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**MASTER**

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**SUMMARY**

**COMPUTER APPLICATIONS AND HYBRID MICROCIRCUITS**

Larry Sheets  
3/29/78

Bendix Kansas City Division is a manufacturing facility. The uses for computer graphics are different than that of our design agency. We are interested in many of the same things as the design agency, but are required to put out formal drawings in a specified drawing system. We worked with Sandia Labs in Albuquerque to have a compatible data base, as well as have the system meet both the design needs and the needs of Bendix. We feel we have been able to do this and have 27 months of production application. As a result, we have reduced the time for through-put, can process changes faster, and have been able to maintain a headcount that would have increased without the graphics system.

A graphics system at Bendix Kansas City has cost approximately \$300,000 and has been used on printed wiring boards, hybrid microcircuits and test equipment schematics.

PATTY  
CODE BDC

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# Computer Aided Design

## Interactive Graphics



### PROJECTED SAVINGS

NEW DESIGNS 4:1

DESIGN REVISIONS 8:1

OVERALL 5:1

OVER 2½ YEAR PERIOD, 43 MAN-YEARS DESIGN TIME SAVINGS

# Computer Aided Design

## Computer Graphics Evolution



- 1969 CAL COMP PLOTTER
- 1970 GERBER N/C PLOTTER SYSTEM  
PHOTOPLOTTER  
DIGITIZER
- 1975 APPLICON INTERACTIVE GRAPHICS SYSTEM (2D)
- 1979 (PLANNED) SECOND INTERACTIVE GRAPHICS SYSTEM  
ADDED CAPACITY  
3D APPLICATIONS
- 1980 (BUDGETED) THIRD INTERACTIVE GRAPHICS SYSTEM  
ADDED CAPACITY

# Computer Aided Design

## *Interactive Graphics*

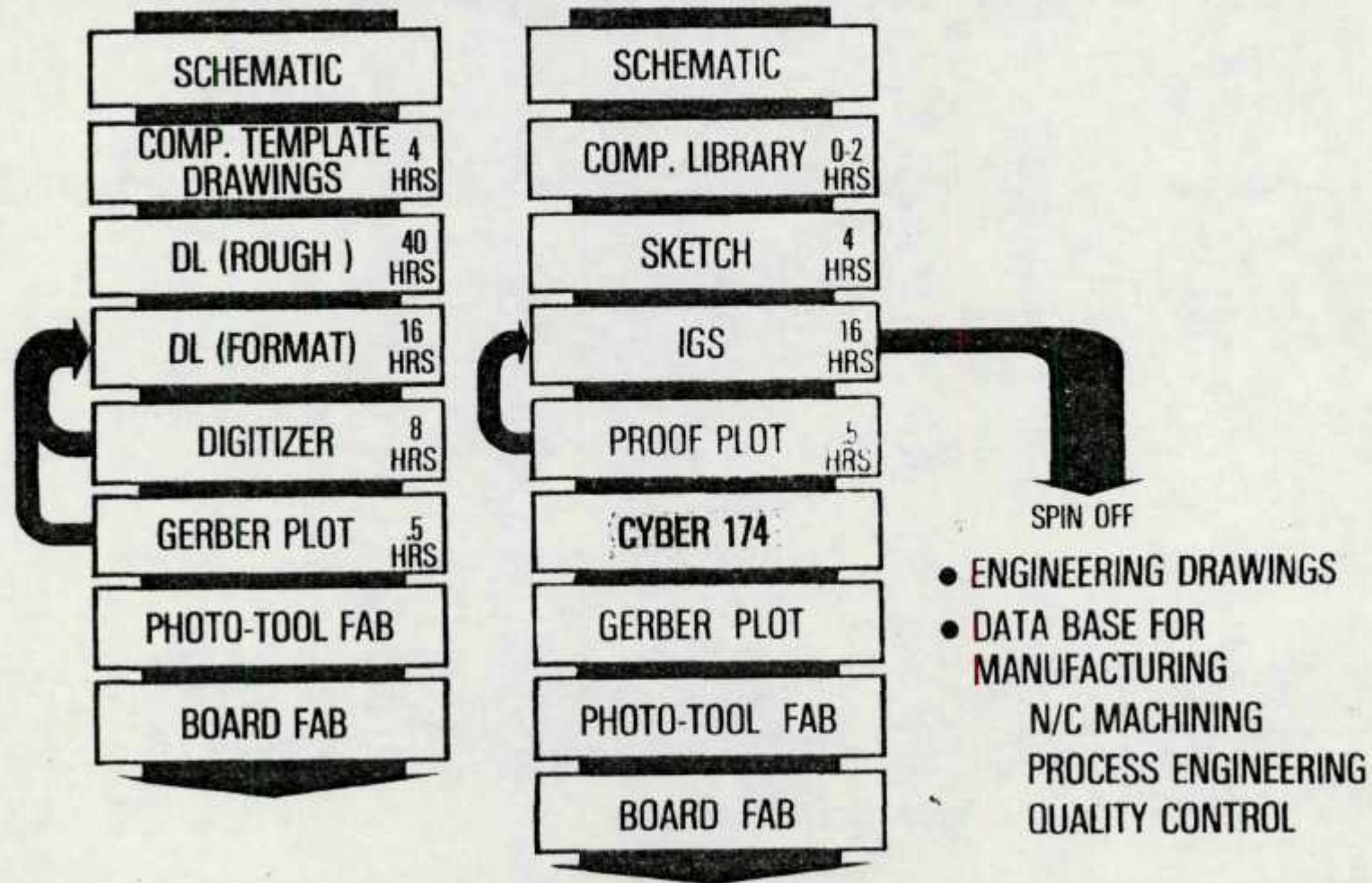


- USED FOR TWO DIMENSIONAL DESIGN WORK
  - PRINTED WIRING BOARDS
  - HYBRID MICROCIRCUITS
  - TEST EQUIPMENT ELECTRICAL SCHEMATICS
- INSTALLED DECEMBER, 1975
- 27 MONTHS PRODUCTIVE APPLICATION
- COMMERCIAL, STAND ALONE SYSTEM - APPLICON
- ELEMENTS
  - COMPUTER
  - 4 GRAPHICS TERMINALS
  - TELETYPE TERMINAL
  - DIGITZER - PLOTTER
  - MAG TAPE & PUNCH PAPER TAPE CAPABILITY
  - HARDCOPY UNIT
  - SOFTWARE FOR BOTH TWO AND THREE DIMENSIONAL APPLICATIONS
  - COST - \$300,000
- CAPABILITY TO INTERCHANGE DATA WITH SIMILAR SYSTEM IN USE AT SANDIA LABS, ALBUQUERQUE

# Computer Aided Design

## PWB Savings-IGS vs. Pre IGS

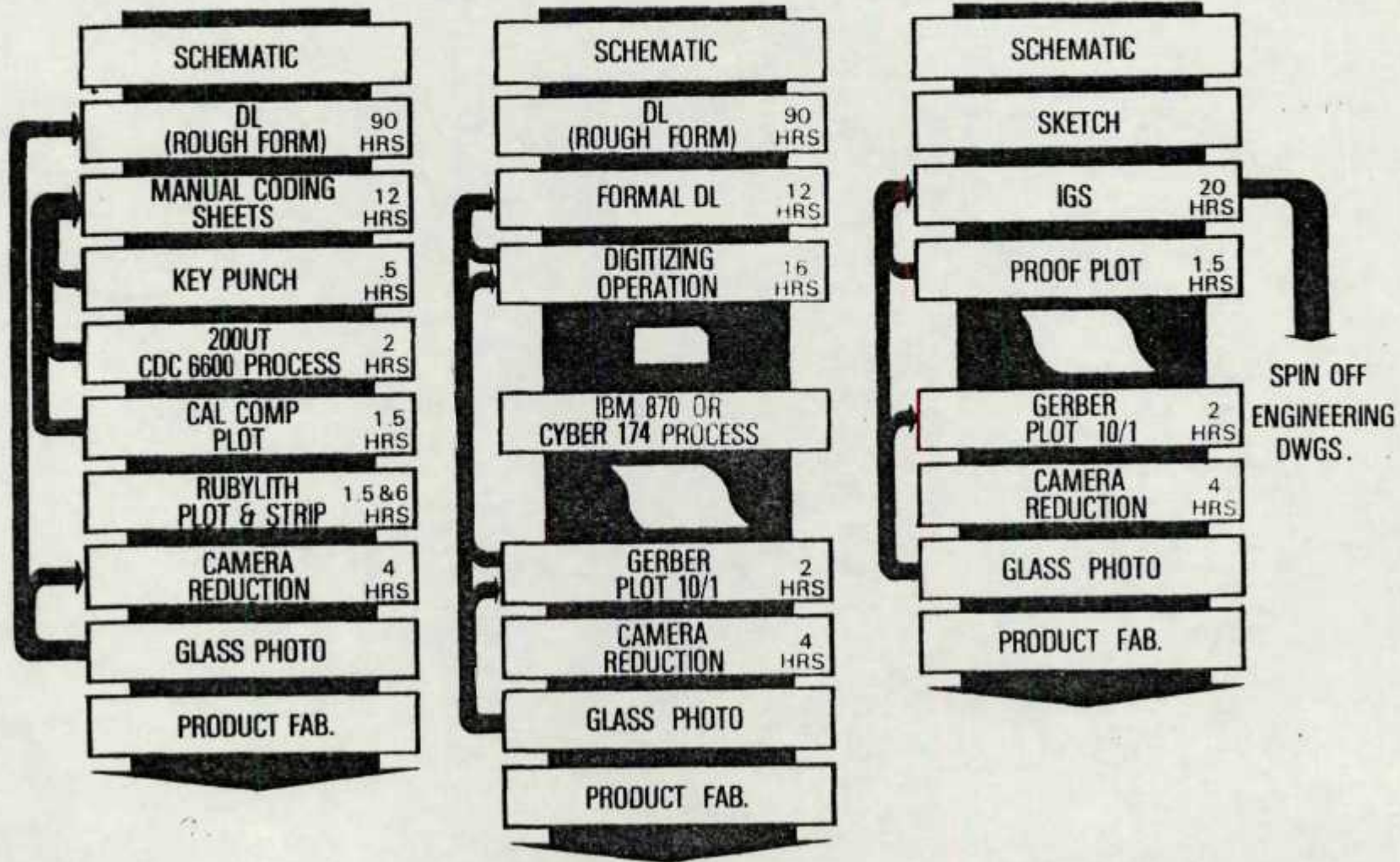
Bendix  
Kansas City  
Division



# Computer Aided Design

## HMC Savings-IGS vs. Pre IGS

Bendix  
Kansas City  
Division





# ***Computer Aided Design***

## ***Interactive Graphics Benefits***



- REDUCED THROUGH-PUT TIME
- FASTER PROCESSING OF CHANGES
- ABILITY TO RECALL EXISTING DATA FOR NEW APPLICATIONS
- FORCES COMPLETE DIGITIZATION OF DESIGN-ELIMINATES AMBIGUITIES
- IMPROVES EFFICIENCY OF USE OF GERBER PLOTTING EQUIPMENT
- RELIEVES DESIGNER OF DRUDGE TASKS
- PROVIDES ANALYTICAL AND COMPUTATIONAL ASSISTANCE TO DESIGNER
- MORE ACCURATE DESIGN LAYOUTS