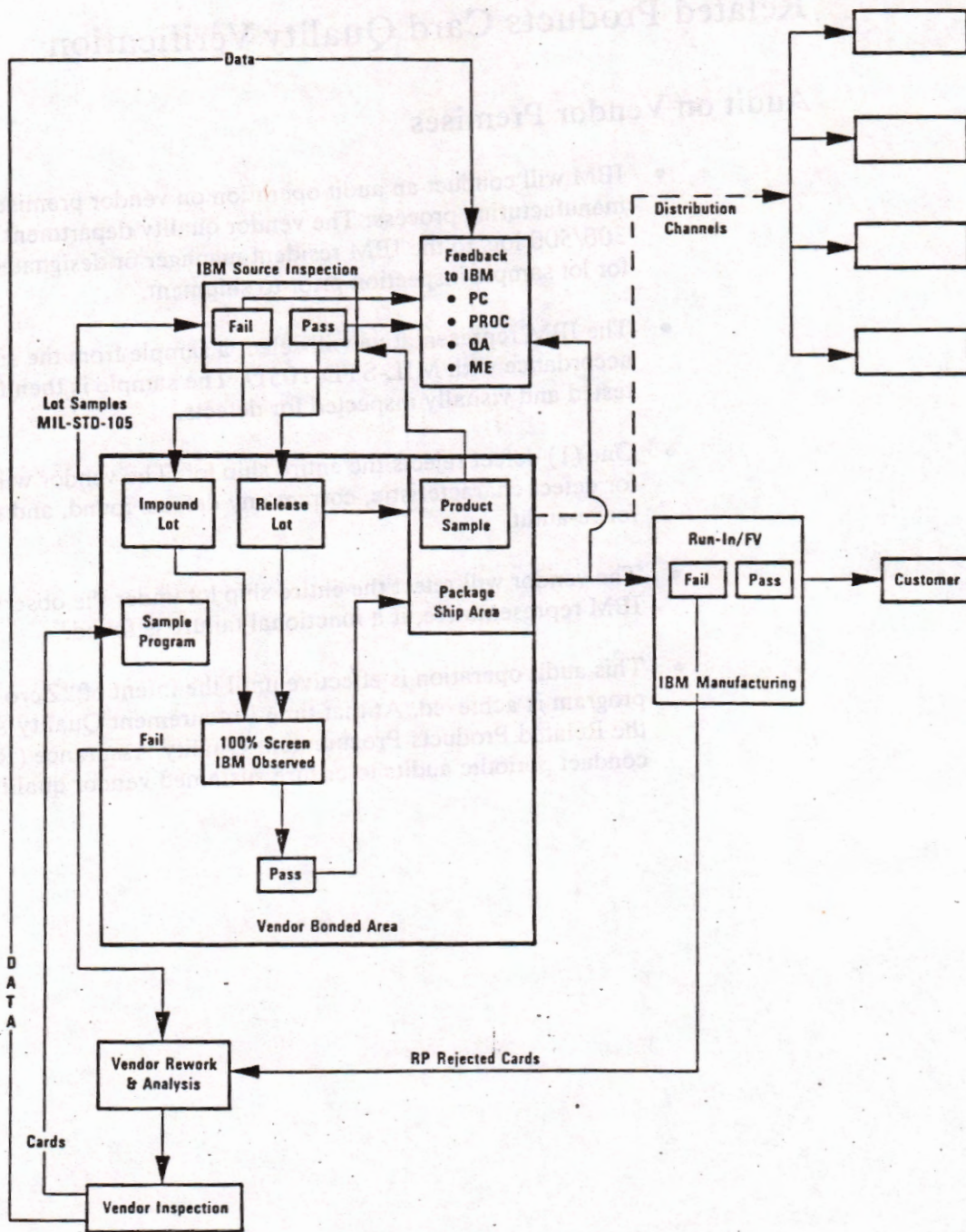
Figure 13. Card Source Inspection Flow

- This evaluation will verify the following:

    1. Released documentation and specifications are complete.

    2. EC level status has been obtained.

    3. Quality workmanship level of vendor and Manufacturing.

- Upon completion of the evaluation, QA will provide a report containing the following:

    1. Identification of the test units (i.e.: S/N, model).

    2. Current status of hardware and software as per documentation.

    3. Off-Spec status on any components.

    4. Deviation list with actions taken or in progress.

Data Collection and Failure Tracking

- After the evaluation QA will begin collecting data on the initial 200 units that are manufactured. After all data has been recorded QA will publish the findings to all departments requesting the report on unique parts only.

System Quality Data Collection

- Quality data collection will be recorded manually by RP Manufacturing using ES Action Log 926-2542-0 D in accordance with STDR Procedure 15.20, to be tracked and reported on by QA.

- When the system has completed all testing, is ready for shipment, and all completed actions recorded, the log will be returned to QA for reporting.

- This information will be compiled and retained by QA for failure trend analysis to be reported weekly to all involved organizations.

    1. Initiate RP Action Log 926-2542-0 D (STDR) Procedure 15.20

    2. Recover RP Action Log for analysis and reporting.

    3. Initiate PS Checklist (PS) Procedure 12.4

    4. Identify defective parts (RWT) Procedure 15.24.

Displays (US/WTC)

- Quality testing will be performed at an ITL in accordance with MIL-STD-105D for sample size only. Source inspection and ITL results will be monitored by PQA. Color monitors will be 100% tested until 0.5% defect is achieved and maintained for one (1) month.

Printers

- Quality testing will be performed at the vendor in accordance with MIL-STD-105 for sample size only. Source inspection results will be monitored by PQA.

Vendor Quality Audits

- All vendors are required to perform a ship audit on all lots to a vendor-designed sample plan approved by PQA. Any defect found during this sample will be cause for 100% testing of the entire lot and removal of all defective material.

Vendor Visitation

- PQA will perform a production audit at vendor plant within two (2) weeks of new production start-ups or break-in of major EC's. PQA will conduct periodic audits after a confidence level has been achieved.

Vendor Change Notification

- The vendor is required to notify IBM PQA of any proposed changes to the Manufacturing, testing or inspection process.

In-House Quality Plan

Pre-DVT Entry Evaluation

- Quality Assurance will conduct an evaluation on five (5) manufactured System Units when RP Manufacturing determines readiness for review, *prior* to DVT Entry.

- These units will be manufactured using build/test procedures representative of the Manufacturing process for customer ship. New Products department will ensure that evaluation cycle is included in the Manufacturing Plan.

Defect Criteria ***Zero Defects***

1. *Critical* – (i.e.: flash/smoke/fire) *automatically shuts down line*. Any defect determined a safety hazard will result in line shutdown.

2. *Major Functional* – (i.e.: shorted, Dead on Arrival) any defect causing system performance degradation. One (1) defect, increase sample size and test for that characteristic. Two (2) defects, Manufacturing 100% tests.

3. *Minor Functional* – (i.e.: CRC error, RAM error) any defect that when grouped with other defects causes system performance degradation. One (1) defect, test normal sample for that characteristic. Two (2) defects, increase sample size and test. Five (5) defects, Manufacturing 100% tests.

4. *Incidental* – (i.e.: workmanship) any defects occurring on the Manufacturing process due to lack of knowledge or negligence. Track and report at weekly Quality meeting.

System Merge (RP Sourced Items Only)

- QA will satisfy system merge capability requirements on a one-time basis prior to MVT completion date. Further system merging tests will be done as defined in the PS Procedure 15.4.

Field Feedback

- The Plant of Control will establish a field tracking system. Data will be provided to the RP Manufacturing Quality Organization on a regular basis.
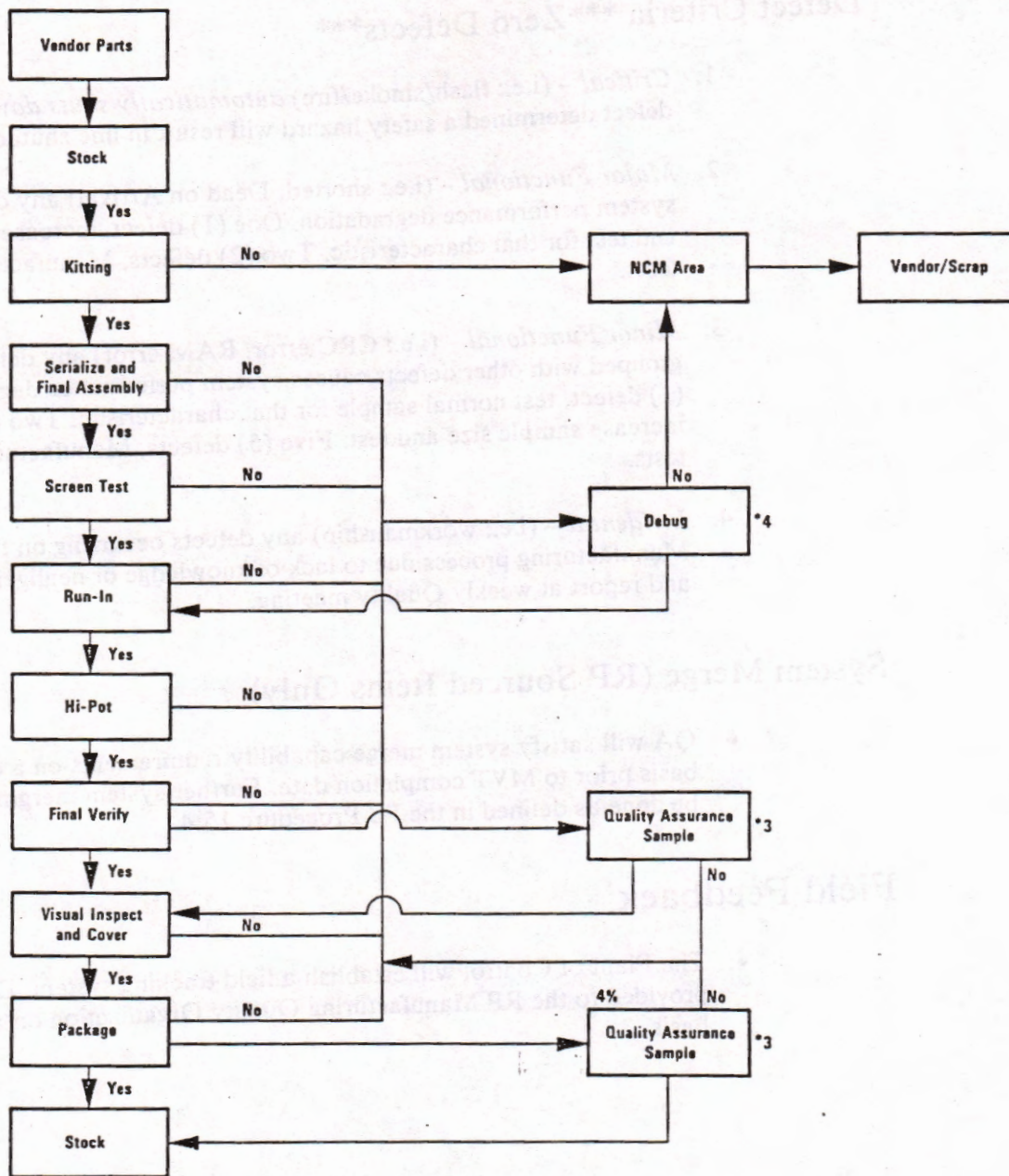
Figure 14. System Quality Data Collection

System Product Sample

- QA will conduct a Product Sample Audit of the Manufacturing assembly/test process. Test requirements and evaluations will be in accordance with PS Procedure 12.4.

- Initial Product Sample will be conducted with current level ME final Verify Test Diagnostics.

4. Initiate documentation on process/product problems to those functions responsible for resolving any process/product deficiencies, and periodically publish reports on those problems.

```
┌──────────────┐
│ Receive From │
│    Vendor    │
└──────────────┘
        │
        ▼
┌──────────────┐      Good      ┌──────────────┐
│ System Test  │───────────────▶│     Ship     │
└──────────────┘                └──────────────┘
        │ Bad
        ▼
┌──────────────┐  Good  ┌──────────────┐   Yes   ┌──────────────┐
│   Retest by  │───────▶│  First Time  │────────▶│ Mark as First│
│Quality Assur.│        │   Failure    │         │Time Unconfirm│
│in Control Box│        └──────────────┘         │   Failure    │
└──────────────┘               │ No              └──────────────┘
        │ Bad                  ▼
        │              ┌──────────────┐
        │              │System Failure│
        │              │   Analysis   │
        │              └──────────────┘
        ▼
┌──────────────┐  Bad   ┌──────────────┐   Yes   ┌──────────────┐
│Card Functional│──────▶│  First Time  │────────▶│ Mark as First│
│  Test by     │        │Confirmed Fail│         │Time Confirmed│
│Quality Assur.│        └──────────────┘         │   Failure    │
└──────────────┘               │ No              └──────────────┘
        │ Good                 ▼                         │
        ▼              ┌──────────────┐           ┌──────────────┐
┌──────────────┐       │Mark as Second│           │Return to Vend│
│Card Failure  │       │Time Consider.│           │  for Repair  │
│  Analysis    │       │Failure & Ret.│           └──────────────┘
└──────────────┘       │Vendor Analys.│
        │              └──────────────┘
        ▼                     ▼                          ▼
┌──────────────┐       ┌──────────────┐           ┌──────────────┐
│ To Vendor if │       │  To Austin if│           │To Development│
│Vendor Problem│       │Test Hardware │           │Engineering if│
└──────────────┘       │   Problem    │           │Card Test Code│
                       └──────────────┘           └──────────────┘
```

Figure 16. Failure Analysis

```
┌─────────────────────────────────────────────────────────────┐
│ Product Sample Plan Structure                                 │
│                                                               │
│  On Going Product Sample – Minimum 8% of machines             │
│                              produced                         │
│                                                               │
│  Installation + 30 Days    – Maximum 5% of machines           │
│                              produced                         │
│                                                               │
│  Installation + 90 Days    – Maximum 2.5% of machines         │
│                              produced                         │
│                                                               │
│  FCC Compliance Test       – One machine per month            │
│                                                               │
│  Extended Run              – One machine each 6 months        │
│                                                               │
│ Hardware Test for:                                            │
│                                                               │
│  On Going P.S.             – Advanced Diagnostics             │
│                              PC Exerciser Application Program  │
│                              Communication Link-Up            │
│                              User Application Programs        │
│                                                               │
│  I + 30/90                 – All Hardware Test for On-Going    │
│                                P.S.                           │
│                              Dealer Demo II (30 Minutes Free  │
│                                Running Program)               │
│                              run-In Diagnostics              │
│                                                               │
│  FCC Compliance            – Test for Compliance to Class "A"  │
│                              Requirements for Electro-Magnetic │
│                              compatibility (EMC)              │
│                                                               │
│  Extended Run              – All Hardware Test for On-Going    │
│                                P.S. and I + 30/90            │
│                              Classical Test                   │
└─────────────────────────────────────────────────────────────┘
```

Figure 15. Product Sample Plan

Quality Audit

- This section summarizes activities of QA relating to process verification, product measurement, inplant/field data analysis, and problem report/tracking.

    1. Perform process verification by periodically auditing each phase of the manufacturing process to determine capability to fulfill its intended purposes.

    2. Product measurement on a product sample basis to determine the overall effectiveness of the complete Manufacturing process in yielding a quality product.

    3. Analyze data from the plant and field in order to track product performance against early life criteria.

CHAPTER 12. PACKAGING SPECIFICATION

Introduction

This specification details the minimum packaging requirements for the Personal Computer and/or related products. By necessity, this document is limited in scope and any item which is not in this specification shall comply with the latest revisions of Department 8S5, Boca Raton. Where conflicts occur, ESD Boca Raton shall regulate and take precedence.

Adherence to the requirements of this specification will result in overall compliance to the minimum packaging requirements necessary for support of RP Manufacturing at IBM Austin.

This specification is not intended to limit or inhibit advancement in the art of packaging, but to provide conformity, ease of manufacturing and low cost.

Exemptions

- Any exemptions from the requirements within this document will need the written approval of Department 8S5.

Related Documents

Corporate Standards

Units will be packaged and tested in accordance with IBM Corporate Standards:

- C-S 1-3600-002   Product Fragility and Packaging Tests
- C-H 1-9711-001   Product Fragility – Vibration Test
- C-H 1-9711-004   Product Fragility – Shock Tests
- C-H 1-9711-005   Packaged Product Tests

Quality Awareness

- Quality will assist in orienting each Manufacturing employee on the need for quality awareness and the "Zero Defect" concept, as part of the Excellence Plus Program.

- Quality will assist Manufacturing in the establishment of quality circles.

- System quality data tracking will provide the ability to identify operator quality problems.

- Promotional efforts (Zero Defects) will be used to maintain a high level of quality consciousness.

- 100% vendor "Zero Defects" seminar now being implemented to ensure all vendors are cognizant of IBM program.

Palletization

IBM Boca currently utilizes two pallet sizes for shipment of finished goods:

- IBM Standard 40" x 48" pallet used w/ 24" x 20 x 13" box
- Non-Standard 27" x 44" pallet used w/ 27" x 22" x 11.75" box

Electrostatic Discharge

- Any product containing exposed components (modules, transistors, etc.) can be damaged by electrostatic discharge and will require special packaging. The user must identify any electrostatic sensitive items and inform the Package Engineering Group responsible for package design. Any parts that need protection from electrostatic must be packed in IBM approved conductive and antistatic materials and labeled with an ESD awareness label.

Areas of Responsibility

RP Manufacturing:

Complete package design, package verification testing and any required fragility testing. Austin will have engineering control of approved packaging parts.

IBM Boca:

Will supply Package Engineer, and Development Engineer when applicable, to Austin to be present during package testing if required. Boca will also procure carton graphics artwork which requires the following information:

- Box size from Austin

- Official product name, description when applicable, and machine model or item number from plant of development

    Note: All package graphics must be approved by IBM Boca Communications/Advertising unless the requesting plant management has agreed to obtain the necessary approvals from Corporate Communications/Advertising.

Description and General Requirements

Personal Computer/Related Products System Unit Packaging

Boxes

Boca currently utilizes two box sizes:

- 24" x 20" x 13" O.D.
- 27" x 22" x 11.75" O.D.

It is recommended that every attempt be made to accommodate future products in these boxes, although this is not a requirement.

Weight/Size

User should not exceed the maximum allowable packaged product weight of seventy pounds. This is dictated by the United States Parcel Post weight restrictions.

Box size (length plus girth) should not exceed 109".

Option Packaging

Standard parts or option packaging is available for products of similar size and weight to existing Personal Computer options. Again, it is advised that utilization of these packages be pursued. IBM Boca has option packaging available for the following options:

- 5", 9", and 13" cards
- Various sized cables
- 5 1/4" fixed disk drive
- 5 1/4" diskette drive (full size and half-high)
- Modules

Department 6P5 can provide further information regarding these particular packages.

CHAPTER 13. MANUFACTURING PLAN

Plan Objective

- This sample plan is intended to serve as a reference throughout the new product release cycle. It will assist in the orderly introduction of a new product into Manufacturing by giving each function common planning ground rules and assumptions.

Product Description

- This is an overview of the Related Product including any devices not manufactured by RP Manufacturing, e.g., displays, printers, etc.. The intent of this section is to give the reader an understanding of the product.

Model Definition

Model 168	Model 179	Model 189
1 Floppy	2 Floppies	1 Floppy
—	—	1 Hard File
256K Planar	256K Planar	256K Planar
Kybd/Tab Adp	Kybd/Tab Adp	Kybd Tab/Adp
Floppy Adp	Floppy Adp	Floppy Adp
—	—	Hard File Adp
—	256 Mem Ext	256 Mem Ext
Printer Adp	Printer Adp	Printer Adp

Options

Options	Decimals
RS 232	20%
128K RAM	30%
PC Expansion Box	15%

Leadtimes

New artwork for system unit and option boxes will require 12 – 16 weeks leadtime for IBM Boca Package Engineering to insure timely delivery for first customer shipment.

EMEA Build

System Units

1983	J	F	M	A	M	J	J	A	S	O	N	D	Total
	—	20	45	—	130	100	155	200	200	200	230	250	1515

PSE System Units	
1984	10,500
1985	20,800
1986	25,300
1987	28,600
1988	10,100

Sourcing Assumptions

- System unit final assembly and test will be done in-house (RP Manufacturing) and shipped to Lexington for U.S. and AFE distribution.

- Unique cards for the Related Product will be assembled and tested by the vendor, controlled by RP Manufacturing.

- RP Manufacturing (Austin) will be the Plant of Control.

- Greenock will be the source for EMEA requirements.

Assembly and Test Plan

System Unit

Assembly Plan

- Assembly procedure will be similar to existing related products.

Test Plan

- The overall system test will be similar to existing related products.

Option Test Plan

- The option test procedure will be the same as existing procedures.
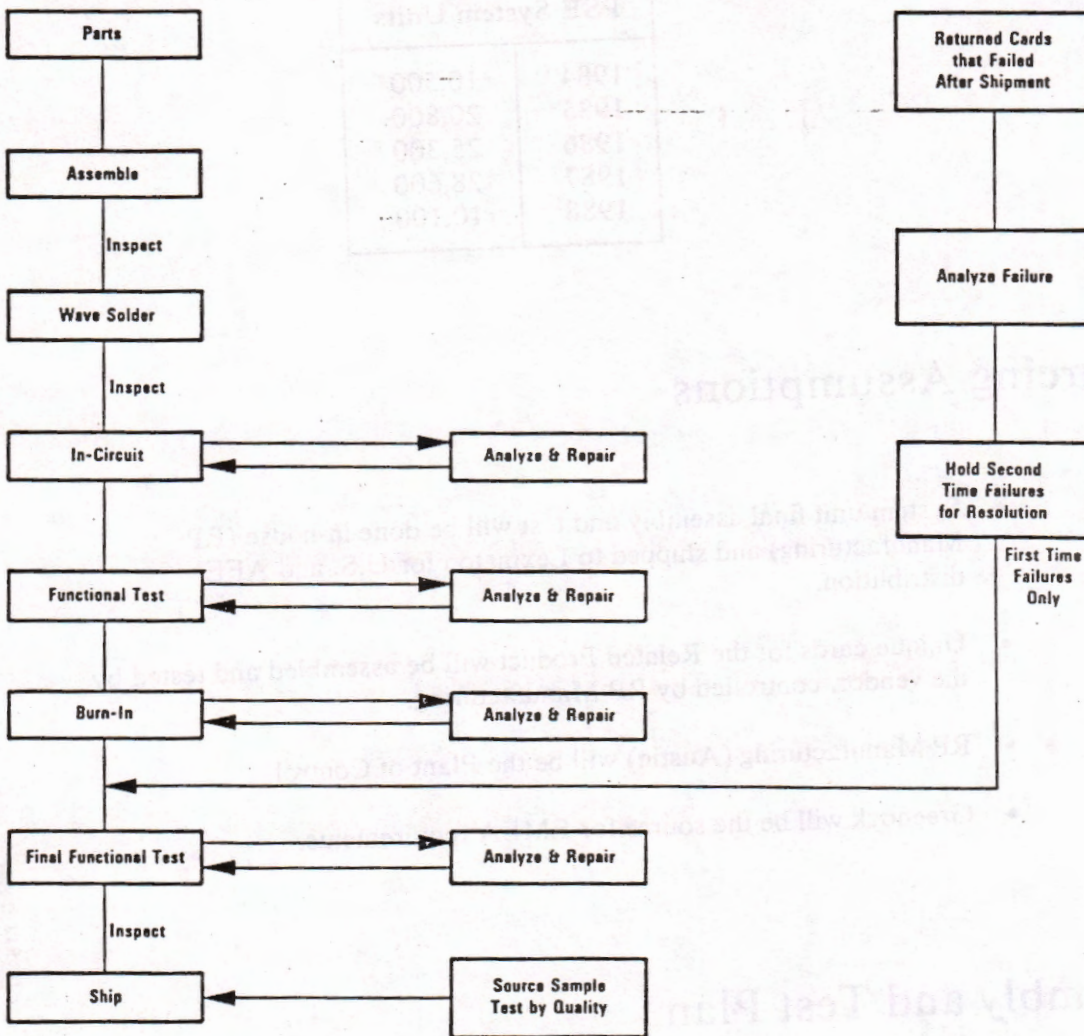
Figure 17. Card Assembly & Test Plan at the Vendor

```
┌──────────────┐
│ Receive from │
│    Vendor    │
└──────┬───────┘
       │
┌──────┴───────┐                    ┌──────────────┐
│    System    │───────────────────▶│     Ship     │
│     Test     │                    │              │
└──────┬───────┘                    └──────────────┘
       │
┌──────┴───────┐       ┌──────────────┐       ┌──────────────┐
│ Retest by Quality │─▶│  First Time  │──────▶│ Mark as First│
│ in Control Box    │  │   Failure?   │       │Time Unconfirmed│
└──────┬───────┘       └──────┬───────┘       │   Failure    │
       │                      │               └──────────────┘
       │               ┌──────┴───────┐
       │               │To System Failure│
       │               │   Analysis   │
       │               └──────────────┘
       │
┌──────┴───────┐       ┌──────────────┐       ┌──────────────┐
│ Card Functional │──▶ │  First Time  │──────▶│ Mark as First│
│ Test by Quality │    │Confirmed Failure?│   │Time Confirmed│
└──────┬───────┘       └──────┬───────┘       │   Failure    │
       │                      │               └──────┬───────┘
┌──────┴───────┐       ┌──────┴───────┐       ┌──────┴───────┐
│ Card Failure │       │Mark as Second Time│  │Return to Vendor│
│   Analysis   │       │Confirmed Failure &│  │  for Repair  │
└──────┬───────┘       │Return to Vendor for│ └──────────────┘
       │               │ Analysis and Disp │
       │               └──────────────┘
       │
   ┌───┴────────────────────────┬────────────────────────┐
┌──┴───────────┐       ┌─────────┴────┐       ┌──────────┴───┐
│ To Vendor if │       │  To Boca if  │       │To Development│
│Vendor Problem│       │ Test Hardware│       │Engineering if│
└──────────────┘       │   Problem    │       │  Card Test   │
                       └──────────────┘       │ Code Problem │
                                              └──────────────┘
```

Figure 18. Card Flow at System Test

Figure 19. System Final Assembly and Test Plan

Quality Assurance Plan

- Data collection for the Related Product system unit will be done manually using the Quality Data Sheet and Product Sample Checklist and compiled on the RP Manufacturing Quality Report.

- On-going product sample quantity will be at 4% minimum.

- Quality Assurance will ensure system merge capability during pre-MVT testing.

- Quality Assurance will conduct evaluations of the system units selected for DVT as part of their normal sample plan.

- The units built for DVT will be built and tested using a manufacturing process that provides a product which is representative of the one utilized for customer shipments.

- The actual DVT will be performed in the Development Laboratory with approval by Systems Assurance.

- The system units selected for DVT will initially be shipped to Lexington and merged with the workstation for a pre-DVT evaluation at the workstation level.

Procurement Quality Plan

- Procurement Quality Assurance will plan and perform all required activities to ensure that all vendor supplied components, sub-assemblies and assemblies for the products described in this plan meet their respective specifications and quality levels.

- Source inspection of initial production lots will be provided.

- Vendor test equipment and procedures will be reviewed to assure quality data will correlate to IBM generated data.

- Interface activities for data-exchange, problem resolutions, etc., will be performed.

- Periodic auditing will be conducted to ensure proper process controls are in place at the vendor.

Release Documentation

Hardware Release

EC001000 Top Asm.   01/05/83

EC000865 Kybd/Tab Card   01/06/83

EC Projections

	1982		1983			
	3Q	4Q	1Q	2Q	3Q	4Q
Keyboard Tab Card	—	—	—	—	2	1

Field Service/Spare Parts Plan

- RP Manufacturing will ship unique FRU's to Greencastle on a regular basis to meet spare parts requirements as defined by FE/CSD.

- Greencastle will send IPT's to RP Manufacturing. They will be processed as customer orders on ESD-MAPICS and shipped out in the specified package as defined for the FRU.

Software Plan

Workstation Software

- Development will ship master diskettes to the Lexington FE Distribution Center (FEDC).

- Code distributed on 5-1/4 inch dual-sided diskettes in finished publications package.

Target Dates (1983)

- Functional Verification (Complete)   03/02/83
- Component Test   02/03/83 – 03/23/83
- Code to FEDC   04/27/83
- Code Ship FEDC to Customers   06/29/83
- Phase Three Technical Review   03/29/83
- A and SR   04/11/83
- Announcement   05/01/83

Publication Plan

- Publications required:
  - Guide to Operations
  - Hardware Maintenance and Service
  - Software User's Guide

Notes:

CHAPTER 14. WTC MANUFACTURING PLAN

Introduction

- This chapter outlines the International Products Limited (IPL) Manufacturing and Distribution Plan for the introduction of a Related Product to Greenock.

- It addresses all aspects of the Manufacturing activity from parts procurement to distribution.

- The plan is similar to the one established for ESD Manufacturing, with Procurement of the major components from established European Sources.

- Assembly/Test is also in line with Boca Raton, and Distribution within EMEA will follow the procedures already established for the Personal Computer (PC and PCXT).

Product Description

System Overview

- This section is intended to provide an overview of the Related Product including standard options and peripheral devices that are part of the base offering. The unique aspects of the product should be described to provide the reader with sufficient information to understand the overall plan.

Options

- This is a statement of Base ES Hardware Options the Related Product will support.

Software Supports

- This is a statement of Base ES Software Options the Related Product will support.

Key Dates and Schedules

Development/Manufacturing Schedule

US Related Products   DVT
MVT
Ann
FCS

EMEA/Greenock   Ann
FCS
Manuf Avail
Parts Avail
Start of Build
MVT
Ship Support
FUS

Business Schedule

US Related Products   Cost Est Kick Off
Cost Est Sign Off
Ann

EMEA   Cost Est Kick Off
Cost Est Complete
Price Available
Ann

Plan Reviews

- The program will be reviewed on a weekly basis with an update issued prior to EMEA announce, MVT, and FCS as required.

Build Volumes

Internal Requirements

- Internal Requirements will be met with product shipped from U.S. RP Manufacturing.

Capital

The manufacturing capital required to support the Related Product:

- Manufacturing Line
- Test Equipment
- Parts Tooling
- Quality
- Total

Expense

The expense required to support the Related Product:

- System Test Diskettes
- Travel – Liaison
  - Vendors (Europe)
  - Vendors (UK)
- Total

Space (Inplant)

The space requirements to support the Related Product:

- Pilot Line
- Parts Storage
- Consolidate/Ship
- Quality Support
- Engineering Support

Manpower

The manpower requirements to support the Related Product:

Product Tech Ops

- Product Engineering
- Records Control
- Manufacturing Engineering
- Test Engineering
- Procurement Engineering
- Packaging Engineering

Quality Assurance

- Detail Parts/System Unit
- Publications/MRI
- Vendor Parts

Release and Records Control

EC Flow for Greenock E.S.

- A Product Documentation Analyst (PDA) will receive a telex from Boca Engineering records advising of EC number to be sent via wide-band and estimated date of release.

- Upon receipt the EC package and aperture cards will be logged.

- Product Engineering (PE) will mark up the affected bills with new P/Ns where relevent including machine reference record and indicating action/no action decisions and the disposition of each part number.

- The package will be passed to Manufacturing Engineering (ME) who will generate vendor/inplant notes and RSEs, review sourcing decisions and indicate number of drawings required prior to passing to PDA.

- The PDA will op code and update DPRS with the revised bill content and move the EC to accept status.

- A drawing package will be passed to reproduction services for provision of the required number of drawings and change packages and one set of aperture cards prepared from the brownlines (on an exception basis).

- The PDA will collect packages from repro services and arrange distribution within ES.

- PE will arrange and minute the EC meeting obtaining break in dates in line with parts disposition and production requirements.

- The PDA will update DPRS with the effective date.

Local Sources

- Shroud Assembly
- Line Cords
- Keyboards
- Publications
- Frame/Cover
- Logic Cards (as PC)
- Planar Board (as PCXT)
- Power Supply

Notes:

1. Greenock Sourcing Strategy will be aimed at extending local source activity on all items that are currently imported. Source changes will be supported by appropriate technical and commercial justifications.

2. Unique hardware (cards) will be initially imported from U.S. RP Manufacturing until local sources are established.

Manufacturing Strategy

Assembly/Test Process

Assembly Philosophy

- Assembly will be a manual operation as per U.S. RP Manufacturing. Initial units will be assembled and tested on a pilot line to prove the process prior to transfer to the production line.

Test Philosophy

- The test will consist of functionally verifying the operation of the system components.

- The unit will be tested prior to being placed in a run-in location. This screen test will comprise the Power On Self Test (POST) and the mandatory safety tests, i.e., ground integrity test and hi-pot test.

- The run-in test will be compatible with U.S. RP Manufacturing and will last for 4 hours ultimately. It will be based on the ME run-in diskette approach.

- Final verification test will reflect the U.S. RP Manufacturing process. The integrity of the final verification test will be maintained through the use of the U.S. RP Manufacturing Test Diagnostics.

- Where necessary unique equipment will be installed to support the test of product units.

Assumptions

- All DPS units will be tested prior to unit build. No alignment of the DPS will take place on the production line.

Test Equipment

- Screen Test Equipment.

- Safety check equipment will be a custom built, combined Ground Integrity and Hi-Pot Tester. This unit will test the ground path of the machine and if successful will cycle on to a Hi-Pot Test.

- Screen test will consist of running the units POST and a unique diskette based test to ensure that only units with a good confidence level are actually passed to run-in.

Run In Test

- No unique equipment is required for the run-in test. Each unit will have a Keyboard test jumper in the keyboard connector and a run-in disk in the floppy diskette drive.

Final Test Equipment

- Final verification test equipment will be based on the PC/PCXT semi-auto test eqipment and will be used to download the test diagnostics to the Unit Under Test (UUT) and monitor the progress of the diagnostics.

- On successful completion of the diagnostic run a test pattern will be displayed on the screen of the UUT. The test operator will be required to examine this and make a judgement on the quality of the display.

Line Control System

- An S/1 System will be used to monitor the flow of units through the line and to collect data on defective material.

- This unit will be connected to Bar Code Wands at each operation, a master machine record will be created and updated as the machine flows through the line. Data will be collected and stored against the serial number of the unit.

- Additional aspects of the S/1 systems will be automatic labor claiming and report generation.

Training

- Product Tech Ops will cover all aspects of Operator training for the manufacturing process.

- The training program will include instruction in the use of all equipment, procedures and debug aids.

Assembly/Test Process – Overview

- The main elements of the process are as follows:

Kitting

- This is a manual operation. The parts will be kitted on a pallet for transporting through the process. This pallet is made of a fire resistant anti-static material.

Assembly

- Manual operation.

Screen Test

- Semi-automatic operation using test diagnostics.

Run In

- 4 hours duration.

Final Verification Test

- Semi-automatic operation using test diagnostics.

Cover Fit

- Manual operation.

```
                    Kitting
                       │
                       ▼
                   Assembly
                       │                                      ┌──────────┐
                       ├──────────────────────────────────────│  Repair  │
                       ▼                                      └──────────┘
                  Screen Test
                   Hi-Pot ──────────────────────►
                       │
                       ▼
                   Run-In ──────────────────────►
                       │
                       ▼
                  Final Test ────────────────────►
                       │
                       ▼
                  Cover Fit
                       │
                       ▼
                Quality Audit ───────────────────►
                       │
                       ▼
               Pack and Ship
```
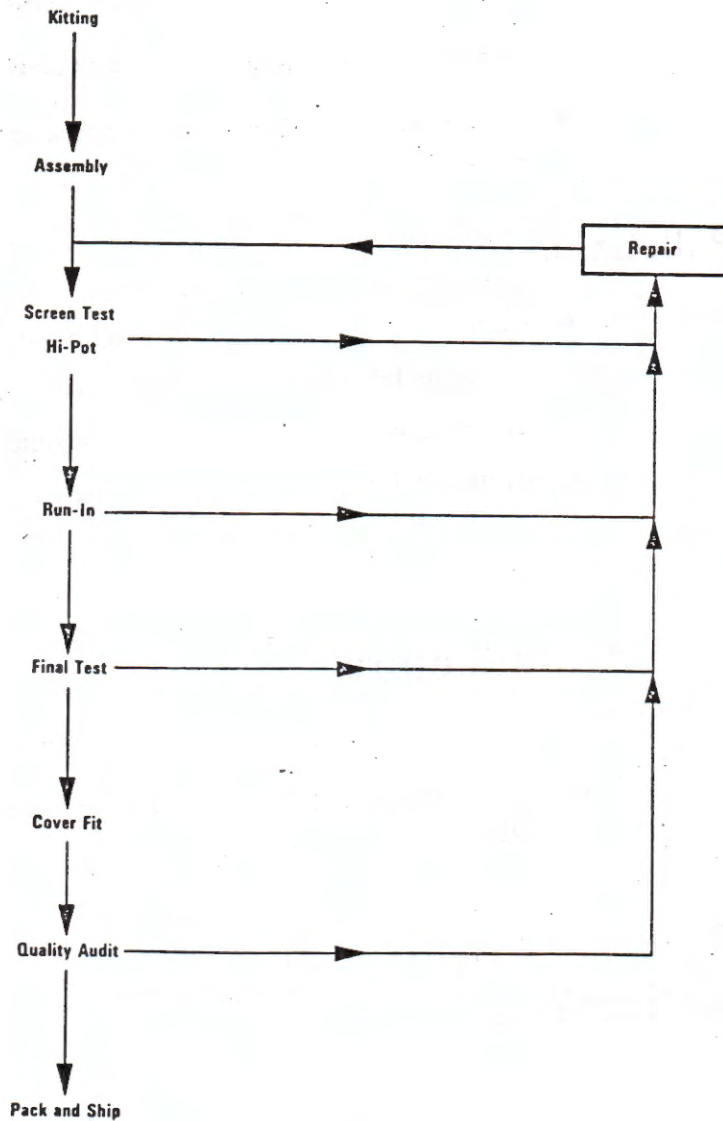
Figure 20. Process Flow

Packaging

- On completion of cover fit, the System Unit will be removed from the pallet and passed through a machine that will wrap the System Unit in polyethylene film.

- The ship carton will be made up automatically on a carton erector. As part of this operation the base of the carton will be closed using staples.

- Bar Code label will be printed and applied to outside of carton.

- System Unit and cushioning will be placed into carton.

- Carton will be passed through automatic sealing machine that will seal top of carton with tape.

Palletizing

- Cartons will advance to palletizing robot.
- Bar Code label on carton will be read by a laser scanner.
- Information will be decoded and transmitted to robot.
- Carton will be placed on appropriate pallet.

Card Manufacture

- Existing manufacturing process will be used for Common and Unique Logic Cards.

Publications

- The Manufacturing Plan for all products sourced in Greenock is common. Any differences associated with the Related Product is defined within its respective Publications Translation Plan.

Manufacturing Process

- There are currently three different manufacturing processes.

Local Manufacture

- EMEA Systems Library
- U.S. "AS IS"/Warranted systems and applications
- Translated applications
- Country originated
- Hardware Options

U.S. Manufacture

- IBM Dayton
- U.S. Vendor

Vendor Logo

- World Wide

Local Manufacture

Translating country and/or Entry Systems Division will provide:

- Print masters (CRC) in the required languages.

- Specifications and/or samples for publications, binders, sleeves, diskette wallet, etc.

Greenock

- Manufacture

- Ship to European Distribution Center

- Release will be via ESD in Millbrook/Hursley with Greenock providing dual service of "Lab of Control" and "Prime Plant" for some products.

- The translating country is totally responsible for:
  - Legal and technical content.
  - Quality of CRC to Manufacturing.

  Note: Greenock is only responsible for the manufacture from the CRC provided. This does not include verification of CRC content.

U.S. Manufacture

- "AS IS"/Warranted products are ordered from the U.S. to gain initial order coverage for EMEA prior to local manufacture.

- Rework of "AS IS"/Warranted products may be necessary to suit EMEA terms and conditions and legal statements.

- "AS IS"/Warranted software products are handled in two groups:
  - Non-Standard
  - Standard

Non-Standard Handling

- Products in this category are ordered from U.S. ready to ship (without rework) to country distribution centers.

- Products in this category are reviewed for legal statements and content on a sample ongoing basis.

Standard Handling

- Products in this category are ordered from U.S. and reworked by local vendor as follows:

  1. Discard U.S. PGM license agreement

  2. If "binder" publication:

     a. Insert errata sheets (if applicable)

     b. Insert multilingual "software terms of sale"

     c. Insert multilingual "software warning notice"

  3. If a "Game":

     a. Insert multilingual "software terms of sale"

     b. Insert multilingual "software warning notice"

Vendor Logo

- Products in this category are independently produced program packages distributed by the PC dealer network.

- The packages carry the vendor's own name and are identified by P/N for order and distribution control.

- Products with a wide European appeal will be distributed via the European Distribution Center (EDC).

- In addition each country may initiate its own local vendor program with distribution only in their home country.

Miscellaneous Publications

Software Submission

- New software products can be offered to IBM. There are several publications released by ESD to define the method of submission:

  1. Software Submission Guide   P/N 8130065

  2. Software Submission Agreement - Internal   P/N 8130064

  3. Software Submission Agreement – External   P/N 8130066

Software Warning Notice (Multilingual)

- For "AS IS"/Warranted and DOS only.

Software Terms of Sale

- Multilingual version for "AS IS"/Warranted only.

- P/N version in individual languages will be produced in the countries for their dealers.

- Non P/N version in individual languages will be printed in the appropriate language DOS manual.

Hardware Statement

- This statement is printed on the back of the front page in "Guide to Operations", "Hardware Maintenance and Service" manuals and the Hardware Options.

Machine Readable Information (MRI)

Release and MRI Timing

Weeks	Activity
X-21	Diskette Label Text in IPL
X-19	Label Text in Boigny
X-18	Artwork in Boca
X-17	Validation Level Diskettes with Translator
X-16	Artwork with Translator
X-16	Typesetting begins
X-16	Translation Sign off on Diskettes
X-15	Master Diskettes in Boca
X-15	Binder Text in IPL
X-15	Master Diskettes in Boigny
X-14	Universal English Boards available in Boca
X-14	Binder/Cover CRC in Greenock
X-13	Universal English Boards received in Basingstoke
X-12	Publication CRC in Greenock
X-10	Production Volumes of Diskettes in Greenock
X-5	Product Available for Shipment from EDC
X-0	Product in CDCs
X+2	Product in Dealers (FCS)

Distribution

- Bulk import CPU direct from U.S., prior to cut over to Greenock manufacture.

- Hardware options/software/spares – support from U.S. and local sources.

- Keyboards shipped in bulk exit Greenock Plant to European Distribution Center (EDC).

- Ocean freight program from day one exit U.S./Far East – requires earlier shipments to meet orders.

- Single ship plan, incorporating Related Product part numbers with PC/PCXT.

- Common stock locations in EDC.

- Full pallet quantities shipped to majors, pick and pack to minor countries only.

- Combined export of Related Product with PC/PCXT.

- Bulk ship to CDC's – CPU separate from keyboard.

- CPU shipped direct from U.S./Greenock manufacturing into EDC

  - Quantity = 12 per pallet
  - Gross weight per pallet = 475 lbs
  - Pallet dimensions = 48" x 40" x 44"

- Printer/Display – shipped direct from Far East vendor into EDC.

- Hardware options/software/spares – shipping and packaging requirements exit U.S. and local sources, as per PC/PCXT.

- All products shipped into EDC – one part number per pallet.

- Products shipped exit U.S./Far East/Local sources on standard 48" x 4" pallets.

- Pallets (imported/local sourced) that are stretch wrapped must contain 'top hats' and corner posts – to reduce damage and repackaging at EDC.

- Imported Products:

  - A part number which is registered on CCFM/CCS must be reflected on outer carton as that part number, if necessary, both U.S. and EMEA part numbers should be displayed. These part numbers must also be shown on the export invoice.

- Greenock Manufactured Units:

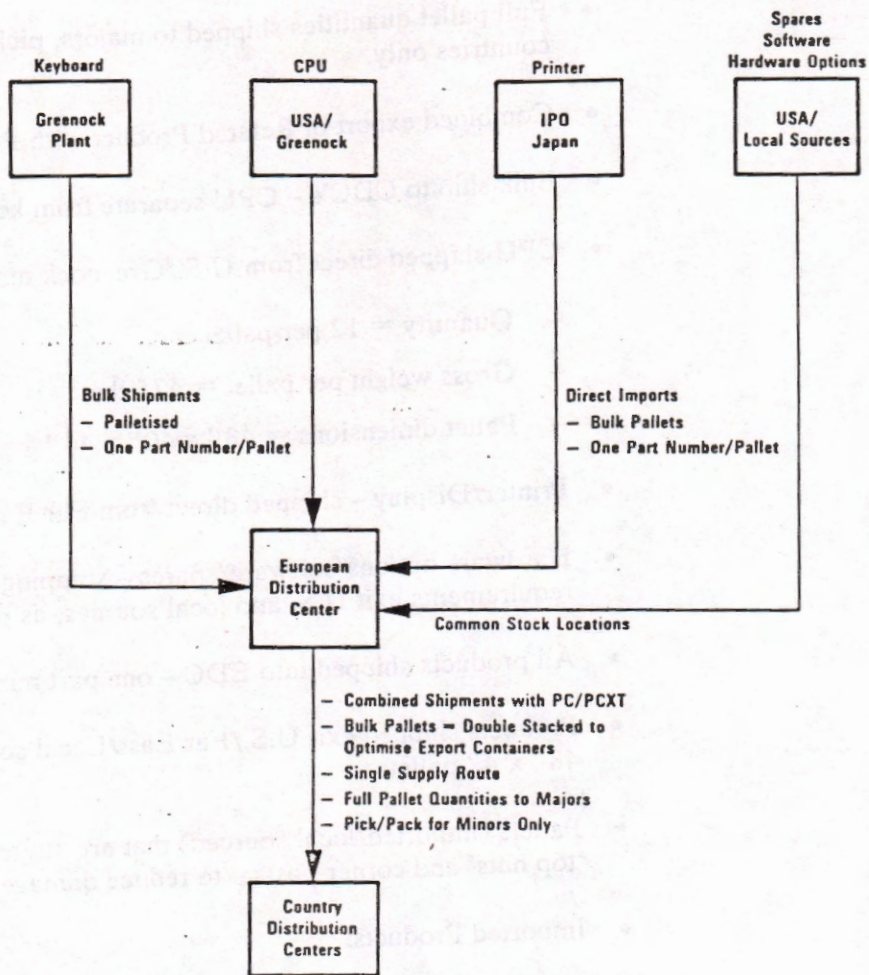 - Outer *pretty pack* carton to display EMEA part number.

Figure 21. Product Material Flow

CHAPTER 15. TRANSFER PRICE DOCUMENT OF UNDERSTANDING

Overview

This chapter details the business agreements under which Entry Systems Division (ESD) will sell and the Developing Division will purchase the Product. It states the prices, and terms and conditions associated with the Product.

Deliverables

Entry Systems agrees to manufacture the Product System Unit models and associated cards. The Developing Division will have the right to negotiate with ESD changes to the agreed upon models, such as addition or deletions of PC Options or unique cards.

Volumes

The Developing Division commits to acquire from Entry Systems Division and Entry Systems Division commits to supply the total volumes stated.

Price

All purchases under this agreement will be charged to the Developing Division at the transfer price.

The transfer price for the committed volumes will be valid through the year 19xx and is predicated on the Developing Division taking the committed volumes. ESD and the Developing Division will review annually the actual volumes taken and the committed Divisional plans to revise the total anticipated volumes. Should the revised total anticipated volumes be less than the original committed volumes, ESD will revise the transfer price for the lower volumes. The revised transfer price will apply to future volumes and to volumes previously taken in the current year. A bill-back payment will be made to cover the price delta in the current year. The Developing Division will not be penalized in the transfer price adjustments for volumes not taken by the Developing Division should ESD not be able to deliver the committed volumes.

ESD may transfer price the Developing Product Division's unique cards at actual cost plus Procurement Burden Apportionment (PBA). This may require the transfer price to be adjusted annually for the actual vendor cost. A bill-back or credit will be made for the difference between the estimated and actual vendor cost for the unique cards.

Supply Management and Scheduling

A separate Product Distribution Document of Understanding (DOU) between ESD, the Developing Division and ISG, details the agreements on supply management scheduling, and distribution. The following summarizes the supply management and scheduling process.

1. ISG/Developing Division will input their supply request to ESD and obtain allocation and confirmation in accordance with the ESD process outlined below.

2. The quarterly forecast/confirmation cycle:

    *   At the beginning of each quarter the ISG/Developing Division will confirm their supply request for the next quarter (the confirmation period) and provide an adjusted forecast demand for the second subsequent quarter (the adjustment period) and a forecast for the third subsequent quarter (the forecast period).

- ESD will confirm back the monthly allocated supply for the confirmation period and the monthly amount of supply reserved for the adjustment period. The confirmation period becomes part of the frozen zone once the confirmed supply is accepted by ISG/Developing Division.

3. The monthly order cycle:

- By the end of each month, ISG/Developing Division will place a purchase order for the supply allocated and confirmed for shipment in the second subsequent month.

4. Annual Plan Volumes:

- ESD will provide annual plan volumes to the Developing Division as part of the Fall and Spring business volumes planning process.

Asset Transfer

Shipment is Freight On Board (FOB) at Entry System's plant of manufacture or warehouse. The responsibility for shipping and all freight charges are borne by the Developing Division.

Warehousing

The Developing Division has the responsibility of establishing the distribution and warehousing facilities for its Related Product. Entry Systems will not provide any warehousing for the Product model(s).

Warranty

The Product machine/models are transfer priced to the Developing Division without warranty and the Developing Division assumes responsibility for the warranty cost and claims on the machines. The Developing Division agrees to reimburse ESD for warranty claims that are processed by ESD due to the common part numbers in the Related Product machines.

Quality

ESD commits to meet the quality requirements stated in the Manufacturing Plan and Quality Plan.

Software

Entry Systems software products will not be transfer priced to the Developing Division. ESD will make the software products available to customer through ISG.

PC Options

Entry Systems Personal Computer Options will not be transfer priced to the Developing Division. ESD will make the PC Options available to customer through ISG.

Termination

The transfer price given to the Developing Division assumes full cost recovery. In the event that some actually incurred fixed expense is not recovered, the Developing Division will assume responsibility for such cost. The Developing Division will not assume the cost if the reason ESD doesn't recover all its incurred Fixed Expenses is because ESD cannot meet their annual volume commitments.

The Developing Division will be responsible for untaken Product inventory, finished or work-in-process, which Entry Systems manufacturing may be left holding due to program termination and for any expenses associated with liquidating such inventories, e.g., converting the inventories to PC-XT's.

All fixed or inventory expenses will be discussed and negotiated prior to the Developing Division reimbursing Entry Systems.

Pricing Actions

ESD and the Developing Division will provide to each other sufficient notice of any pricing actions affecting their common parts in time for both the Developing Division and ESD to coordinate a price action announcement.

Notes:

CHAPTER 16. PUBLICATIONS/ MANUFACTURING

Overview

- The intent of this chapter is to provide a general description of the Personal Computer (PC) Library design, documentation size, publishing specifications and manufacturing process and leadtimes.

- Sample pages from existing PC manuals have been included in this chapter to graphically depict the style, format, fonts and layout techniques currently being used.

- Upon acceptance as a Related Product, the ESD Related Products – *Advanced Manufacturing Planning* department (2N5) will be the focal point for any/all publications/media planning activities.

PC Library Format

- There are a number of reasons for the *size* and *format* of the present style of the PC documentation. Some of the more important considerations are customer acceptance, ease-of-use, and user-friendly style. Customers are now accustomed to the format and image presented in the current PC publications. It is important that this image be continued throughout all PC type publications.

- The documentation for new Related Products developed at locations other than Boca Raton is to be designed as separate or supplemental books. This allows the base PC Library to remain intact with no changes or modifications.

- The supplements will refer to the PC Library manuals by section or subject area, and are PC look-alike documents. They will follow the same format of text, color and presentation as the base PC library. These supplements include a *Guide to Operations*, a *Hardware Maintenance & Service* manual, and a *Technical Reference* manual (when required).

IBM 86\ D, WBI
IBM-G-115

IBM-G-148

- The maintenance philosophy of these supplemental packages is the same as the base PC Library.

- The *Guide to Operations* is included as part of the ship group, the *Hardware Maintenance & Service* and *Technical Reference* manuals are available as saleable items.

- These supplements will be packaged in separate PC binders, slip cases or games binders. The binders will be the same color and size as used in the base PC library manuals.

- Revisions of supplemental documentation can be done independently of the base PC library manuals. Separate packaging insures that any documents, PC library or supplemental, can be updated independently of one another.

PC Hardware Publications

Guide to Operations

- The *Guide to Operations* manual (GTO) contains Installation/Setup instructions, Problem Determination Procedures (PDP's) and a Customer Diagnostic Diskette. The PDP's direct a customer to perform simple steps to isolate a problem to a Customer Replaceable Unit (CRU). A CRU is generally a whole unit (i.e., a system unit, keyboard, printer, expansion unit). The PDP's also direct a customer to take the failing CRU to a service area (IBM Service Center, authorized IBM Service Dealer) for repair or exchange.

- The flow of this manual, using an instruction or statement followed by a line drawing or illustration makes this manual very usable. No cross-referencing (turning pages back and forth) is necessary with this method of presentation.

Installation Instructions

1 Set the Power switch on the system unit (and expansion unit, if attached) to Off.

2 Set the Power switches on all external devices (printer, TV, etc.) to Off.

3 Unplug the system unit's (and expansion unit's) power cord from the wall outlet.

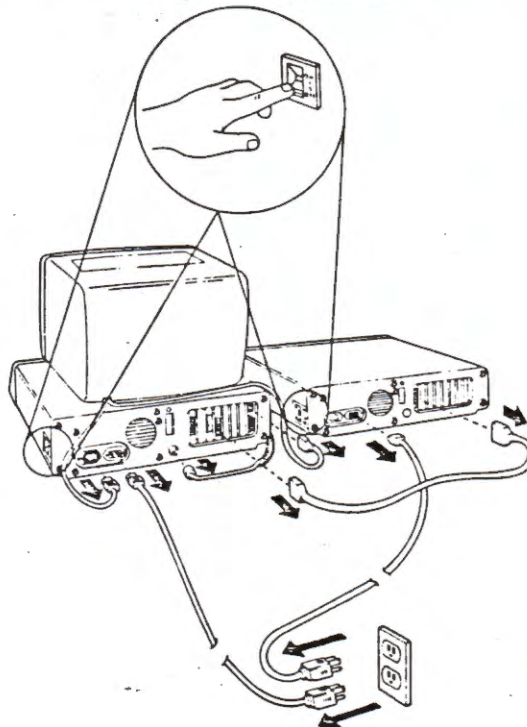**4** Disconnect all cables from the rear of the unit in which the option is to be installed.

Figure 22. Guide to Operations – Sample Page

Hardware Maintenance & Service

- Normally trained Service Personnel use the *Hardware Maintenance & Service* (HM&S) manual to repair a Personal Computer product. The HM&S manual contains a diskette providing an extended level of diagnostics that isolates a problem to a failing Field Replaceable Unit (FRU). A parts catalog, and sections for parts locations and removal/replacement, are also included in this manual.

- This manual uses the same chronological approach as the *Guide to Operations* with steps supported by artwork. No cross-referencing is used in parts removals or the Problem Isolation Chart (PIC) areas of the manual.

START

This is the entry point for using all of the PICs. You may have an error code, audio error during power-on self-test (POST), an undetermined problem, or a problem related to one device. If an error code appears along with an audio error, disregard the audio error and go to the appropriate PIC that corresponds to the error code.

In order to continue, you must have the following minimum comonents:

1. System Unit
2. Keyboard
3. Input device (diskette drive and Advanced Diagnostic diskette)
4. Output device (display)
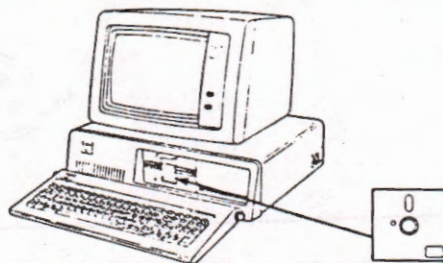
ARE THE OPTION PARAMETERS AND SWITCH SETTINGS CORRECT?

(See section 4 "LOCATIONS" for the proper option parameters and switch locations, and see section 6 "SWITCH SETTINGS" for the proper switch settings.)

NO Install options to match the option parameters and set the switch settings to match the system configuration. If this did not correct the failure, continue to the next page.

YES

3-2

Figure 23. Hardware Maintenance & Service – Sample Page

Technical Reference

- The *Technical Reference* manual contains information used by engineers, programmers and designers for product development (OEM type information). This manual contains a high level of technical design information about the product.

IBM Printer Adapter

The printer adapter is specifically designed to attach printers with a parallel port interface, but it can be used as a general input/output port for any device or application that matches its input/output capabilities. It has 12 TTL-buffer output points, which are latched and can be written and read under program control using the processor In or Out instruction. The adapter also has five steady-state input points that may be read using the processor's In instructions.

In addition, one input can also be used to create a processor interrupt. This interrupt can be enabled and disabled under program control. Reset from the power-on circuit is also ORed with a program output point, allowing a device to receive a power-on reset when the processor is reset.

The input/output signals are made available at the back of the adapter through a right-angled, PCB-mounted, 25-pin, D-shell connector. This connector protrudes through the rear panel of the system or expansion unit, where a cable may be attached.

When this adapter is used to attach a printer, data or printer commands are loaded into an 8-bit, latched, output port, and the strobe line is activated, writing data to the printer. The program then may read the input ports for printer status indicating when the next character can be written, or it may use the interrupt line to indicate "not busy" to the software.

The output ports may also be read at the card's interface for diagnostic loop functions. This allows faults to be isolated between the adapter and the attaching device.

This same function is also part of the combination IBM Monochrome Display and Printer Adapter. A block diagram of the printer adapter is on the next page.

Printer Adapter   1-117

Figure 24. Technical Reference – Sample Page

PC Maintenance Philosophy

- The maintenance philosophy for the PC Library is based on *two levels* of service, one provided by customers, and another provided by trained service representatives.

- Customers detect errors by a system failure,Power On Self Test (POST) failure , or by speaker tones and screen messages. Using a customer diagnostic diskette and PDP's customers can detect failures to a CRU.

   Note: For more detailed information, refer to Chapter 8 of this publication.

- ESD Service Channels (IBM CEs or trained service personnel) use *advance diagnostic diskette*, PICs, and other service information to isolate to a FRU.

Related Product Sample Documents

- Supplemental Related Product documentation shall adhere to the following organizational outlines.

Guide to Operations

- Introduction/Installation
- Operations
- Problem Determination Procedures
- Options
- Relocate
- Index

Hardware Maintenance & Service

- Introduction
- Problem Isolation Charts
- Locations
- Removal/Replacement Procedures
- Parts Catalog
- Index

Technical Reference

- Hardware
- System Usage
- Logic Diagrams
- Specifications
- Glossary
- Index

RP Application Software Manual

- This activity is the responsibility of the Developing Laboratory and normally will be planned, developed and written by a local Software Information Development group.

- The Development Laboratory has the responsibility to deliver tested, approved, Camera-Ready-Copy (CRC) for all Hardware and Software Publications (including media—diskettes, etc.) to ESD's "Publications/ Software Manufacturing" organization.

General Publications Specifications

- Press Roman typestyle is chosen for its readability for PC publications. A 60 lb. coated (patina matte) paper is used so there is no show-through (from one side of a page to the other) of the ink. No divider tabs are used in the documentation (except in the *Guide to Operations* for customers ease of information retrieval).

- The size of paper used in the printing process provides exact multiples of pages (5-1/2" x 8-1/2") to a sheet of paper (as folded, cut and run through the printing press) with no waste or special handling. This produces a significant cost savings in the overall expense of each document. The binder size, paper size and (paper) hole size all help to position the paper within the binder so that when a user reinserts the book into the binder sleeve it goes in without catching on the bottom of the sleeve.

- A line length of 26 picas (total image area), or 22 picas of running text is standard for the PC documentation. A depth of 45 picas for text is standard, with page numbers at the 47th pica.

- Specific colors are used to denote screen messages and other important data, and are consistent throughout all customer and maintenance documentation.

- The PC type formatting of text is done for ease and effectiveness of reading, with new sections always starting on right-hand pages. Head levels are constant through all publications.

- Figure numbering is not used, for instructions are always followed by necessary line drawings that clarify steps and procedures. This flow, using an instruction, then illustration or line drawing to clarify the instruction, will be used throughout all manuals. Page referencing (moving from one page to another) is not necessary using this chronological text/artwork approach.

- IBM part numbers are used in lieu of form numbers. This allows Retail Dealers, internal IBM personnel and others to easily order PC documents.

  Note: Upon acceptance as a Related Product (Interlock 0-1) a detailed PC Publishing Specification package will be made available to the Development Laboratory's Information Development Organizations.

Publications/Media Manufacturing

- The ESD Publications/Software Manufacturing organization (Dept. 9J8) is responsible to manage the printer preparation, EC release, and publication/media manufacture of all chartered Related Products. This organization will provide the necessary technical assistance and guidance to their peer groups at the Developing Laboratory site.

- The following is a leadtime (in weeks) and product activity chart identifying all elements of a publication product.

Week	Publication Manufacturing	Diskette Manufacturing	Diskette Label Manufacturing
10	CRC at Boca Production Publications including binder & dust jacket artwork — Quality Review		CRC at Boca Production Publications
9	Publications CRC to EC Coordinator Boca — Prepares for EC release to Production Facility — Collating lists — Floor Plans	Master diskette to EC Coordinator Boca — Manufacturing verification test	Diskette label CRC to EC Coordinator Boca
8		EC RELEASE TO PRODUCTION FACILITY	
7	Production Facility submits orders to printers		Production Facility submits orders to printers
6			
5	Boca blue line review		Diskette labels sent to Diskette Production Facility — Quality check <-------
4	Boca print block review	Begin replication of diskettes with labels at Production Facility	
3	Printer ships to Production Facility — Receiving quality check	Ship disks to Production Facility	
2	All parts available — Production Facility begins product package merge		
1.5	Software Product Verification Test — Boca Quality		
1	Ship to Bureau for early distribution to dealers		
0	Volume ship capability from Production Facility		

Figure 25. Publications/Software Manufacturing Cycle

Notes:

CHAPTER 17. DISTRIBUTION PROCESS DOCUMENT OF UNDERSTANDING

Overview

The following text describes the ESD Related Products Distribution process which is unique in that it deals primarily with the Information Systems Group (ISG) channels – NMD/NAD. ISG sells to the typical customer IBM has dealt with in the past.

There is a Related Products Distribution Center in Lexington, Kentucky, managed by the Field Engineering Division (FED). This distribution center will receive and stock all RP Hardware components, PC Options, unique software, and publications – by product.

Upon receipt of an ISG/Customer order, all the appropriate parts are picked from stock in preparation of shipment. At this time the RP System Unit(s) Models are tested. The complete order is then packed and shipped directly to the customer.

Product Description

A brief description of the product content, including: model configurations and feature options (hardware and software). These products will be stocked by the Distribution Center and shipped to the customer based on unique order requirements. The term Shippable Manufacturing Units (SMU) refers to these deliverables.

Key Dates

The following four checkpoints are key to the distribution process:

- Field Tests
- Announcement
- Product Introduction
- General Availability

Ground Rules and Assumptions

1. ESD will configure to the various models and ship to Field Engineering Division (FED) in Lexington for distribution. Customer PC options will be added in Lexington.

2. The following Shippable Manufacturing Units (SMU's) will be stocked and shipped from Lexington:

   - Monochrome Monitor
   - Color Monitor
   - Printer
   - Adapter Cards

3. ESD Related Products reserves the right to negotiate the discontinuance of any model if its volume falls below 20% of the total product volumes for 2-consecutive calendar quarters.

4. Any quality/reliability performance characteristics unique to this product must be solved by the Product Manager and with ISG/FE/ESD concurrence.

5. The Plant of Control (POC) which is ESD Related Products Manufacturing, will be responsible for the product, its field performance, its schedules, and measurements.

   - The Plant of Control (POC) will develop a plan for field and Lexington Distribution quality performance with a tracking system for regular feedback. This plan will be reviewed with the Developing Division/ISG and base PC Quality Assurance for their concurrence.

6. The transfer price terms and conditions, along with the volumes and transfer price(s) will be negotiated separately.

7. All hardware SMU's are to be bulk shipped to Lexington with one part number per pallet. Software and unique publications will be shipped from Dayton, NJ to Lexington in mixed power packs.

8. Monthly ESD shipment reports will be sent to ISG Scheduling and FED Distribution, Lexington by ESD Operations.

9. Engineering Change level control is not required, however, first in/first out will be required in Lexington.

10. Insurance coverage for the inventory (including carrier liability) is to be provided through the Corporate Insurance Department.

11. ISG will provide FED with the Product part numbers, noting which are unique and which are common to other PC products.

12. ISG will load all the appropriate P/N information into AAS prior to the first order.

13. Training will be provided by Product Management to Lexington FED Distribution in time for the configuring and testing of the first units.

14. Hardware and up-to-date diagnostics will be provided by Product Management to FED Distribution for the training of the test personnel.

15. A Program Coordinator will be assigned by FED Distribution, Lexington for the start-up period through General Availability. The New Products Administrator is the ESD Related Products contact for the product.

Supply Management

1. Customer accept plans (Lexington ship plans) will be the responsibility of the Developing Division/ISG.

2. Supply plans to support the customer accept plans will be developed by the Developing Division/ISG as part of the regular volume supply planning process (see Scheduling in this chapter).

3. ISG Supply Management will convert the supply plan to the machine type, model and SMU levels and communicate these volumes to Field Engineering Headquarters (FEHQ) and Boca Raton.

4. Boca Raton will size, negotiate with ISG, and commit the supply.

5. Significant increases or decreases to the plan of record may result in additional charges to the product cost and transfer price. These will be evaluated on a business case basis. Any resultant inventory will be carried by ISG.

Scheduling

1. The Developing Division/ISG will derive the annual customer volumes through the established Business Volumes Negotiations process. This process will determine the annual customer accept plans and resulting supply plans needed for their support.

2. Concurrent with the Business Volumes Negotiations, the Developing Division will conduct volume reviews with the Internal and World Trade organizations to determine their respective annual demands.

3. The Developing Division will be the focal point for establishing and loading the committed plan of record to the base plan system and the business volumes system (GBS).

4. ISG will act as the focal point for communicating the consolidated, agreed-to, product demands to ESD and FED Distribution, for their use in planning support of the annual shipment volumes.

5. The Developing Division/ISG will negotiate on the monthly basis the current load/supply status and interlock on the volumes necessary for the quarterly input to the ESD supply management process.

6. ISG will input their supply request to ESD and obtain allocation and confirmation in accordance with the ESD process outlined below.

7. The quarterly forecast/confirmation cycle:

- At the beginning of each quarter ISG/Developing Division will confirm their supply request for the next quarter (the confirmation period) and provide an adjusted forecast demand for the second subsequent quarter (the adjustment period) and a forecast for the third subsequent quarter (the forecast period).

- ESD (ISG and Worldwide Volumes Planning and Distribution) will confirm back the quarterly allocated supply by month for the confirmation period and the monthly amount of supply reserved for the adjustment period. The confirmation period becomes part of the frozen zone once the confirmed supply is accepted by ISG.

8. The monthly order cycle:

- By the end of each month, ISG will place a purchase order for the supply allocated and confirmed for shipment in the second subsequent month.

- Committed monthly volumes will be converted to weekly shipments by ESD (Sales Operations, Product Supply and Scheduling), and they will communicate these to ESD (ISG and Worldwide Volumes Planning and Distribution), who in turn will pass the weekly numbers to ISG Scheduling and FED Distribution, Lexington.

9. Annual Plan Volumes:

- ESD will provide annual volume planning numbers to SPD as part of the Fall and Spring business volumes planning process.

- The ship plan volumes will be identified by model, and by month for the current base plan period without years identified by annual volumes.

- Prior to announcement Related Products Business Evaluation will be responsible for receiving supply requirements and communicating commitments to the Developing Division/ISG. After product announcement ESD (Plans and Controls, Business Volumes) will assume this responsibility.

ESD Manufacturing

1. Manufacturing will ship in Economic Delivery Quantities (EDQ's) to the nearest full truckload with final monthly quantities shipped by the close of the accounting month.

2. SMU shipments will be in consistent, palletized quantities.

3. Ship ahead will not be allowed except on a pre-negotiated basis between ESD Related Products Manufacturing and ISG Supply Management.

4. The regular interplant billing process will be used for transfer of product from ESD Related Products to FED Distribution, as modified by any transfer pricing agreements.

5. Asset ownership will transfer from ESD to FEHQ at time of shipment from Related Products Manufacturing.

6. Based on the approved Manufacturing Plan, ESD Related Products Manufacturing commits to a SPQL of 98% at General Availability time. Related Products Manufacturing will improve this to 100% defect free within 9-months of General Availability.

FED Distribution

1. FED Lexington will have the responsibility for receiving, stocking, and handling the machine and SMU shipments from Manufacturing and drop ship suppliers.

2. FED Lexington will pick the SMU's and perform pre-delivery preparation prior to shipment to the customer. System orders will be filled beginning with the correct machine type and model.

3. Lexington will attach the System Units which require a unique configuration to a slave display and printer and power up the system using the Advanced Diagnostic Programs to ensure that each system is operational.

4. The FED Lexington Quality function will certify FED's preliminary preparation, pick and ship procedures as part of their Quality Assurance role.

   • FED Lexington Quality will supply Related Products Quality with weekly reports consisting of the number of machines processed, number of failures, failure modes, which Field Replaceable Units (FRU's) failed and any additional information that is mutually agreed to by FED Distribution and ESD Quality.

5. Lexington will ship a 100% defect free product at General Availability time. This will be domonstrated by each unit successfully passing the Final Test Process in the Lexington FED Distribution Center. This criteria will apply only to those units which are opened and tested in Lexington.

6. Lost/misdirects/damaged/premium transportation inquiries by carriers on product shipped from Related Products Manufacturing to FED Lexington will be the responsibility of FED Lexington.

7. All field returns belong to ISG and will not go back to ESD. FED is responsible for the reconditioning and testing prior to customer reassignment for all field returns.

8. Rejected SMU's in Lexington will be sent to the appropriate repair/warranty center for disposition.
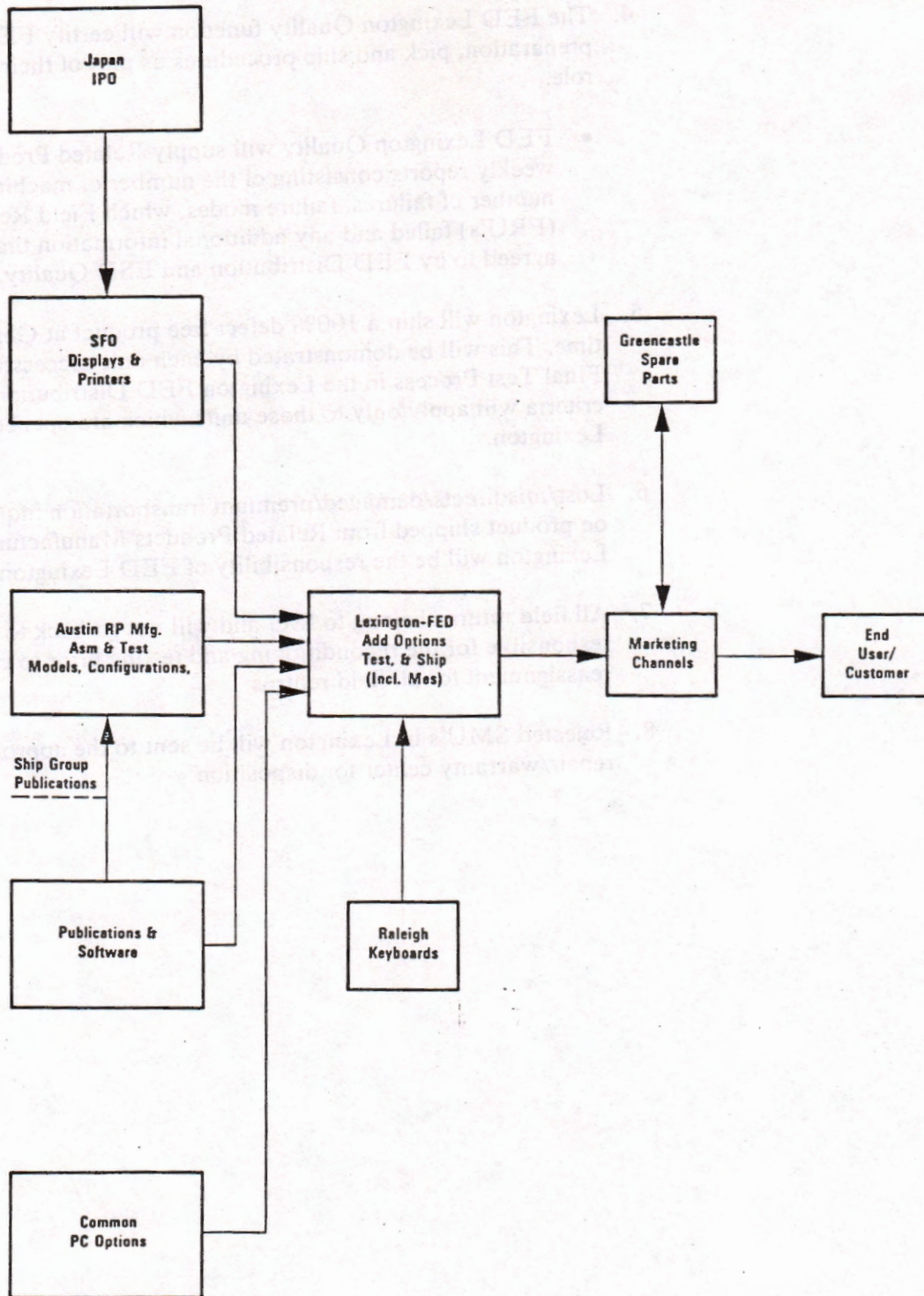
Figure 26. Distribution Flow

17-8   Distribution Process

Finance

1. The current Personal Computer financial systems will be followed for all of the Boca Raton sourced SMU's.

2. FED Mechanicsburg, Pennsylvania, will be the responsible Financial/Accounting organization for the new product upon shipment from Related Products Manufacturing

3. The Plant of Control will coordinate the shipment of all product (SMU's and part numbers) shipped to Lexington, both vendored and IBM. The invoices and intracompany billings for these will be paid by Boca Raton, who will invoice FED Mechanicsburg Accounting by part number, quantity, actual unit cost, and total cost.

4. Inventory in Lexington will be carried on the FED Distribution ledger at cost by plant number. At month end the total inventory balance will be transferred to the ISG ledger.

5. FED Distribution expenses will be charged to the appropriate profit center (IS & CG) on a monthly basis. These expenses will be categorized in two parts:

   - Pick/Pack

   - Pre-Delivery Preparation

Notes:

CHAPTER 18. SERVICE TERMS AND CONDITIONS (Ts & Cs)

Overview

- Entry Systems Division (ESD) has developed and implemented an interactive, multilayered hardware and software service system. This system has the ability to respond to and resolve both common and unique requirements of the various marketing channels and their customers and/or end users.

- This document reflects the Personal Computer (PC) Service Environment as it exists today. Due to the nature of the rapidly changing PC environment, Development laboratories anticipating entry into this marketplace with PC Related Products should contact Related Products Marketing Planning, Dept. 2N7, Boca Raton, to ensure that their product service plan is consistent with the service environment at the projected time of announcement.

Service Offerings

- Service offerings are divided into *two categories*; Warranty and Post-Warranty service.

Warranty Service

- PC and PCXT are warranted for 90 days, future products are planned to be warranted for twelve months from date of purchase. Service performed during the warranty period is provided at no charge to the customer, covering both parts and labor. Warranty service is normally provided at the point of sale, and dealers are reimbursed by ESD for warranty service. However, Personal Computers (PC's) under Warranty can be taken to any IBM Service Center or IBM PC authorized dealer for warranty service.

Post-Warranty Service

Post-Waranty service is provided on PC's under the following options:

- *Dealer Service Option* – a fixed fee dealer offering, which is basically an extension of the warranty period. The dealer sets his own price, and may, if he wishes, offer it free. This option covers parts and labor for a nine month or 12 month period and can be renewed indefinitely. Under the Ts & Cs of DSO, the dealer is reimbursed in the same manner as warranty.

- *Extended Warranty* – a fixed fee Customer Service Division (CSD) offering covering parts and labor on a 9 month renewable basis.

- *Maintenance Agreement* – a fixed-fee CSD offering covering parts and labor on a 12 month renewable basis.

- *Per/Call* – a variable-fee offering, providing labor at a fixed hourly rate plus parts at list price.

    Note: In addition to the offerings mentioned previously, dealers can create and price their own post-warranty "maintenance agreement" type offerings.

Service Methodology

- Service offerings are further divided into *five service methodology options*, which are priced according to level of customer involvement and the location at which the service is performed.

Options

1. *IBM On-Site Repair* – IBM CSD representatives perform the repair at the user location.

2. *IBM On-Site Exchange* – the failing element Field Replacement Unit (FRU) is replaced by an IBM CSD representative with a working unit at the user location.

3. *Customer Carry-in Exchange* – the failing element or FRU is taken to the IBM Repair Center or IBM authorized dealer for exchange.

4. *Mail-in Exchange* – the failing element or FRU is mailed to the IBM Repair Center or IBM authorized dealer for exchange.

5. *Mail-in Repair* – the failing element or FRU is mailed to the IBM Repair Center or IBM authorized dealer for repair.

User Entry

The terms and conditions governing entry into and use of the support structure vary from contract to contract, and are determined by the following factors:

- Warranty/Post-Warranty Period
- Point of Sale: IBM or Retail store
- Support Options purchased by user
- Hardware/Software

NAD/NMD/IBM Product Centers

Software Support Structure

The first point of contact in the Software Support Structure for end-users is determined by Volume Procurement Amendment (VPA) or non-VPA status. Users with a VPA contract will have a registered Technical Coordinator who is their interface to the The Personal Computer Assistance Center (PCAC). Non-VPA users interface to the PCAC through the IBM Product Center Representatives, or through the Local NAD/NMD Branch Office Systems Engineer (SE).

PCAC is the next level of support, and is accessed through a toll free "800" number.

The PCAC staff, using symptom-fix type data bases called Customer Support System (CSS) and EQUAL, will attempt to identify and resolve the user problem. In the event that they cannot do so, the next level of support for them is the Dealer Support Center (DSC). The DSC is the interface to the ESD Development group, and through them, to the product vendors.

Note: Vendor proprietary software is sold on an "AS IS"/Warranted basis, and the ultimate responsibility for problem resolution or circumvention may fall on the user.

Customer Service Division (CSD)

Customers who have purchased their PC's through the NAD/NMD marketing organization are provided with a toll-free "800" number which connects them with the CSD Service/Exchange Communications Center (S/ECC). This Center will determine the user's service coverage (Per Call or Maintenance Agreement) and route the service request to the appropriate service branch for on-site service, or direct the customer as to which service option to use.

- Carry-in Repair/Exchange
- IBM On-site Repair/Exchange

As the figures indicate, there are various paths through the CSD support structure. Whether the customer has fixed-fee Maintenance Agreement coverage, or pays variable-fee Per Call (fixed hourly rate plus parts) rates, the options are priced according to the level of customer involvement and location at which service is performed.
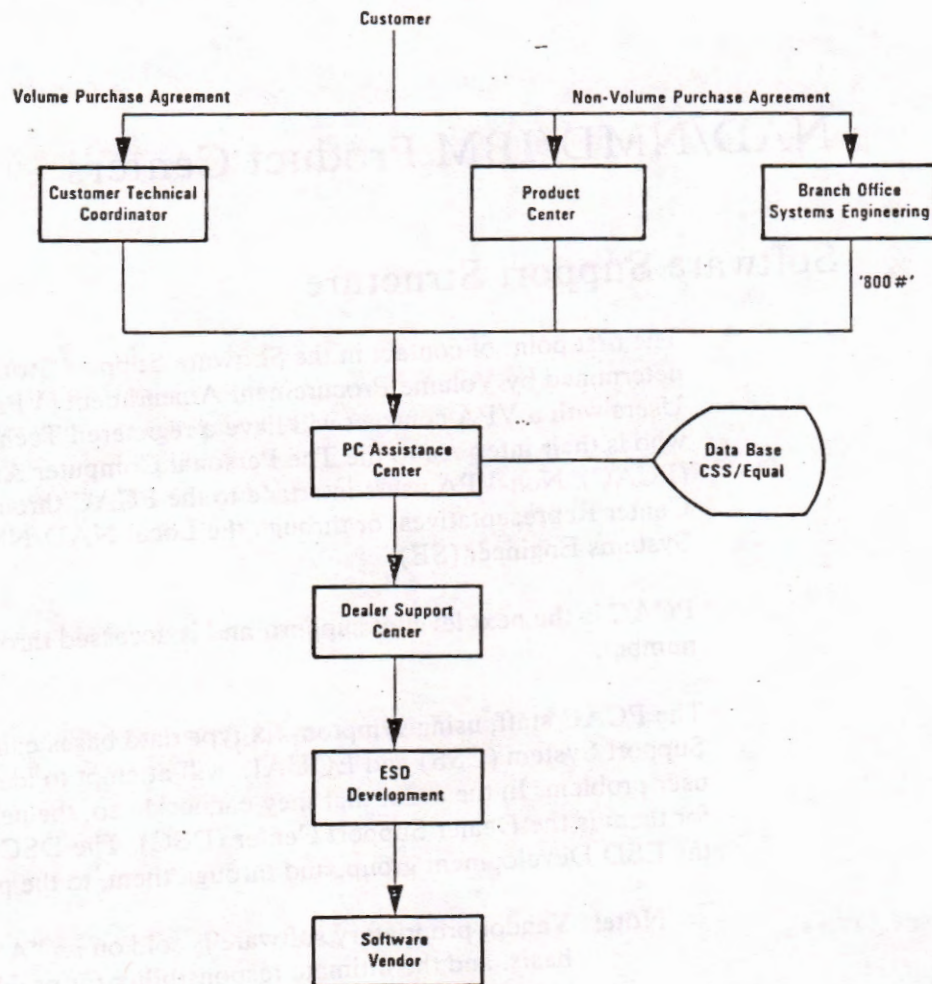
Figure 27. Software Support System

Retail and Value Added Dealer (VAD)

Service and Support Structure

- The retail purchase and Value Added Dealer (VAD) users entry into the Support Structure is normally the place of purchase; however, the PC can be taken to any IBM Repair Center or IBM authorized dealer. The dealer also has access, via a toll free "800" number, to both the Customer Support System symptom-fix data base and the Dealer Support Center for additional help in problem identification and resolution. As in the case of software support, the Dealer Support Center is the interface to the ESD Development group and the vendor for additional support, if required. The Dealer Support Center also has a direct interface to the Product Engineering groups for technical support.

  Note: At the present time, a test program is being conducted for a limited number of products, which provides a direct user hot-line support for problem identification and resolution. This is done via a toll-free "800" number on a fee-per-call basis, with a limit on the amount of time the representative will spend on a particular problem, and with a user option to buy additional time from the hot-line group.
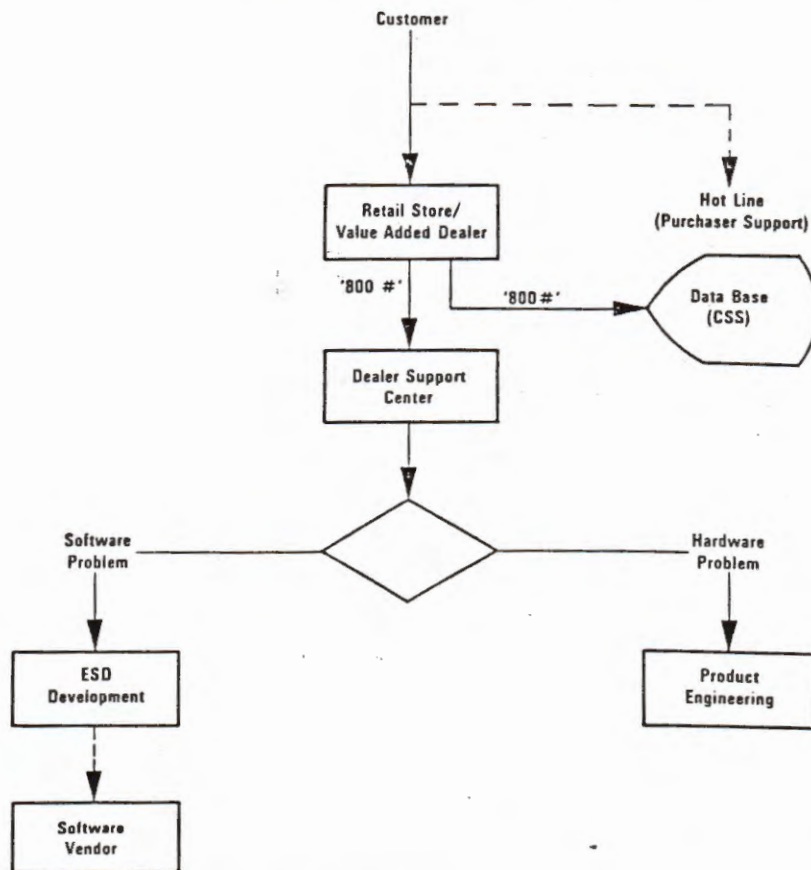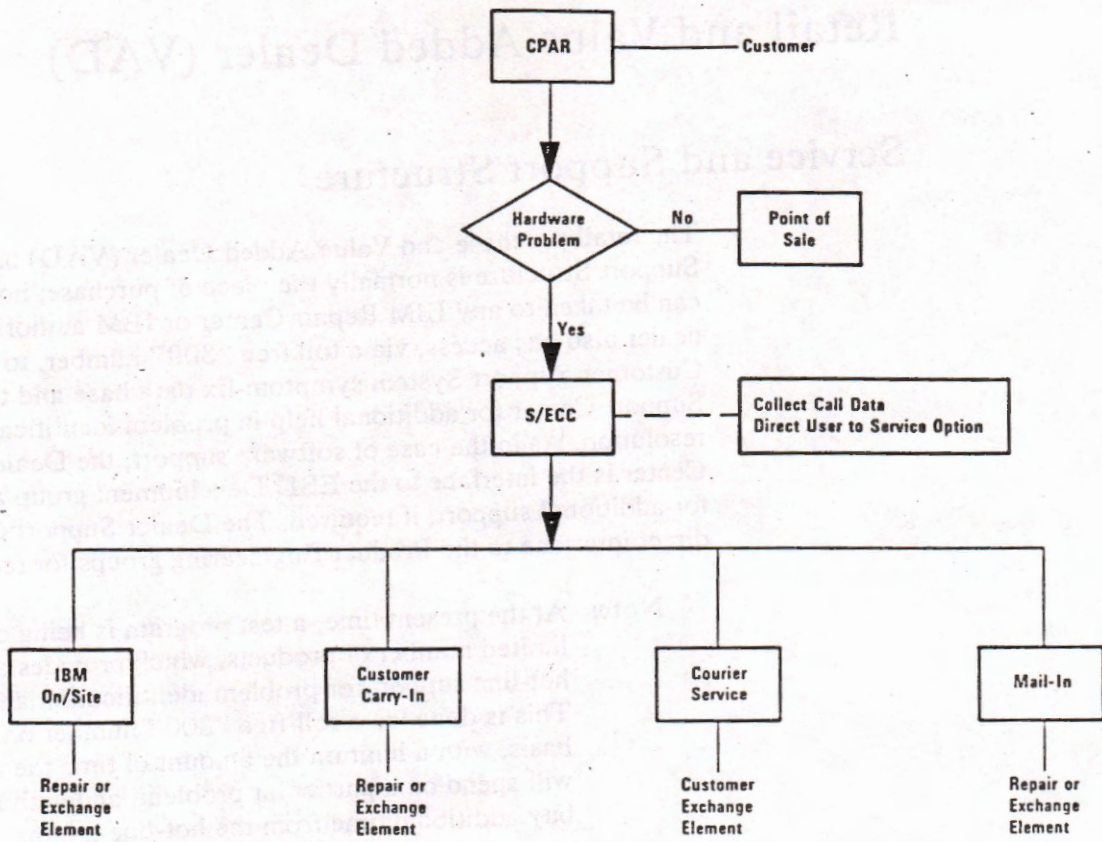
Figure 28. Retail/VAD Service Structure

```
                    ┌──────────┐
                    │   CPAR   │────────── Customer
                    └────┬─────┘
                         │
                         ▼
                    ◇─────────◇        ┌──────────┐
                    │ Hardware │  No    │ Point of │
                    │ Problem  │────────│   Sale   │
                    ◇─────────◇         └──────────┘
                         │
                        Yes
                         │
                         ▼
                    ┌──────────┐        ┌──────────────────────────┐
                    │  S/ECC   │--------│   Collect Call Data      │
                    └────┬─────┘        │ Direct User to Service Option │
                         │              └──────────────────────────┘
                         │
        ┌────────────────┼──────────────────┬──────────────────┐
        ▼                ▼                   ▼                  ▼
   ┌──────────┐    ┌──────────┐       ┌──────────┐      ┌──────────┐
   │   IBM    │    │ Customer │       │ Courier  │      │ Mail-In  │
   │ On/Site  │    │ Carry-In │       │ Service  │      │          │
   └────┬─────┘    └────┬─────┘       └────┬─────┘      └────┬─────┘
        │               │                  │                 │
   Repair or       Repair or          Customer          Repair or
   Exchange        Exchange           Exchange          Exchange
   Element         Element            Element           Element
```

Figure 29. CSD Service Structure

```
              ┌────────────────────┐
              │  Customer Service  │
              │   Representative   │
              │   Branch Offices   │
              └─────────┬──────────┘
                        │
                        ▼
              ┌────────────────────┐
              │  Region Designated │           ⬡
              │      Support       │--------- Retain
              └─────────┬──────────┘
                        │
                        ▼
              ┌────────────────────┐
              │   Field Support    │
              │      Center        │
              └─────────┬──────────┘
                        │
                        ▼
              ┌────────────────────┐
              │ Product Engineering│
              └────────────────────┘
```
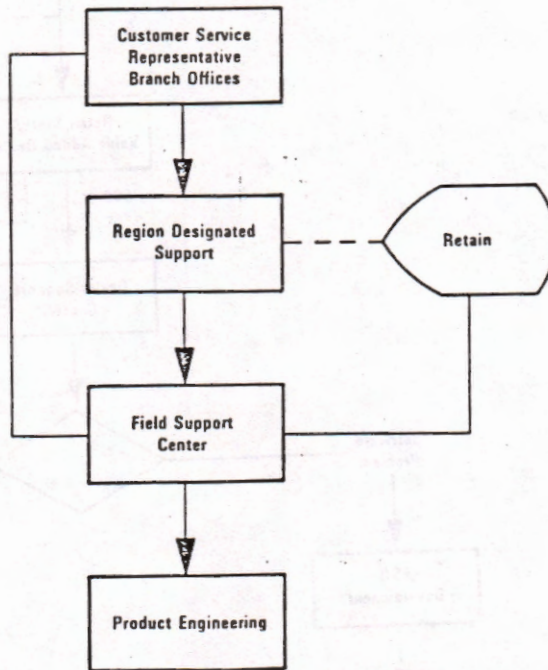
Figure 30. CSD Hardware Service Structure

CHAPTER 19. ENTRY SYSTEMS DIVISION (ESD) MARKETING

ESD Marketing Overview

- Non-IBM marketing channels through which customers may acquire IBM products are growing rapidly. Concurrently, NAD, NMD, and NDD are selling increasing volumes of IBM products.

- To further clarify the elements of ESD Retail Marketing the *Related Products Marketing Planning* department will make available the ESD Marketing Practices manual. This document describes in detail our Channels Software Terms and Conditions (T's and C's), Maintenance and Related Services, as well as the agreements and bulletins currently in effect in ESD Marketing.

- It should be pointed out that when an ESD product becomes part of another division's product (i.e., a related product) the marketing responsibility for the final product rests with the Developing Division. It should not be assumed that the related product would be appropriate for marketing through the ESD Marketing function.

Notes:

GLOSSARY

Terms

Frozen Period: Three month period following confirmation on volume commitment in which quantities cannot be altered.

Interlock: A term used by ESD Related Products to identify the five major check point or approval steps in the RP Management process.

Lab of Control: The Development Laboratory that develops, tests, and delivers the Related Product to RP Manufacturing.

MAPICS: The I/S System used by ESD for order entry, manufacturing, and distribution of its products.

Pancake: A Related Product term used to identify a system unit, model, or models of a product.

Plant of Control: Location of product ownership that controls/monitors cost, quality, and accountability to the customer for a product.

Abbreviations

AC: Alternating Current

AFE: Americas Far East

B/M: Bill of Material

BIOS: Basic Input Output System

CAD: Computer Aided Design

CADAM: Computer Aided Design
And Manufacture

CCF: Corporate Central File

CCSF: Corporate Custom System File

CE: Customer Engineer

CPAR: Customer Problem Analysis
Report

CPU: Central Processing Unit

CQRL: Component Quality and
Reliability Laboratory

CRC: Camera-Ready-Copy

CRT: Cathode Ray Tube

CRU: Customer Replaceable Unit

CSA: Common Sub-Assembly

CSD: Customer Service Division

CSS: Customer Support System

DC: Direct Current

DCP: Diagnostic Control Program

DIP: Dual In-line Package

DMA: Direct Memory Access

DOS: Disk Operating System

DOU: Document of Understanding

DPRS: Design Practices Release
System

DSC: Dealer Support Center

DVT: Design Verification Test

EC: Engineering Change

EDC: European Distribution Center

EDQ: Economic Delivery Quantities

EMC: Electromagnetic Compatability

EMEA: Europe/Middle East/Africa

EMI: Electromagnetic Interference

EMS: Electromagnetic Susceptibility

ES: Entry Systems

ESD: Entry Systems Division,
Electrostatic Discharge

EVT: Engineering Verification Test

FE: Field Engineering

FCC: Federal Communications
Commission

FCS: First Customer Ship

FED: Field Engineering Division

FEDC: Field Engineering Distribution
Center

FEHQ: Field Engineering Headquarters

FOB: Freight On Board

FRU: Field Replaceable Unit

FVT: Functional Verification Test

GTO: Guide To Operations manual

HM&S: Hardware, Maintenance and Service manual

I/O: Input/Output (device)

IPL: International Products Limited

IPO: International Procurement Organization

IS&CG: Information Systems & Communications Group

ISD: Information Systems Division

ISG: Information Systems Group

ITL: Independent Test Laboratory

LSI: Large Scale Integration

MAPICS: Manufacturing Accounting Production Information Control System

MDCP: Manufacturing Diagnostic Control Program

ME: Manufacturing Engineering

MPR: Manufacturing Problem Report

MRI: Machine Readable Information

MSTP: Manufacturing System Test Process

MTBF: Mean Time Before Failure

MVT: Manufacturing Verification Test

NCM: Non-Conforming Material

NMD/NAD: National Marketing Division/National Accounts Division

NPTH: Non-Plated Through Hole

NTF: No Trouble Found

OD: Outside Diameter

OEM: Other Equipment Manufacturer

P/N: Part Number

PBA: Procurement Burden Apportionment

PC: Personal Computer, Production Control

PCAC: Personal Computer Assistance Center

PDA: Product Documentation Analyst

PDP: Problem Determination Procedure

PE: Product Engineering

PIC: Problem Isolation Chart

PLD: Powerline Disturbance

PLT: Powerline Transients

POC: Plant of Control

POH: Power On Hours

POST: Power On Self Test

PQA: Product Quality Assurance

PROC: Procurement

PS: Product Sample

PTDS: Problem Tracking and Distribution System

PTH: Plated Through Hole

QA: Quality Assurance

R/W: Read/Write

RA: Repair Action

RAM: Random Access Memory

RAS: Reliability/Availability/ Serviceability

REA: Request for Engineering Action

RES: Radiated Electromagnetic Susceptibility

RFI: Radio Frequency Interference

RFQ: Request For Quotation

ROS: Read Only Storage

RP: Related Products

RPPE: Related Products Product Engineering

RPPQA: Related Products Product Quality Assurance

RPSA: Related Products System Assurance

RQI: Request for Quality Investigation

S/ECC: Service/Exchange Communication Center

S/N: Serial Number

SA: Systems Assurance

SCE: Service Cost Estimate

SDLC: Single Data Link Communication

SIP: Single In-line Package

SMU: Shippable Manufacturing Unit

SPA/EMC: Systems Product Assurance/Electromagnetic Compatibility

SPQL: Ship Product Quality Level

STDR: System Test Data Report

SUT: System Under Test

T/H: Temperature/Humidity

TTL: Transistor Transistor Logic

UK: United Kingdom

UL: Underwriter Laboratory

UL/CSA: Underwriter Laboratory/ Canadian Standards Authority

UUT: Unit Under Test

VAD: Value Added Dealer

VPA: Volume Procurement Agreement

WTC: World Trade Corporation