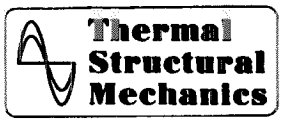
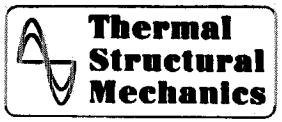


APOLLO/NASTRAN WORK STATION

G.N. MORRISON

HUGHES AIRCRAFT COMPANY
EL SEGUNDO, CALIFORNIA

HUGHES



TODAY'S BRIEFING

HUGHES

- HARDWARE
- SOFTWARE
- USERS & USAGE
- PERFORMANCE
- ADVANTAGES
- INITIAL PROBLEMS
- FUTURE SOLUTIONS

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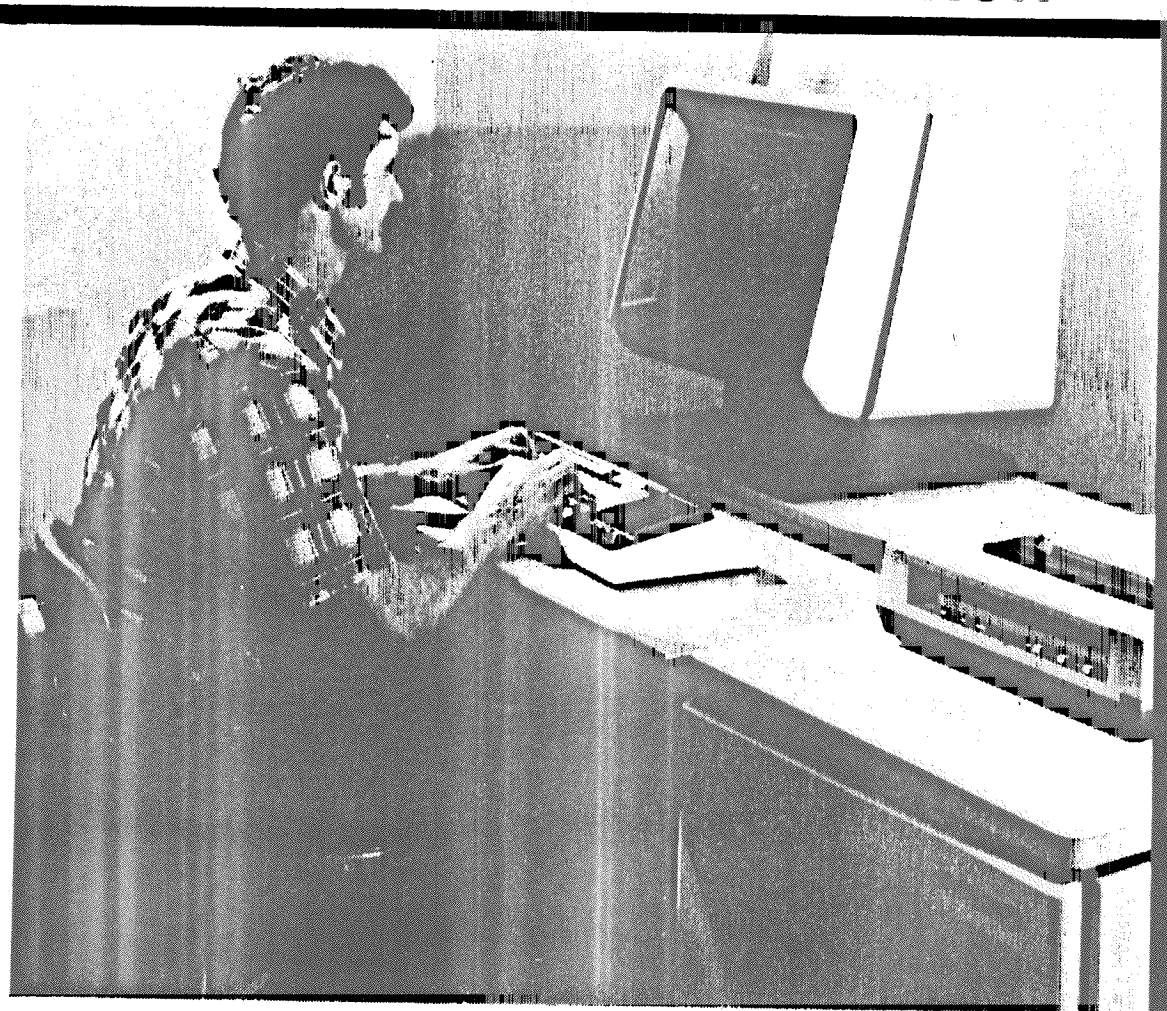
APOLLO DN 420 WORK STATION

HUGHES



- 158 WB WINCHESTER DISK
- PERFORMANCE ENHANCEMENT BOARD
- 2 DN420 2 MB
  1 DN600 1 MB
  2 DN300 1 MB
- CIPHER TAPE DRIVE
- PRINTRONIX 300 LPM PRINTER
- QMS 12 PAGE/MIN LASER PRINTER
- HP PEN PLOTTER
- SEIKO COLOR COPIER

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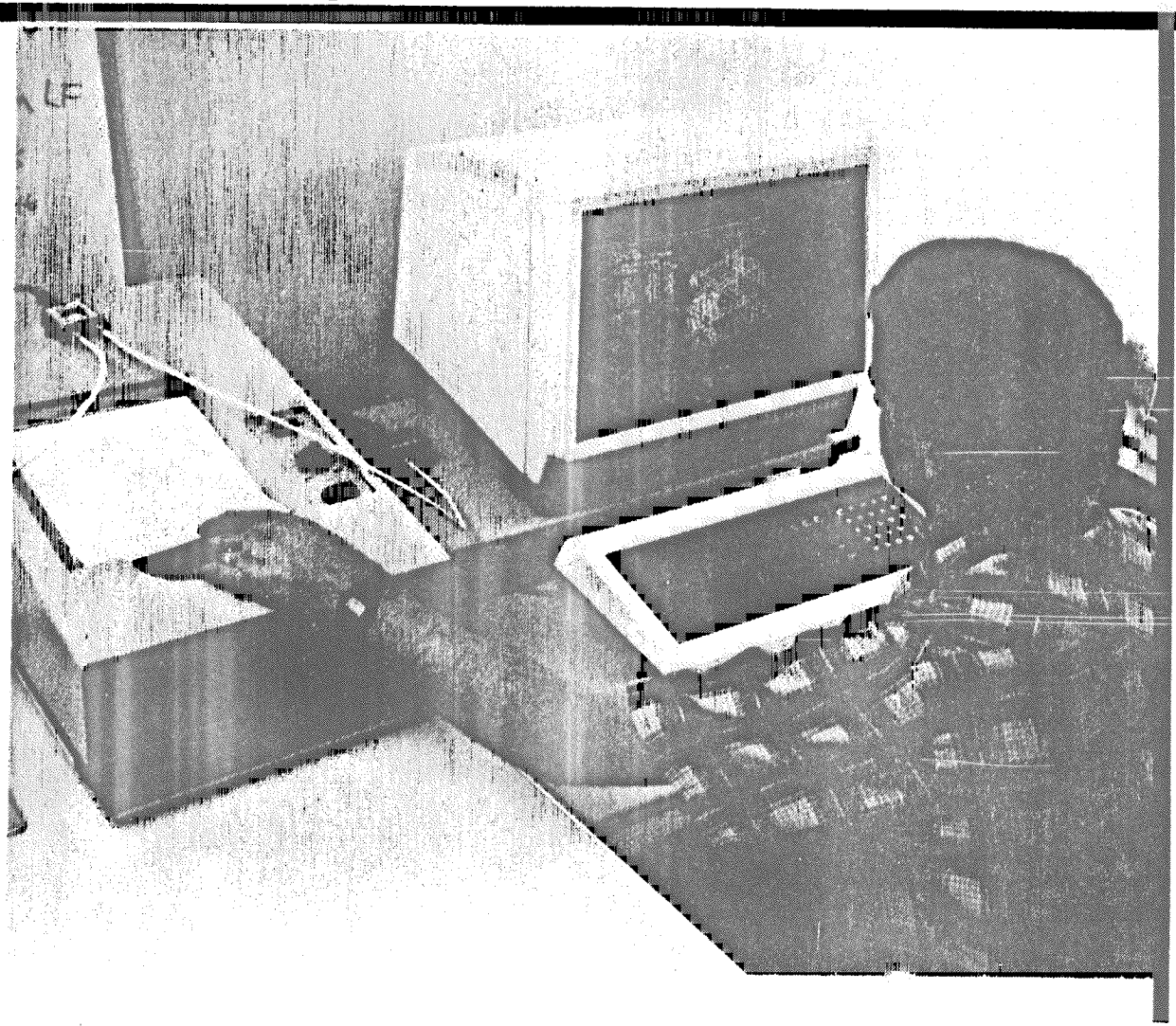
COMMUNICATION EQUIPMENT

HUGHES



- 11 TIME SHARING LINES AT 9600 BAUD
  - HARDWIRED VISUAL 50 TERMINAL
  - 2 PORTS PER NODE TO HUGHES DATA SWITCH
- REMOTE COMMUNICATIONS – TERMINAL EMULATION & HASP EMULATION

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APOLLO OPERATING SYSTEM

HUGHES

- SCREEN – MULTIPLE PROCESSES PLUS EDITOR
- TIME SHARING – ONE PROCESS PER LINE
- JOB QUEUES – MOST JOBS RUN – BACKGROUND PROCESS
- PRINT QUEUE – ALSO PRINTS SCREEN DISPLAY
- LASER PRINTER CAN REPRODUCE PLOT-10 FILES

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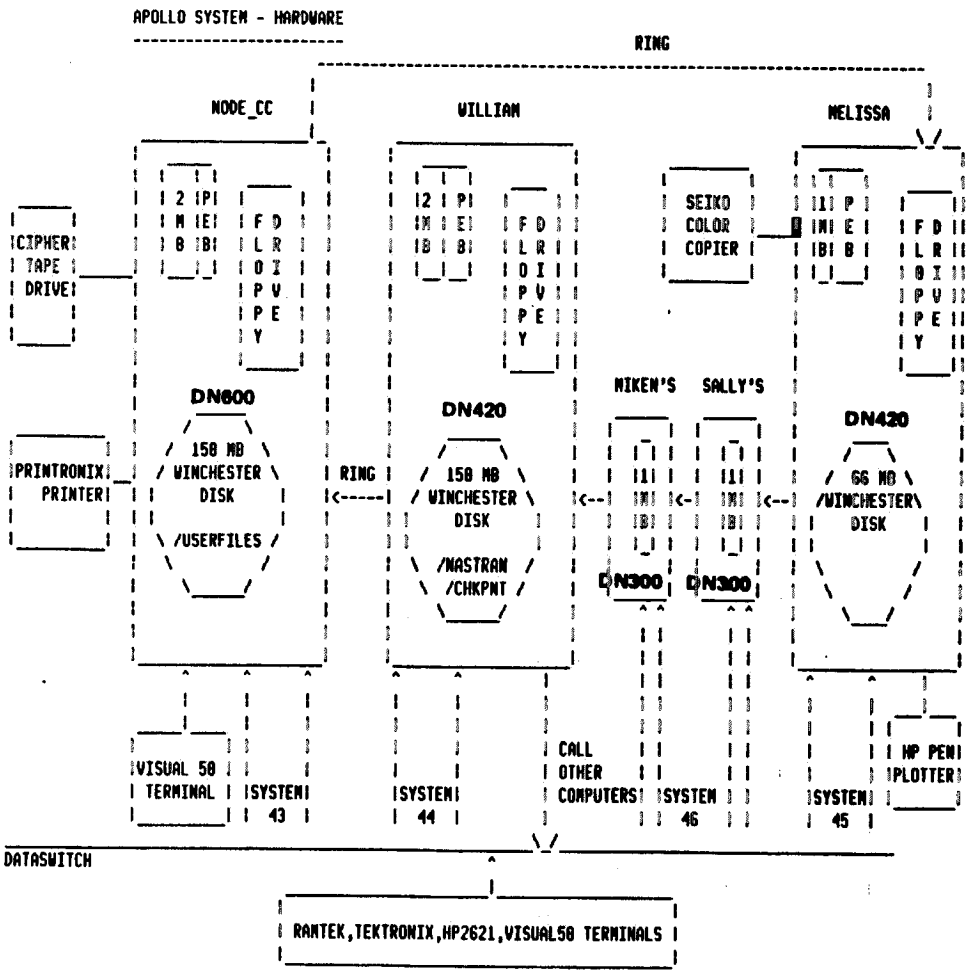
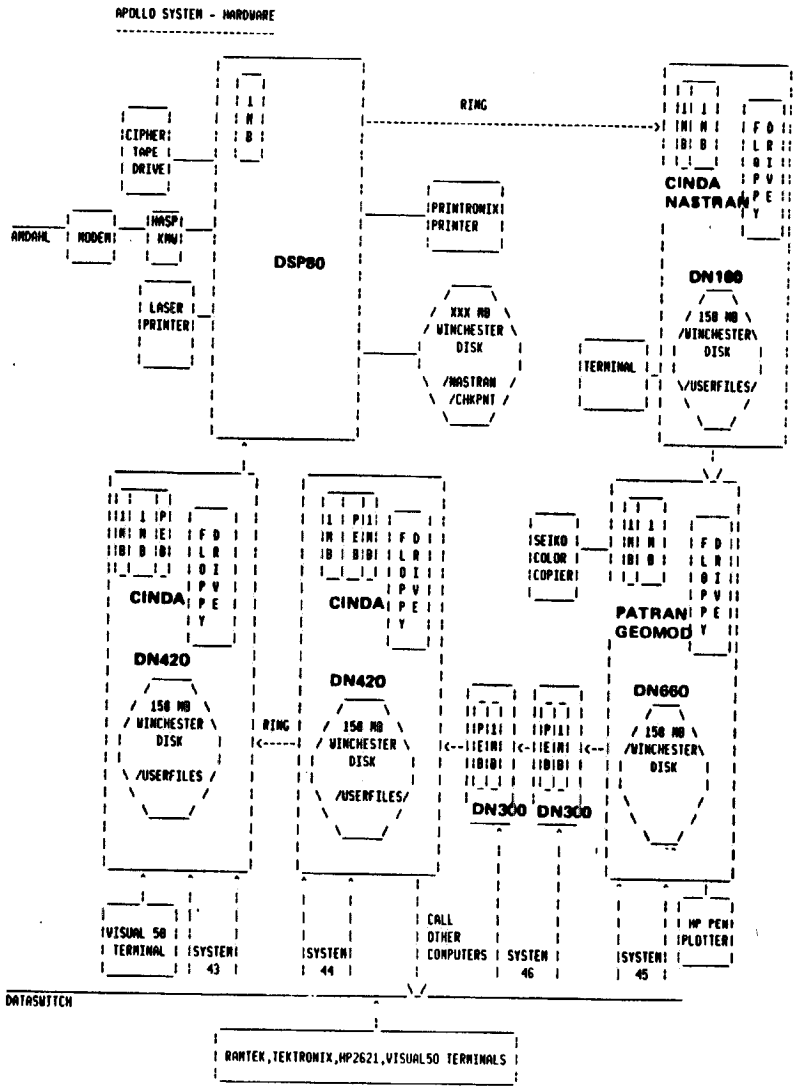
CURRENT SYSTEM SCHEMATIC

HUGHES





HUGHES

FUTURE SYSTEM SCHEMATIC

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STRUCTURAL ANALYSIS

HUGHES

- SOFTWARE
  - NASTRAN
  - HUGHES INTERACTIVE PRE/POSTPROCESSORS
    - MODEL GENERATION
    - DEFORMED PLOTS
    - MODE SHAPE ANIMATION
    - COLOR FILL PLOTS
  - PLOTTING
- 15 ANALYSTS – PART TIME
- THIRD OF SYSTEM USAGE

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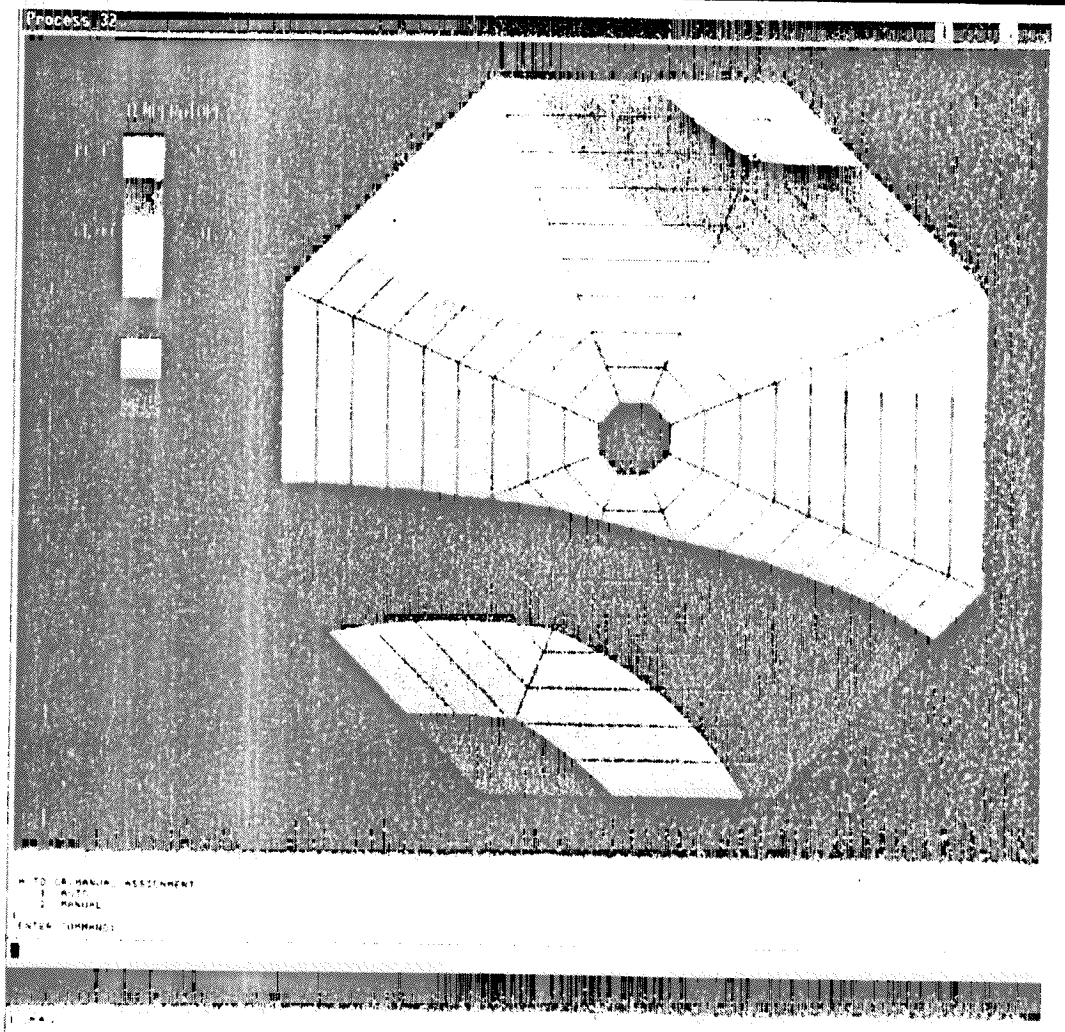
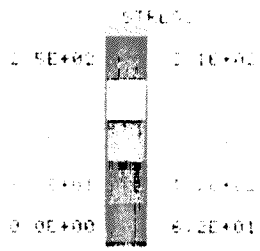
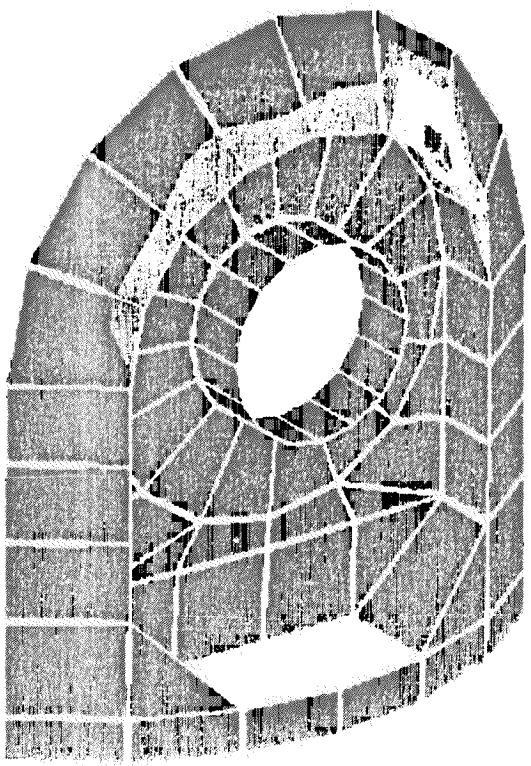
DISPLAY OF ELECTRICAL MODEL

HUGHES







HUGHES

DISPLAY OF STRUCTURAL MODEL

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USAGE (TYPICAL WEEK)

HUGHES

- 84 CPU HOURS (30% FOR NASTRAN)
  (15 CPU HOURS – VAX 11-780)
  67 HRS JOB QUEUES
  17 HRS FOREGROUND
- 186 CONNECT HOURS
  133 SIO LINES
  153 APOLLO SCREENS
- 240,000 LINES PRINTED
- 280 MB OF DISK STORAGE

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ADVANTAGES

HUGHES

- LOCAL PROCESSING
  - FASTER, MORE RELIABLE COMMUNICATIONS
  - NO WAITING FOR OUTSIDE DATA
  - ELIMINATES PRINTER OPERATOR
  - SYSTEM CONTROL – PRIORITIES, RATES, ETC
- USER – FRIENDLY OPERATING SYSTEM
- EXCELLENT EDITING CAPABILITIES
- DISTRIBUTED PROCESSING

NASTRAN SYSTEM SOLUTION

- PROBLEM – BOTH NODES SLOWED DOWN WHEN NASTRAN WAS RUNNING
- SOLUTION
  - PUT NASTRAN FILES ON NASTRAN NODE TO AVOID NETWORK I/O
  - COPY FILES BACK TO NODE WITH USER FILES AFTER RUN
  - BUY FASTER MACHINE

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OTHER INITIAL PROBLEMS

HUGHES

- SLOW
  - EXECUTION — SOME NASTRAN JOBS RUN 4–8 HOURS
  - FILE TRANSFER TO/FROM OTHER COMPUTERS
- TOO MANY USERS FOR RESOURCES

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FUTURE SOLUTIONS

HUGHES

- FASTER COMPUTER

POSSIBLE OPTIONS	PROBLEMS
APOLLO COMPUTER ENGINE DN160	P.O.
IMPROVED APOLLO DN460, DN660	P.O.
RIDGE	NASTRAN/3 MONTHS
VAX	COST
FPS-164, ARRAY PROCESSOR	COST

- DATA LINK FOR BETTER OUTSIDE COMMUNICATIONS

  ETHERNET TO VAX

IMPROVED PRODUCTIVITY