



calma

Solutions to Productivity Problems

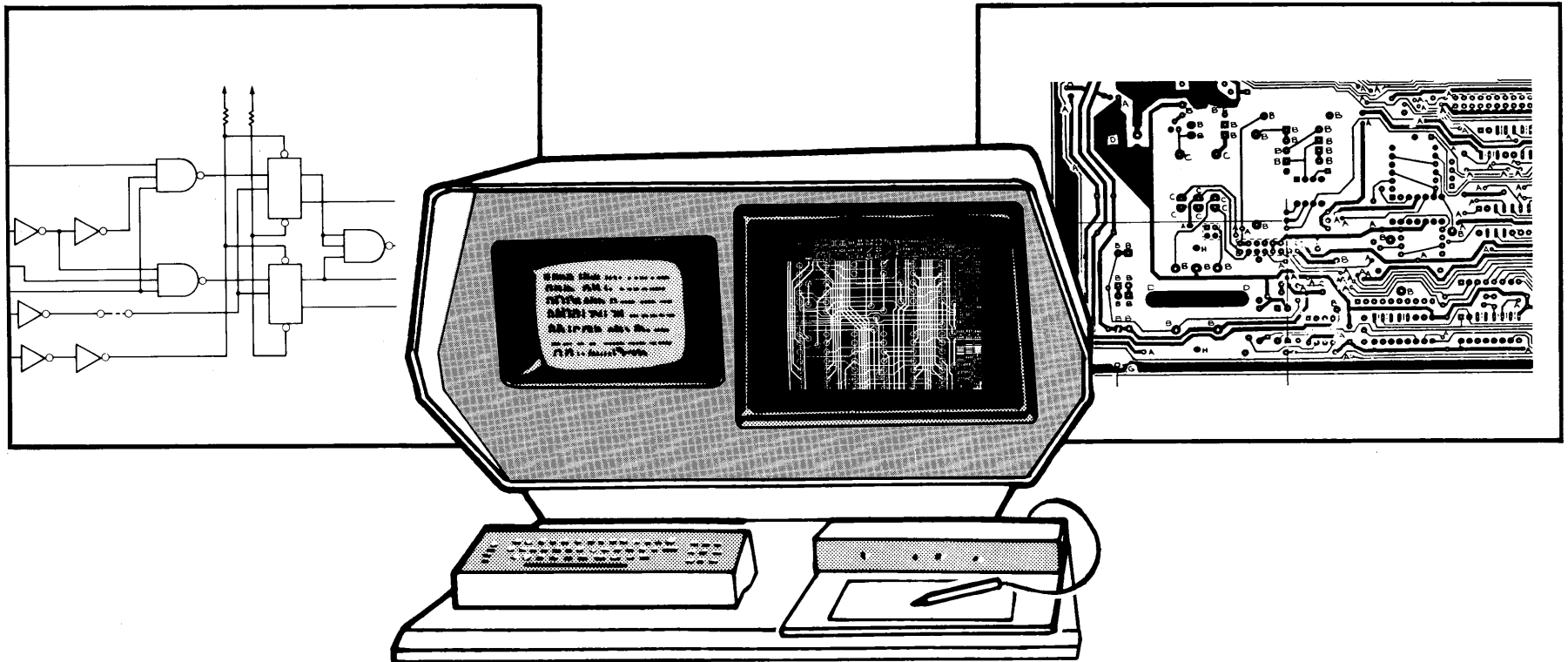




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CARDS

Printed Circuit Design System





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Company Background

- **Incorporated in 1964**
- **Wholly-owned subsidiary of General Electric**
- **Three areas of CAD application: microelectronics; mechanical products; architecture, engineering & construction**
- **Over 900 installations worldwide**
- **Approximately 1200 employees throughout the world**
- **Committed to providing the best possible solution to productivity problems**



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GE/Calma Partnership

Calma



**CAD/CAM
Technology**



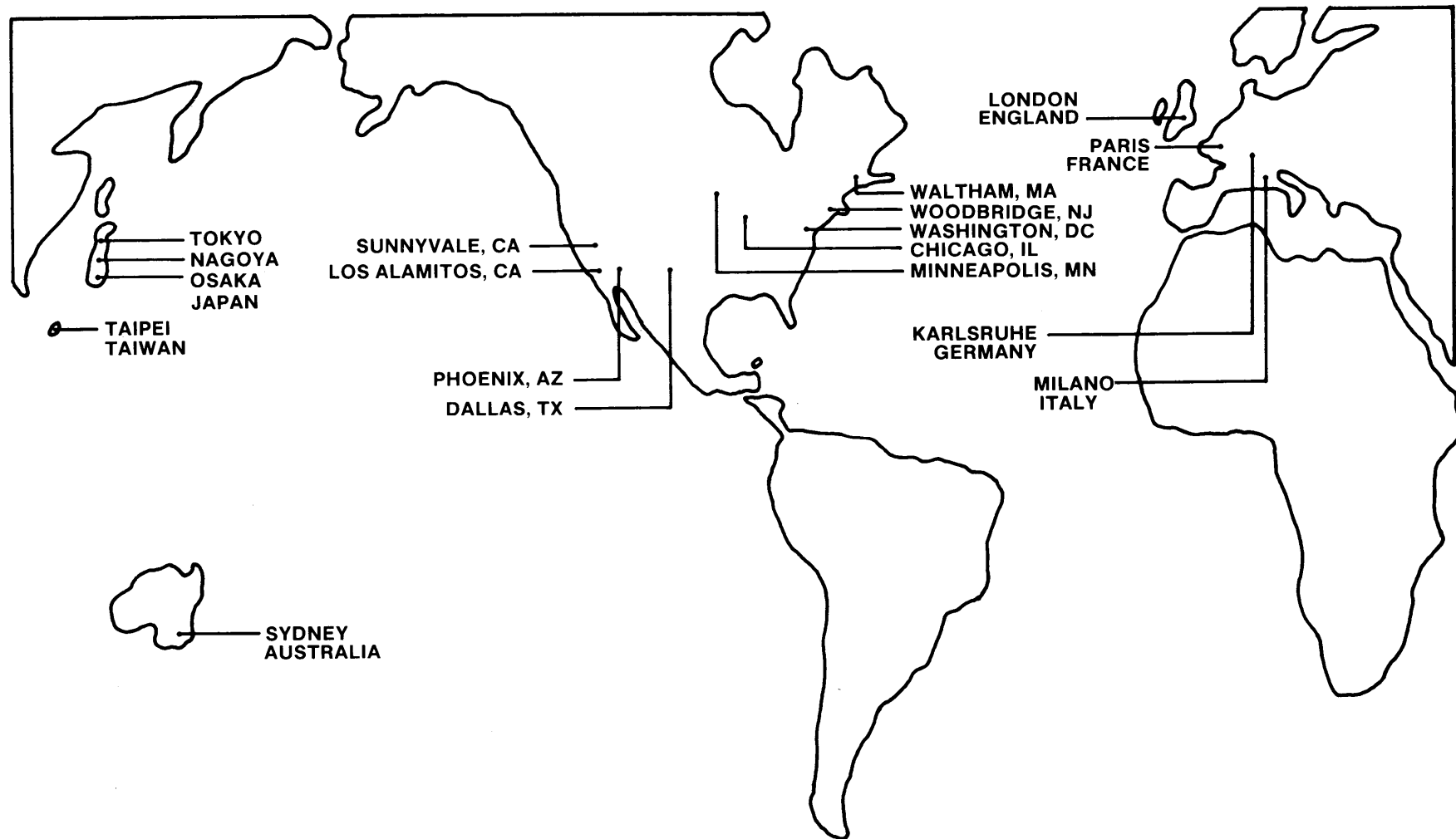
**Financial Strength
Technical Resources**



Increased Productivity



Worldwide Technical Centers





Domestic CARDS Users

Amdahl

Atari

Burroughs

Aerojet

Comten

Data General

Delco

Digital Telephone

EMI

Fairchild

Floating Point

Fluke Instruments

General Electric

Harris

Honeywell

Hughes Aircraft

Intel

ITT

MIT

Microcomputer System

Motorola

NCR

National Exsysco

Precision Art Masters

Rockwell

Sanders



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International CARDS Users

AEG

Burroughs

Chuo Meiban

Electronic Marcel Dassualt

GEC

GTE

General Instruments

ITT

Matsushita

Motorola

Lucas Aerospace

Physisch Labortorium

Pioneer

Plessey

Nippon Electric

Radiotelevisione

Sanyo

Sony

Societe Du Cuivre Professionnel

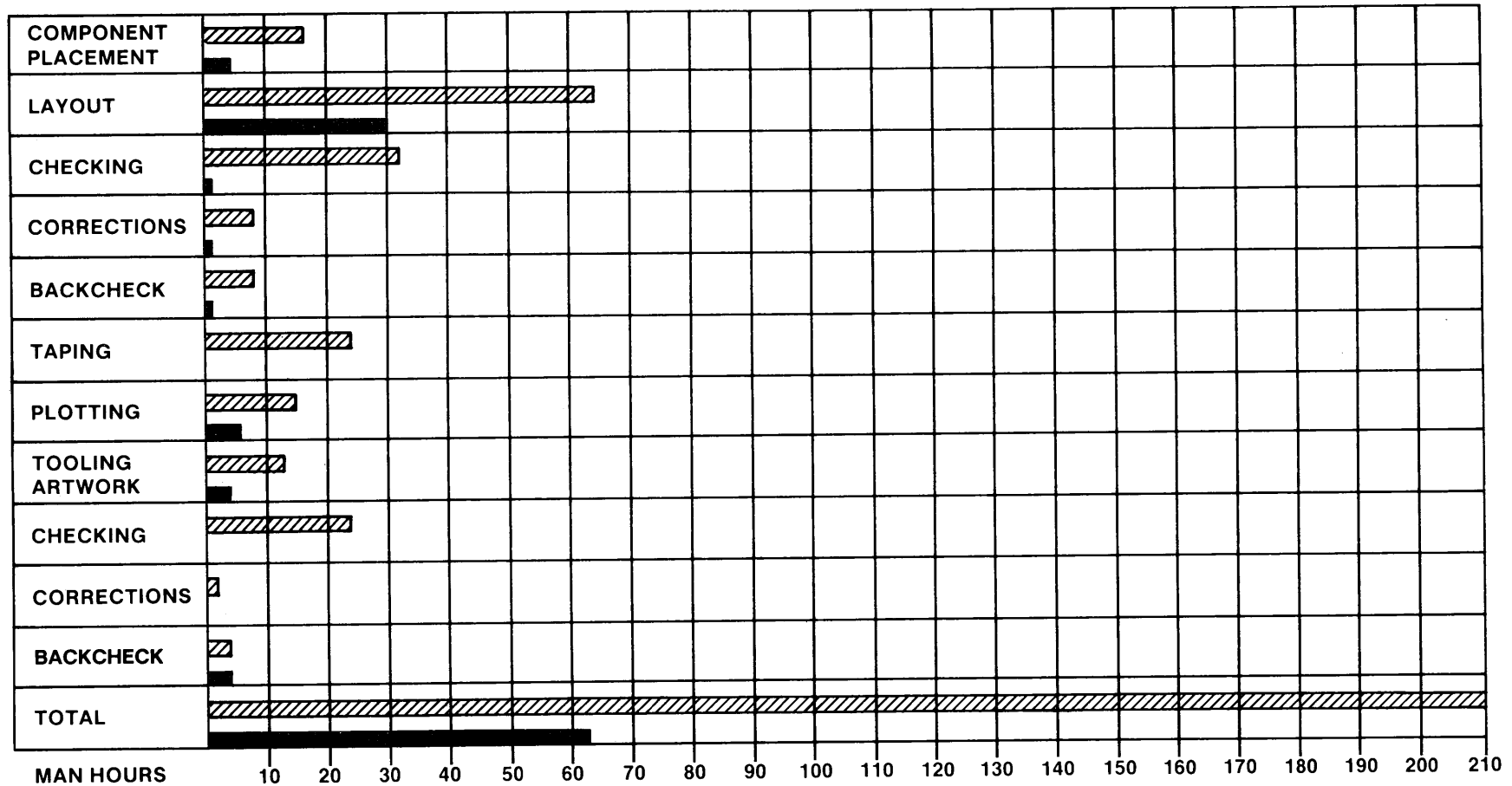
Toshiba

Elin-Union A.G.

Telefonia



Potential Savings Using CAD*



■ CAD
▨ Manual

* Based on comparison of tasks and hours required to create artwork for an 8 layer, 80 EIC board.



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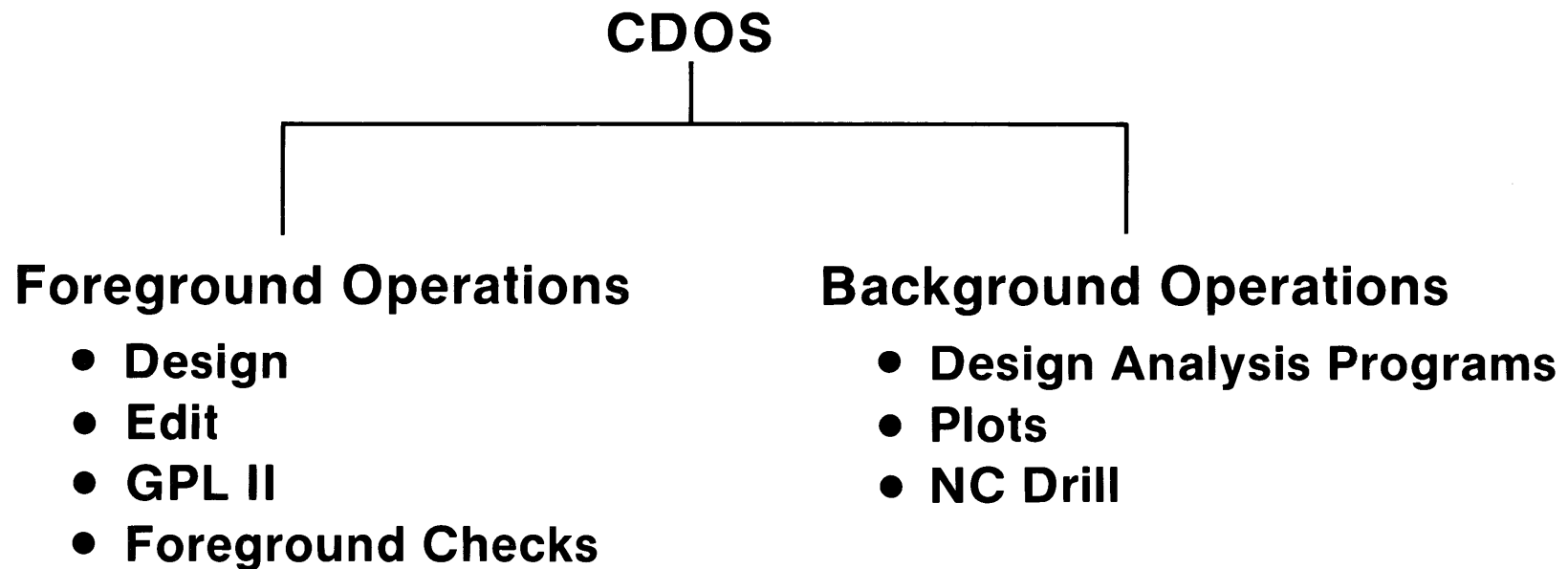
CARDS Features

- **Calma Disk Operating System**
- **Human engineered design station**
- **Vector Memory Display design station**
- **Mechanical drafting**
- **Graphic Programming Language (GPL II)**
- **Design Analysis Programs**
- **Electrostatic plotting**



Calma Disk Operating System

Provides multitask ability by separating foreground and background operations



BENEFITS: Ensures optimum use of CPU time
Minimizes multistation system degradation

DESIGN

CARDS Design Station

Dual Displays

- Full color graphics screen displays the design
- Alphanumeric screen displays command inputs, error messages, and designer prompts



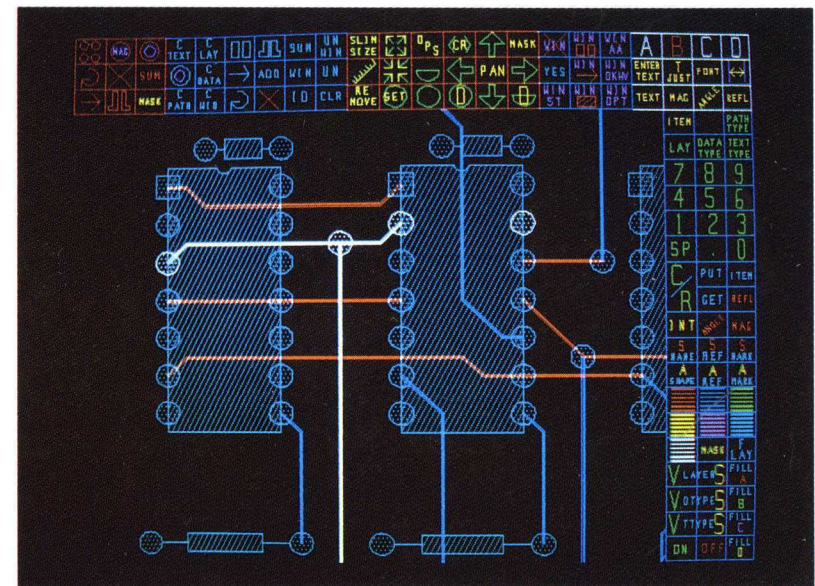
BENEFIT: Improves interactivity between designer and system

DESIGN

Signal Highlighting

Using color for easy identification of nets and their features

- Signal 001 and its features highlighted in a contrasting color



BENEFIT: Helps the designer locate data

DESIGN

Vector Memory Display Design Station

- Continuous pan & zoom
- Multiple viewports
- Selective erase
- On-screen menus
- Voice control unit



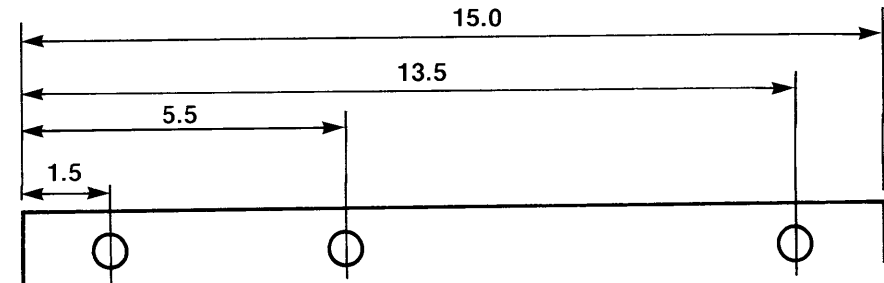
BENEFIT: Faster on-line designing

DESIGN

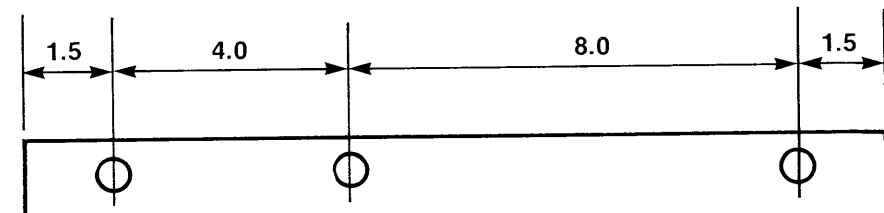
Mechanical Drafting

Automatic Dimensioning

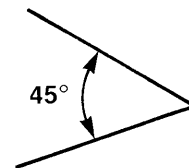
- **Baseline Dimensioning**



- **Linear Dimensioning**



- **Angle Dimensioning**



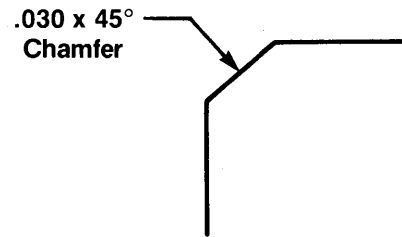


DESIGN

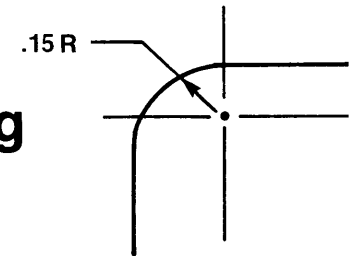
Mechanical Drafting

Automatic Dimensioning

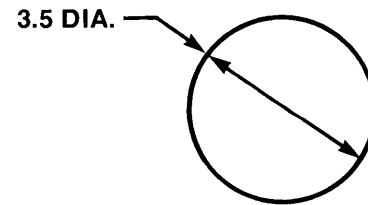
- **Corner Dimensioning**



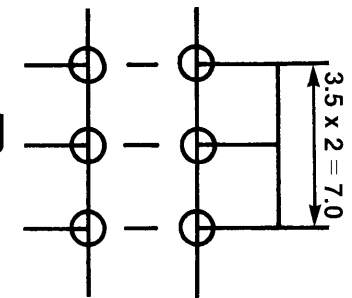
- **Radial Dimensioning**



- **Circle Dimensioning**



- **Array Dimensioning**



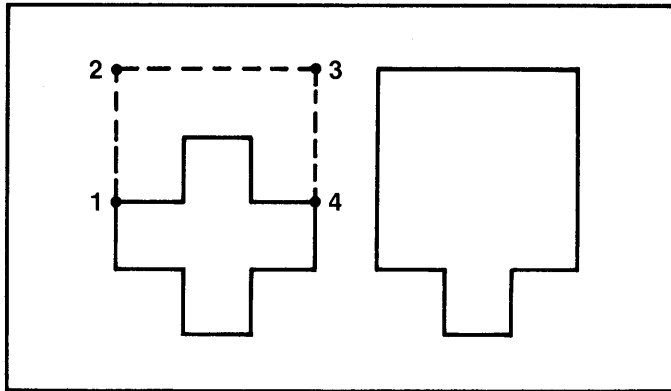
BENEFITS: Frees the designer from tedious drafting duties
Delegates detailed, repetitive tasks to the computer



EDIT

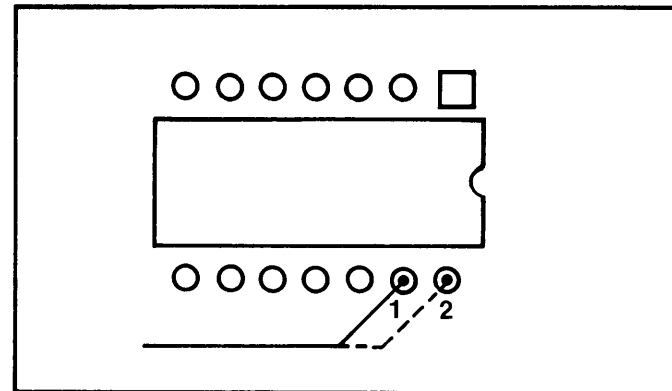
Powerful Commands

- **REDO**



REDO lets the user open a geometry (i.e., ground plane or trace) at any location, then close it at the same or new location by entering the desired change. The change will be merged with the original data.

- **STRETCH**



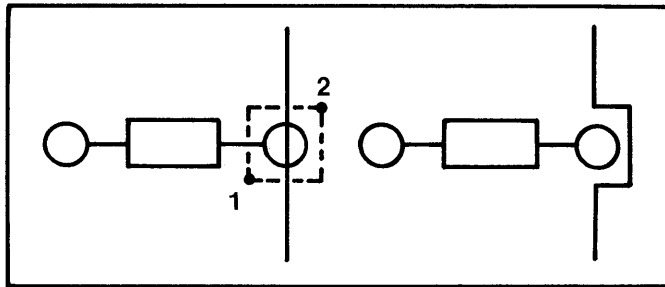
The all-angle **STRETCH** command stretches a user-selected side of a trace to a new location.



EDIT

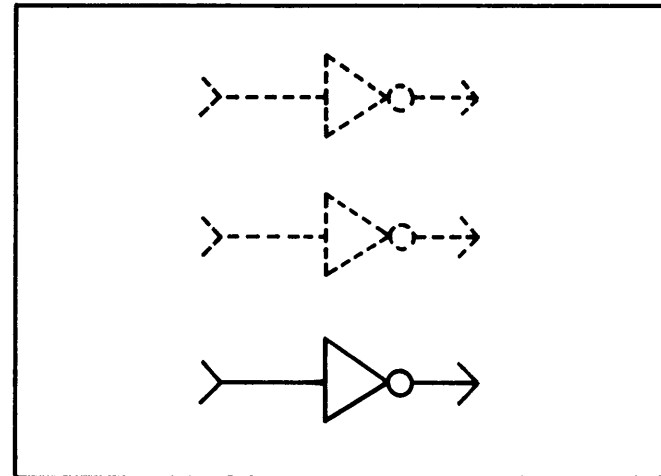
Powerful Commands

- **NOTCH**



A notch of any size and direction may be added at any location on a line segment.

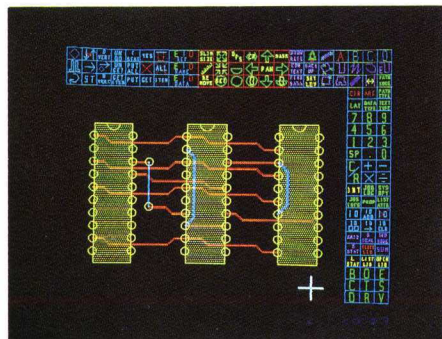
- **COPY**



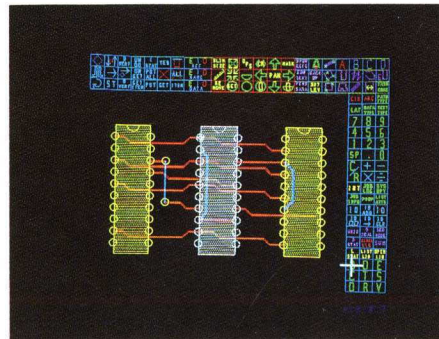
COPY lets the user put duplicate patterns anywhere in the format without redefining them.

EDIT

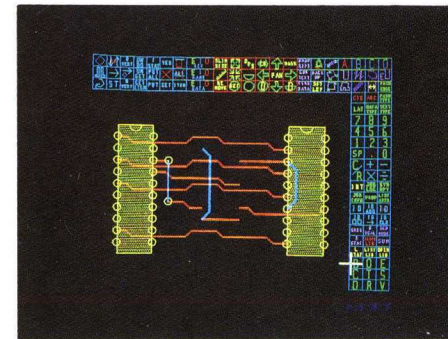
Selective Erase



- 3 DIPs on graphics screen



- Middle DIP identified in bright white



- DIP deleted without repainting the graphics screen

BENEFITS: Saves CPU time
Improves multistation response time



GPL II

Graphic Programming Language

General purpose language designed for:

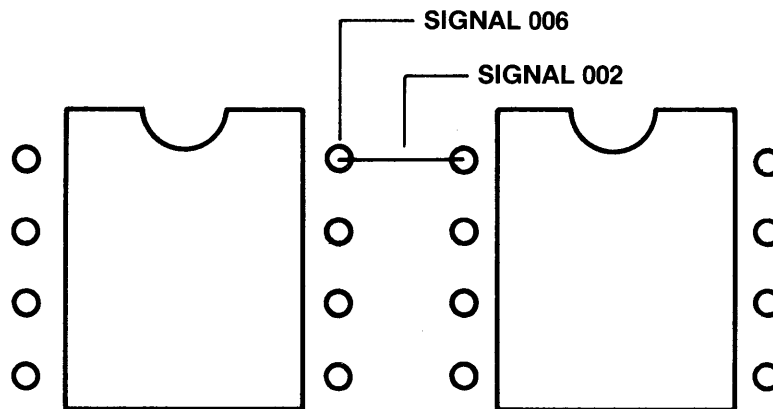
- **Increasing the system's capabilities**
- **Custom tailoring the CARDS system**

BENEFITS: Easy to learn and use
Interacts directly with the database
Performs edits and calculations

FOREGROUND CHECKS

On-line Continuity Checking

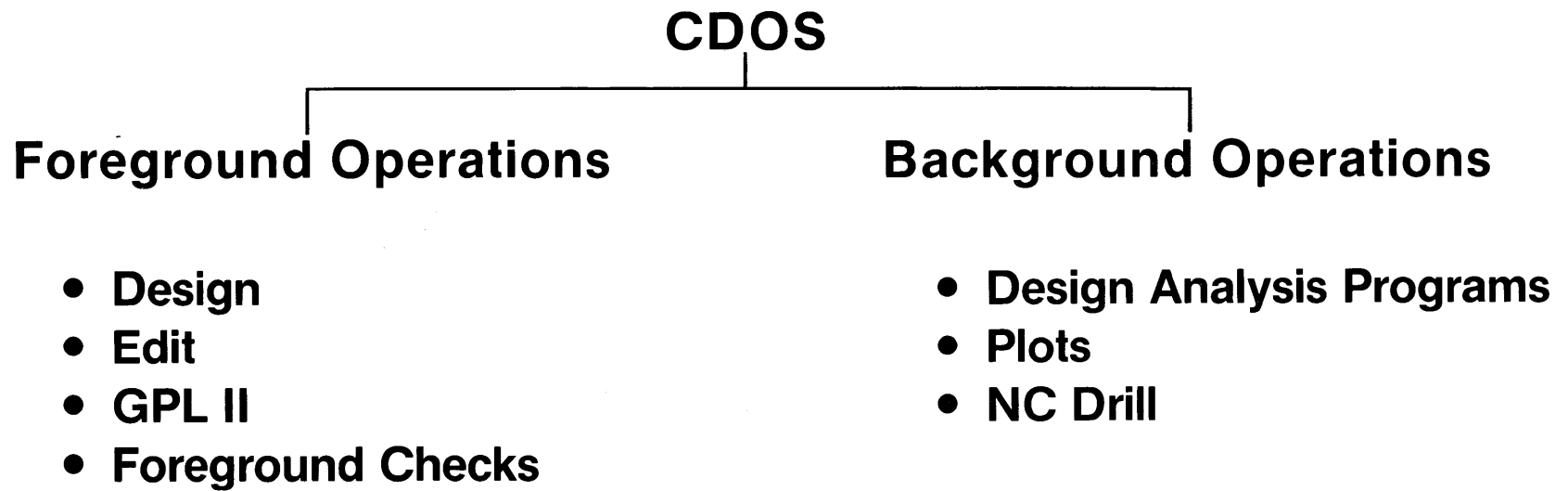
Continually checks connections between nets; an error is displayed on the alphanumeric screen when the designer joins nets with different signal names.



**BENEFIT: Allows immediate correction
of design problems**



Calma Disk Operating System





Design Analysis Programs (DAP)

DAP checks PC boards for design correctness

- **Spacing Verification**
- **Connections-to-Planes Verification**
- **Minimum/Maximum Pad Intrusion**
- **Minimum Trace Intrusion**
- **Background Continuity Checking**

BENEFITS: Fully automatic — no designer interaction required

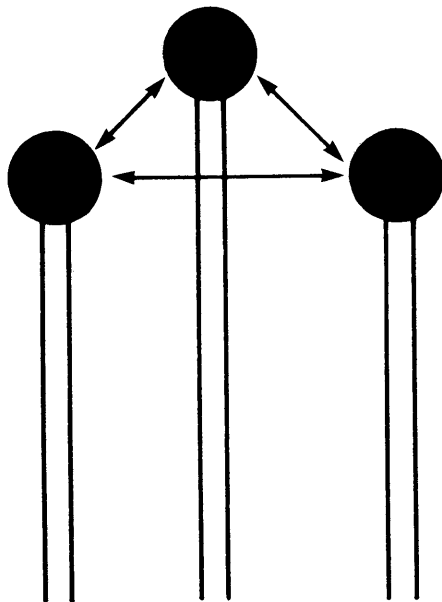
Assures total accuracy

DAP

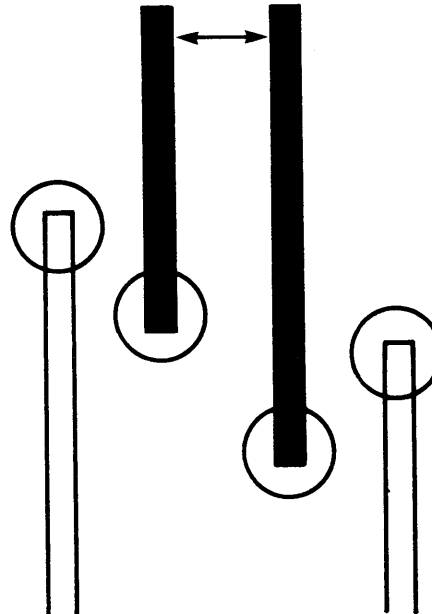
Spacing Verification

Checks critical distances

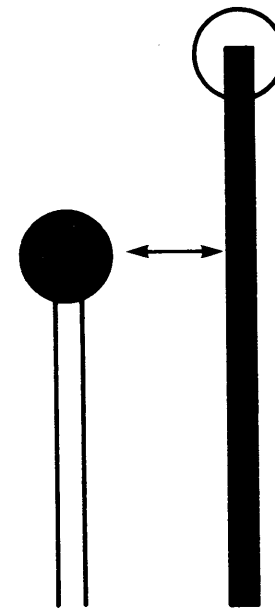
• PAD TO PAD



• TRACE TO TRACE



• PAD TO TRACE

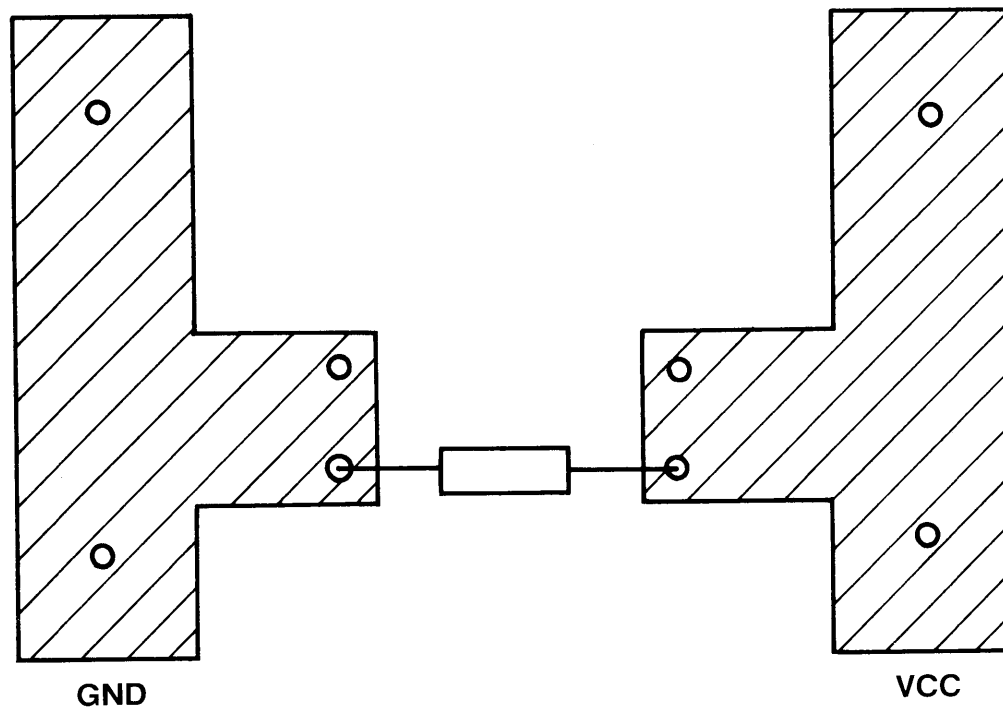




DAP

Connections-to-Planes Verification

Verifies electrical connections to power and ground planes by recognizing power/ground pad connections within an enclosed boundary.



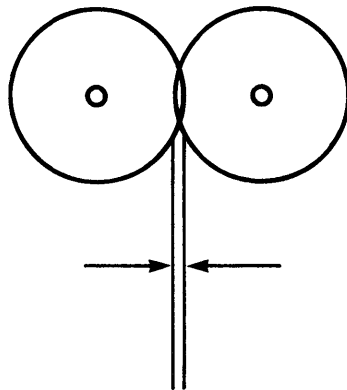


DAP

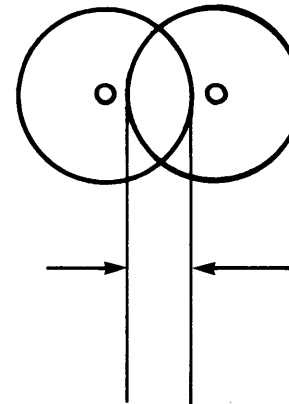
Minimum/Maximum Pad Intrusion

Checks and reports an error, if the overlap between two pads is not design rule correct.

Minimum Pad Intrusion Error



Maximum Pad Intrusion Error

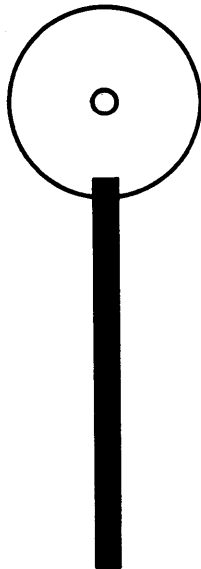


DAP

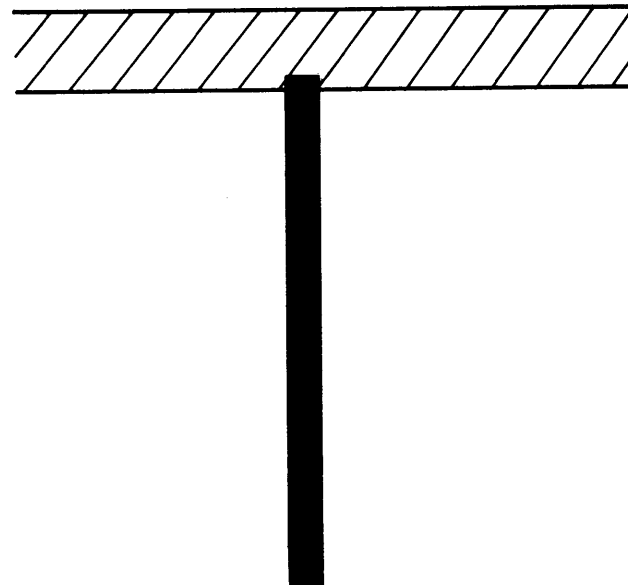
Minimum Trace Intrusion

Checks and reports an error,
if a trace is not connected
deep enough into a pad or trace.

Minimum Trace
Intrusion Error



Minimum Trace
Intrusion Error



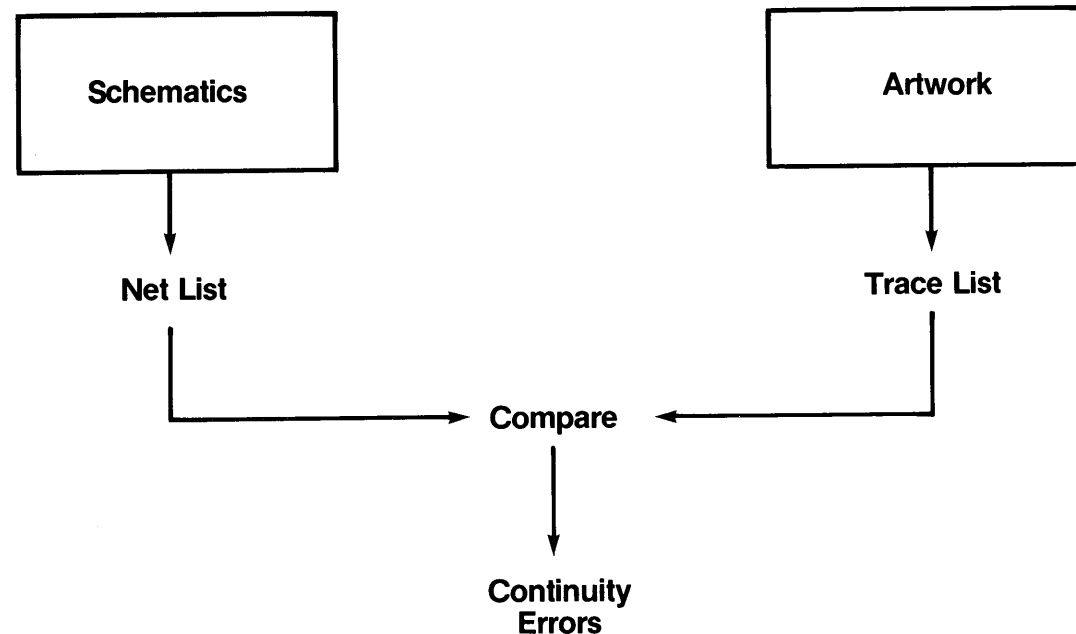


DAP

Background Continuity Checking

Checks engineering schematics against artwork.

Verifies at system level (checks several boards against several schematics).

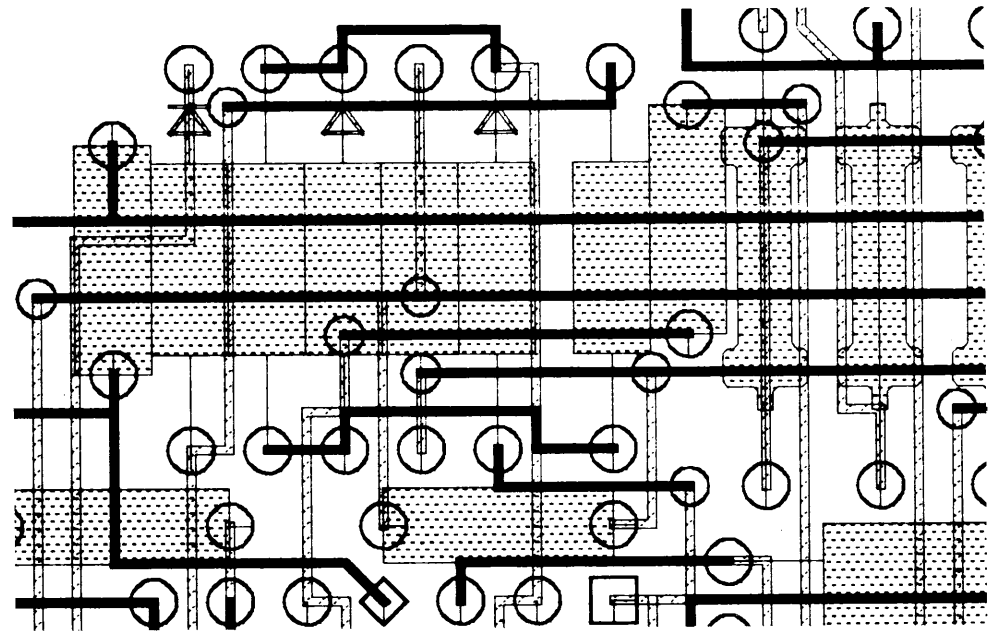




PLOTS

Electrostatic Plotting

- 10 times faster than pen plots
- 64 fill codes
- 64 line codes
- 200 dot-per-inch resolution
- Multiple copies output



BENEFITS: Improves throughput
Increases reliability
Produces scaled plots

Benefits

- **Increases designer's productivity**
- **Decreases design cycle time**
- **Assures higher manufacturing yields**
- **Keeps abreast of state-of-the-art CAD/CAM advancements**
- **Reduces overall costs**



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Product Support

Calma's commitment to you

- **Customer Education**
- **Application Support Response Center**
- **Application Engineer Support**
- **Hardware Regional Response Centers**
- **Parts Depots**

Customer Education

- **Calma U Courses**

 - PC Operations

 - PC System Support

 - PC Technical Overview

 - PC Schematic & Artwork Analysis

 - PC Board & Artwork Analysis

 - Graphic Programming Language

- **Regional Seminars**

- **On-Site Training**

- **Consulting Services**



Application Support Services

- **Application Support Response Center**
 - Receives customer phone calls**
 - Follows status of all reported bugs**
 - Follows status of enhancement requests**
 - Receives documentation remarks**
 - Tracks new systems**
 - Publishes software problem alert**
- **Application Engineer Support**
 - Install software and verify operation**
 - Answer customer phone calls**
 - Visit customer sites requiring additional field support**
 - Evaluate customer sites to increase production and reduce costs**



5 Hardware Regional Response Centers

- **Receive and track all customer service requests**
- **Dispatch requests to Customer Engineers within 1 hour**
- **Contact customer to quote estimated time of C.E.'s arrival at customer's site**
- **Assign a C.E. as well as a back-up C.E. for each customer**



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Worldwide Parts Depots

