competitive update

NOVEMBER 3, 1980

HONEYWELL LEVEL 6 SERIES HIGHLIGHTS AND ANALYSIS

The Competitive Analysis area is divided into two clusters – Commercial, managed by Don McGinnis and Technical, managed by George Hayes.

Although each cluster is responsible for its respective marketing areas, the groups are well aware of overlap within the Commercial and Technical marketplace and are prepared to work together to service all requests for competitive data.

COMMERCIAL CLUSTER

COMPETITOR	CONTACT	DTN/LOCATION
IBM GSD **HP Commercial** **Mainframe Competitors**	Don McGinnis	264-5375 MK1-2/N38
IBM DPD	Rick Case	264-7307 MK1-2/N38
Wang (Integrated Information Processing) **Prime Commercial** **Datapoint** **IBM OPD**	(OPEN)	MK1-2/N38

TECHNICAL CLUSTER

Data General	George Hayes	231-4886 MR1-1/A95
Prime Technical **Perkin-Elmer**	Martin Harrison	231-7194 MR1-1/A95
HP Technical **Honeywell** **SEL** **Communications**	Nizar Huddani	231-7194 MR1-1/A95

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COMPETITIVE UPDATE/HIGHLIGHTS & ANALYSIS IS PUBLISHED BY CORPORATE SALES COMMUNICATIONS, BG/S51 MAYNARD, PRINTING AND CIRCULATION SERVICES, NORTHBOROUGH

H O N E Y W E L L   L E V E L   6   S E R I E S:

H I G H L I G H T S   &   A N A L Y S I S

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1.0 HONEYWELL CORPORATE

For the purpose of this document Honeywell and HIS refer to Honeywell Information Systems.

● History

- Wholly owned subsidiary of Honeywell; based in Minneapolis.
- Acquired Computer Control Corporation which was marketing DDP-116. This model was enhanced into 316, 516 and 716 systems, and marketed under the Honeywell name.
- Level 6 Series announced in 1976.
- First delivery Model 43; February 1977.
- Number of Level 6s installed is over 5,000 (June, 1979)
- Current manufacturing capacity is 400 systems per month. Honeywell has reduced the size of its minicomputer salesforce as it cannot meet the demand for the Level 6 product from customers. Level 6 is used internally by Honeywell in products such as front-end processors for large mainframes and page printing systems.

● Financial*

	1976	1977	1978	1979
- Total Revenue $M	913.8	1,036.9	1,293.6	1,452.6
- Income Before Tax$M	41.4	79.4	105.7	152.4

*Does not include Cll-HB in which HIS maintains 47% ownership.

● Offices

HIS maintains offices in the United States and most countries worldwide, with almost 400 locations.

● Field Staffing (Dataquest - June, 1979)

	Sales	Software	Field Service
- U.S.	800	3,000	3,554
- International	400	2,270	1,899
- Total	1,200	5,270	5,453

2.0 HIS PRODUCTS & MARKETING

2.1 HIS - LEVEL 6 SERIES MARKETING

- **Why the Level 6**

    - GENERAL:

    After its merger with General Electric in 1970, HIS had virtually abandoned the minicomputer marketplace. Level 6 was the HIS entry back into the market.

    - Level 6/53 and 6/57 were positioned to compete with systems such as the PDP-11/70 and PRIME 550.

    - Level 6/43 was designed to penetrate the mid-range market against systems like the PDP-11/34, -11/44, PRIME 450, etc.

    - Level 6/23 and 6/33 are entry level systems in the same range as LSI-11 and PDP-11/23.

- **Targeted Product Space**

    - Level 6/53 and 6/57:

        . Approximately 2.3 times the performance of Model 33.
        . In a commercial environment, approximately 15 times more powerful than Model 33 and approximately the same as a PDP-11/44 with CIP.
        . In a scientific environment, the use of a Scientific Instruction Processor (SIP) improves performance by about 15 times over Model 33. This would equal the performance of a PDP-11/60 or -11/44 with a Floating Point Unit.
        . Upward compatible with Model 23, 33, 43 and 47.
        . Entry level system price is $220,000.

    - Level 6/43 and 6/47:

        . Approximately 1.6 times the performance of Model 33.
        . In a commercial environment, about seven times that of Model 33 and about the same as a PDP-11/44 without CIP.
        . In a scientific environment, the performance is about the same as Model 53.
        . Entry level system price is $100,000.

    - Level 6/33:

        . Low-end system
        . Uses the same instruction set and architecture as larger Level 6 models.
        . Maximum memory of 128K bytes
        . Compares approximately to a PDP-11/34

COMPANY CONFIDENTIAL

- Level 6/23:

  . LSI version of 6/33
  . Uses a synchronous bus rather than a megabus
  . Uses the same instruction set as Model 33; performance is about 60%
    of same
  . Compares to a PDP-11/03
  . Entry level system price is $22,000

2.1.1 Overview of the Honeywell Level 6 systems

	Model 23	Model 33	Model 43	Model 47	Model 53	Model 57
Memory/bytes						
minimum	32K	32K	32K	32K	32K	32K
maximum	128K	128K	2,048K	2,048K	2,048K	2,048K
Disk capacity/bytes-						
maximum	4M	4,000M	4,000M	4,000M	4,000M	4,000M
	(Diskettes only)					
Typical register-to-register add time						
(microsecond)	4.5	3.1	2.0	2.0	1.4	1.4
Floating Point Processor	N/A	N/A	Optional	Optional	Optional	Optional
Commercial Instruction Processor (CIP)	N/A	N/A	N/A	Standard	N/A	Standard
Memory management	N/A	N/A	Optional	Optional	Standard	Standard
Cache memory	N/A	N/A	N/A	N/A	Standard	Standard
Writable Control Store	N/A	N/A	Standard	Standard	Standard	Standard

N/A = Not Applicable

The Level 6 series is based on three different CPU models - the 23, 33 and 43.
Model 43 with cache yields a Model 53, Model 43 or 53 with CIP is equivalent
to a Model 47 or 57.

● **Promotional Themes**

- Full range manufacturer with full range support.
- Compatibility not only within Level 6 but across Series 60, now known as various DPS systems.
- Large program capability by minicomputer standards (over 64K bytes)
- Price/performance

NOTE: Level 6 is a word addressing machine and therefore, can address 128 Kbytes (64K words). This does not mean that HIS can write larger programs. A program on PDP-11/RSX occupying 20 Kbytes will occupy 40-50 Kbytes on Level 6/MOD 400 and 600.

● **Targeted Markets**

- Technical and Commercial OEMs
- Distributed Data Processing (host-mainframe and Level 6 nodes)
- Specialized commercial (small business systems - Distributed Processing System [DPS 4] type)
- Sophisticated end users (Fortune 1000, Government, etc.)
- Packaged into front ends and page printing systems

● **Marketing Strategies**

- Targeted selective markets and accounts
- Very good salesforce

2.2 H I S   —   L E V E L   6   H A R D W A R E

● **Processors/Memory**

- Level 6/53 and 6/57:

  . Segmented memory management
  . 16-bit word length; 20-bit addressing yields address space of 2,048K bytes
  . Addressing unit is in words (2 bytes)
  . Scientific Instruction Processor (SIP) is optional
  . Commercial Instruction Processor (CIP) standard on Model 57
  . 8K byte memory cache (95% hit rate)
  . Supports up to 63 users
  . Error Detection And Correction (EDAC) double-fetch memory is available. This is a 22-bit memory that employs 6-bit Hamming code to detect and correct all internally caused single-bit errors and detect all double-bit errors.
  . All modules plug into the megabus, a high-speed asynchronous bus capable of providing a throughput of up to 6M bytes per second.
  . Price: (6/57; 384K bytes memory, 512M bytes disk, tape drive, line printer, card reader, console, 16-line communications interface, GCOS MOD 600 and FORTRAN) $220,000.

- Levels 6/43 and 6/47:

    . Optional memory management
    . 16-bit word length; 20-bit addressing yields address space of 2,048K bytes
    . Optional SIP
    . CIP standard on 6/47
    . Supports up to 63 users
    . Can use double-fetch EDAC or parity memory
    . Price: (6/43; memory management, 384K bytes memory, 66 Mbytes disk, 300 lpm printer, eight asynchronous lines, eight VIP 7200 CRTs, MOD 400 software) $100,000.

- Level 6/33:

    . Same general architecture and instruction set as larger Level 6 models.
    . Maximum 128K byte memory
    . Supports four to eight users
    . No memory management
    . Sold only in technical OEM areas (single user environment)
    . Price: (CPU, 128K bytes memory, 10MB disk, console, MOD 400 software) $45,000.

- Level 6/23:

    . Uses a synchronous bus rather than a megabus
    . Same instruction set as other Level 6 models
    . Supports diskettes and smaller disks only
    . Primarily used for data entry related functions (forms driven)
    . Price: (CPU, 64K bytes memory, dual diskette drive, two workstations, 160 cps printer, MOD 200 software) $21,500.

- All lower Level 6 models can be upgraded to higher models (6/23 excepted) by exchanging CPU boards. They all use the same backplane (megabus) and common peripherals.

- **Mass Storage**

    NOTE: Prices are given as $purchase/$monthly maintenance

    - Floppy Disks

        . Packaged in either single or dual configurations
        . Single or double sided
        . One drive subsystem, single sided: $3,680/32
        . Two drive subsystem, single sided: $4,780/43
        . One drive subsystem, double sided: $4,205/25
        . One drive subsystem, double sided: $5,630/45

- Cartridge Disk (5-26MB)

Model #	CDU9114	CDU9115	CDU9116	CDS9336
Capacity/drive	5 Fixed/REM	5 Removable	10 Fixed/REM	26 Fixed/REM
Maximum drives/ controller	4	4	4	4
One drive and controller	$12,100/88	$11,700/88	$12,700/108	$13,600/95
Additional drives	$ 7,400	$ 7,000	$ 8,000	$10,100/85

- Large Disks (40-300MB)

Model #	MSU9101	MSU9102	MSU9103	MSU9104
Removable pack	Yes	Yes	Yes	Yes
Formatted capacity	33	67	128	256
Maximum drives/ controller	4	4	4	4
Maximum transfer rate	1.2MB/Sec.	1.2MB/Sec.	1.2MB/Sec.	1.2MB/Sec.
Prices				
Single drive and controller	$21,000/160	$23,500/160	$30,000/230	$34,500/230
Dual drive and controller	$35,500/270	$40,500/270	$54,500/410	$63,500/410

- Tapes, Printers, Card Readers

  . Tapes:

      .. 800 bpi, 45 ips, seven or nine track: $ 11,000/100
      .. 800/1600 bpi, 45 ips, nine track: 17,200/120
      .. 800 bpi, 75 ips, seven or nine tracks: 13,000/120
      .. 800/1600 bpi, 75 ips, nine track: 22,200/180
      .. 1600 bpi, 45 ips, nine track: 14,800/120
      .. 1600 bpi, 75 ips, nine track: 19,100/180

- Printers:

120 cps		$ 4,615/ 61
160 cps		4,890/ 66
240 lpm	96 characters	14,690/ 81
300 lpm	64 characters	11,690/ 76
440 lpm	96 characters	23,690/166
600 lpm	64 characters	22,190/156
drum 660 lpm	96 characters	26,390/216
drum 900 lpm	64 characters	24,690/201

- Card Readers/Punch:

80 column/300 lpm	$ 6,010/ 85
80 column/500 lpm	6,710/110
80 column/100 lpm punch	14,710/147
80 column/400/100 lpm reader/punch	16,710/167

2.3 H I S   L E V E L   6   S O F T W A R E

- There are three different operating systems (MOD 200, MOD 400 and MOD 600) supported on Level 6 hardware. The common features are:

  - Same file system among the three executives
  - Same command language
  - All languages support the same file system
  - File system compatible with other GCOS systems: DPS/8, DPS/66, DPS/7

- MOD 200 Operating System

  - Supported on Model 23 and up
  - Event based or time slice scheduling
  - Sixteen priority levels with user assigned queuing at each level
  - Automatic volume recognition
  - Limited task swapping mechanism
  - Available in both 'execute only' and 'program development' versions
  - Supports entry-level COBOL only

- MOD 400 Operating System

  - Real-time operating system (RSX-11M type)
  - Supported on Model 33 and up
  - Available in two versions (SAF = Short Addressing Form for memory up to 64 Kbytes) and (LAF = Long Addressing Form for memories over 128 Kbytes).
  - Supports only one batch stream which can be 'rolled out' (swapped) to accomodate interactive tasks.
  - Priority scheduling (1-63) is available; round-robin at the same priority level.

- MOD 600 Operating System

  - General-purpose operating system (IAS type)
  - Designed after Honeywell's MULTICS
  - Supported on Model 43 and above
  - Timesharing operating system, uses a predefined time slicing algorithm
  - Supports a segmented address space into which one or more 256K word to 64K word segments can be loaded
  - Supports full spooling
  - Upward compatible with GCOS-66 and MULTICS

- Languages

  - Entry level COBOL (MOD 200 and 400 only)
  - Intermediate COBOL (MOD 400 and 600 only)
  - Advanced level FORTRAN (Level 1, ANSI 77)
  - RPG II
  - BASIC and ADVANCED COBOL (full ANSI 1974 with multi-key ISAM) have been announced - available in Q4-1980.

- Data Management

  - Single key ISAM is standard
  - INFO 6 (Query and reporting system)
  - TOTAL 6 (CINCOM supplied - on MOD 400 only)
  - IDS II (Compatible with GCOS-66 on MOD 600 only)
  - DEF (Data Entry Facility)

- Utilities

  - Sort/Merge
  - Other utilities such as edit, print, link, etc. are available

- Software Pricing

	License Fee	One-Year Support
GCOS-6 MOD 200	$1,900	$575
GCOS-6 MOD 400	1,500	550
GCOS-6 MOD 600	5,100	700

  - Languages

	License Fee	One-Year Support
Entry level COBOL	$3,780	$800
Entry level FORTRAN	735	365
Intermediate COBOL	4,700	950
Advanced FORTRAN	2,750	400
RPG II	2,900	630
Assembler	300	40

- Data Management

	License Fee	One-Year Support
GCOS-6 Data Entry Facility	$ 1,400	$ 200
INFO-6 Data Inquiry/Update	3,800	200
GCOS-6 Sort/Merge	265	40
IDS-II	13,000	1,192
IDS-II runtime services	7,000	642
TOTAL-6	10,500	1,260

2.4 C O M M U N I C A T I O N S

● Controllers

   NOTE: Prices are given as $purchase/$monthly maintenance

   - Multiline communications processor with:

      . Eight asynchronous lines: $3570/26
      . Eight synchronous lines: $7900/43

   - Synchronous Lines

      . Up to eight DMA lines on one controller
      . Speeds up to 72,000 bps
      . Supports Autocall
      . Compatible with HDLC Bell 301/303, CCITT V24 and HDLC V35, CCIT V35

● Honeywell to IBM

   - Uses 2780/3780 facilities
   - HASP multileaving facility

● Honeywell to Honeywell

   - Uses polled VIP emulation (Honeywell's block mode terminal) to
     communicate with other Level 6s, Level 62, 64, 66 and MULTICS.

● Other Packages

   - Remote batch facility is used for connections to Level 66 and acts as
     an RJE station.
   - Terminal concentrator facility provides a multiplexed terminal
     concentration capability to a variety of host systems over single or
     multiple host links.

- Communications Pricing

	License Fee	One-Year Support
GCOS-6	$1,640	$260
GCOS-6	2,200	290
HIS-to-HIS	400	80
GCOS-6 Remote Batch	900	160
GCOS-6 Terminal Concentrator	750	130

2.5 TRANSACTION PROCESSING

- Uses a subset of TDS under GCOS-66/64
- Provides features such as journaling
- Only supported on MOD 600 Executive
- A Transaction Processor (TPS) for the MOD 400 operating system has been announced.
- Pricing:

  - GCOS-6 TDS $8,000/900
  - GCOS-6 TDS Runtime Services $5,000/600

2.6 HIS SERVICE / SUPPORT

- Hardware Service

  - 90 day on-site warranty
  - Standard maintenance contract provides:
    . installation assistance
    . preventive and remedial maintenance
    . normal contract hours: 8:30 a.m. - 5:00 p.m., Monday through Friday

  - Over 400 service locations worldwide
  - Local offices are almost always well staffed/stocked

- Software Service

  - 90 day warranty
  - Software error/correction through software technical assistance request service (same as Digital's Software Performance Report service)
  - Software update service (as available)
  - Software consulting fees:
    . Average is $200.00 per day
    . HIS also works on fixed cost projects

  Overall, HIS has good hardware and software field support.

2.7 SYSTEM PERFORMANCE

NOTE: Multiuser benchmark results showing interactive response times and/or number of users supported at a given response time are not currently available on the Honeywell Level 6. However, the following comparisons have been compiled based on publicly available information. (See Figure 1a and 1b.)

FORTRAN/SCIENTIFIC ENVIRONMENT

Stand Alone
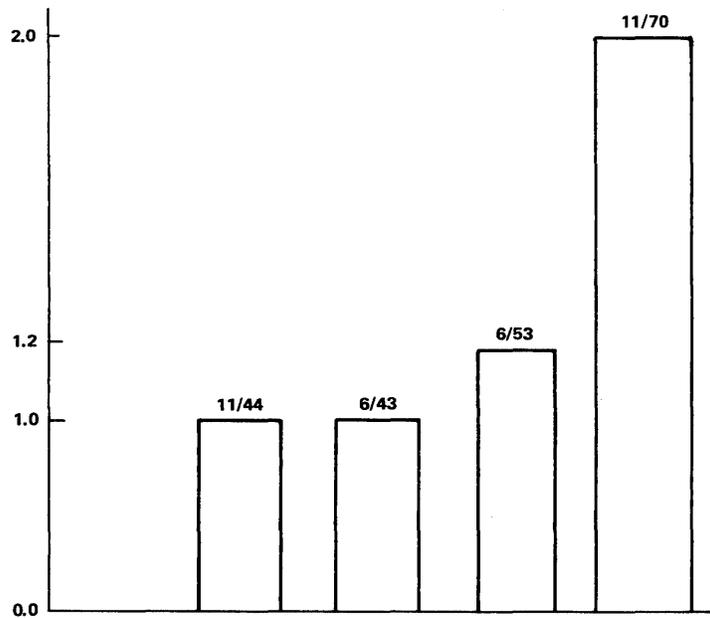
*ALL INCLUDE FPU/SIP

FIGURE 1A

COBOL/COMMERCIAL ENVIRONMENT

Stand Alone
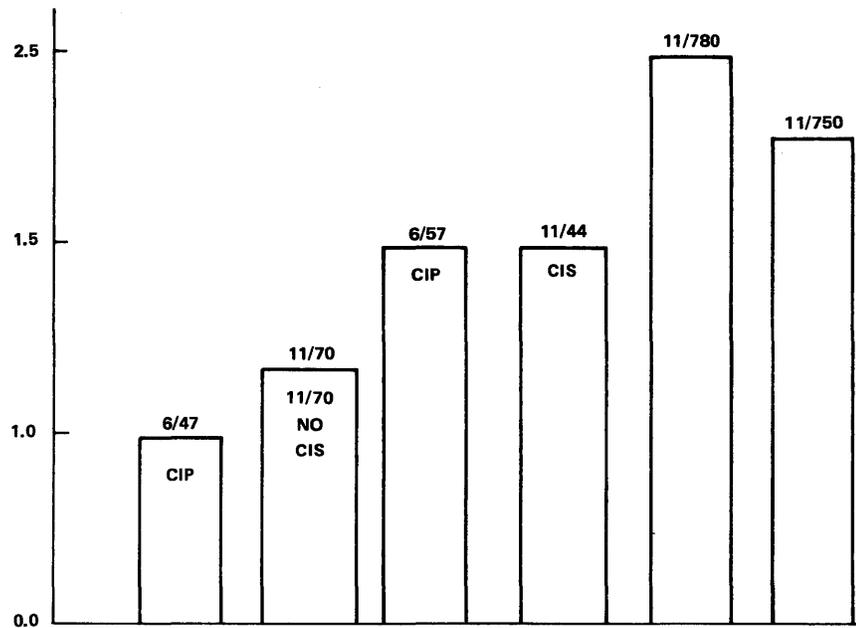
FIGURE 1B

2.8 HIS LEVEL 6 SYSTEM PRICING

● Pricing Summary

System Size	Small	Medium	Large
Purchase	$53,610	$99,230	$278,470
Maintenance	31,200	44,640	137,400
Five-Year Cost	84,810	143,870	415,870

NOTE: Prices below are given as $purchase/$monthly maintenance.

● VERY SMALL SYSTEM

Model 23 CPU	
128K bytes	$23,250/259

Dual Diskette Drive
VIP 7205 Console
Eight Asynchronous Lines
MOD 200 includes Screen Manager,
Sort and entry level COBOL

5-Year Maintenance	15,000
Total 5-Year Costs	$38,250

● SMALL SYSTEM

HIS Model 33 CPU	$ 6,350/ 49
10-slot Chassis	
128 Kbytes EDAC Memory	11,400/108
52 Mbytes Cartridge	
Disks (2x26)	23,500/195
Multiple Device	
Controller	1,250/ 10
VIP 7205 Console	2,400/ 30
160 cps Printer	3,640/ 56
Eight Asynchronous Lines	3,570/ 26
GCOS-6 - MOD 400	1,500/ 46
Total	53,610/520
Total 5-Year Costs	$84,810

● MEDIUM SYSTEM

HIS Model 43 CPU	
10-slot Chassis	$16,000/ 86
256 Kbytes EDAC Memory	19,000/184
134 Mbytes	
Disks (2 x 67)	41,500/270
Multiple Device	
Controller	1,250/ 10
VIP 7205 Console	2,400/ 30
300 lpm Printer-	
64 characters	10,440/ 66
16 Asynchronous Lines	7,140/ 52
GCOS-6 - MOD 400	1,500/ 46
Total	99,230/744
5-Year Maintenance	44,640
Total 5-Year Costs	$143,870

● OPTIONS

Model 47 CPU (includes	
Commercial Processor)	$20,000/200
Scientific Instruction	
Processor	5,050/ 11
Memory Management	500/ 5

● LARGE SYSTEMS

HIS Model 57 CPU	
10-slot Chassis	$44,000/ 300
4-slot Expansion	2,100/ 8
Scientific Processor	5,050/ 11
1024 Kbytes Memory	76,000/ 736
512 Mbytes	
Disk (2 x 256)	60,500/ 410
VIP 7205 Console	2,400/ 30
Multiple Device	
Controller	1,250/ 10
1600 bpi, 75 ips,	
9-track Tape	19,100/ 180
600 lpm Printer	20,940/ 146
32 Asynchronous Lines	14,280/ 104
GCOS-6 - MOD 600	5,100/ 58
COBOL	4,700/ 79
FORTRAN	2,750/ 34
TDS	8,000/ 75
IDS - II	13,000/ 100
DEF	1,400/ 17
Totals	280,570/2298
5-Year Maintenance	137,880
Total 5-Year Costs	$418,450
Model 53 CPU	$ 19,200/ 193

- All the above systems do not include
  terminals.
- Execute-only CPUs are approxmiately
  $700 less expensive.
- OEM discounts of up to 35% are given
  depending on quantity.

2.9 CONFIGURATION RULES

● Honeywell Level 6 megabus can have from five to 23 slots. Each CPU occupies two slots (Model 33 occupies one). Each memory board comes with 128K words (256K bytes). The Model 57 configuration in Section 2.8 will occupy the following number of slots:

– CPU	2
– Memory	4
– Disk Controller	1
– Multiple Device Controller	1
– Tape Controller	1
– Communications Multiplexers	4
Total	13

● The 6/57 can be expanded to 23 slots, allowing for plenty of growth.

3.0 DIGITAL VS HIS

3.1 HIS DEFICIENCIES

● Hardware Deficiencies

- Lacks high performance, real-time interface hardware (e.g., LPA-11K, DR-11B) for laboratory data acquisition, industrial (process) control, flight simultation and other time-critical applications
- No CSS capability to provide users with customized solutions
- No remote diagnosis capability
- High memory costs – $76,000 for 1MB (vs $34,200 on PDP-11/70)
- Cache (8 Kbytes) available on Models 53/57 only
- Limited address space of 20 bits
- Limited RAMP features; failure in certain controllers (MLCP) can 'lock up' the entire system
- No 32-bit architecture

● Software Deficiencies

- MOD 200

    . Supports COBOL only
    . Most often used for data entry types of applications (PDT-11 equivalent)

- MOD 400

    . Does not support swapping of interactive tasks; only batch can be 'rolled out'
    . Programs can only be relocated at load time, leaving 'holes' in memory. Insufficient contiguous memory can 'lock out' users
    . Round-robin scheduling is not time driven. A compute bound program can dominate the entire system
    . Operating system can only address memories up to 512 K words.
    . There is no login procedure for users
    . Any user can access any file on the system simply by changing directories.

- MOD 600

    . No true real-time support
    . Not a virtual memory operating system
    . Has a very high systems overhead (256 Kbytes)
    . Not widely used among Level 6 users; there are only a few sites
      worldwide.

- General Deficiencies

    - X.25 has been committed (functionality not known)
    - No password/login procedures
    - No PASCAL, APL, PL/1
    - FORTRAN and COBOL are low level implementations of ANSI standards
    - Program sizes are restricted to 64K words
    - No job accounting
    - Networking restricted to file transfers only
    - No multi-key ISAM (RMS-11K)
    - No 'HELP' command
    - No symbolic debuggers as on VAX or PDP-11 COBOL
    - No software for data acquisition, laboratory automation, etc.

- Inter-System Link (ISL)

    This is a hardware/software combination that allows multiprocessor
    configurations. ISL was announced in 1977 and was targeted for telephone
    industry types of markets. It is based on MOD 400 software. As of Rev.
    200 of MOD 400 (August 1980) there is no software support for ISL.

3.2 H I S   C O N S I D E R A T I O N S

- Hardware Considerations

    - Modular hardware design
    - Range of compatibility
    - Easy field upgrade capability from small to larger systems
    - Overall lower priced peripherals
    - Very reliable hardware

- Software Considerations

    - CODASYL DBMS (IDS II)
    - Transaction processing capabilities
    - Shareable, reentrant code
    - Comprehensive accounting, financial and manufacturing packages
    - Operating systems require no SYSGEN - as such, offers no tuning
      capabilities. However, this can look attractive to unsophisticated
      users.

4.0 COMPETITIVE STRATEGIES

HIS is primarily known in the industry as a mainframe rather than a minicomputer vendor. Digital, however, known as the largest supplier of minicomputers, is also very much respected for its mainframes.

- **"Networks and Distributed Solutions"**

  Market Segment:

  Large or growing companies with multiple facilities and integrated information requirements.

  - Many Fortune 1000 customers have present requirements for distributed systems or will require the ability to configure such systems in the future. Digital has the best networking offerings in the industry. Level 6 only provides file transfer capabilities.

    Stress the comprehensive and highly functional capabilities of DECnet. Do not forget that Digital also offers a 3271 PE and SNA for IBM Interconnect.

- **Demos and References - "Try It, You'll Like It"**

  Market Segment:

  All markets will have special appeal to prospects who are unfamiliar with Digital products.

  - Digital, with over 20 years experience building interactive systems, has substantial ease-of-use (DCL, English language commands, prompts, etc.) advantages over GCOS-6. Demos in particular should be very effective.

  - Digital has an installed base of over 235,000 systems. There are excellent references in virtually any corner of the world. Honeywell will have problems quoting reference sites, particularly for MOD 600.

- **Stress Multiuser Performance**

  Market Segment:

  All markets.

  - Honeywell claims the performance of Model 6/57 as equal or better than a PDP-11/70. This may be true in a single user benchmark. However, a Model 6/53 or 6/57 should start degrading in multiuser, multilanguage environments with 16 or more users.

    Stress the proven multiuser performance of VAX/VMS and RSTS/E and the ability of PDP-11/70s, VAX-11/750 and -11/780 to support large numbers of users (32 and over).

- **"The Power of Virtual Memory"** - Addressability and Program Size

Market Segment:

Any user requiring large program capability.

- Virtual memory systems have become widely accepted in both mainframe and minicomputer marketplaces. It is important to stress the advantages of VMS over GCOS-6, which is a non-virtual operating system (VMS provides the ability to run large programs without having to resort to time-consuming overlay techniques or attaching vast amounts of costly physical memory).

- Stress COBOL performance

  PDP-11 COBOL on the -11/44 will provide equal or better performance of a Model 6/57 at a much lower cost. VAX-11/750 will outperform the Level 6 line in any environment and provide all the benefits of a virtual machine (refer to the VAX Marketing Guide), at about the same price range as a 6/47.

- Stress FORTRAN and its performance

  Honeywell's FORTRAN is a low level implementation and at best will match the performance of a PDP-11/70 without the Floating Point Unit.

- Stress Symbolic Debugger on PDP-11 COBOL

  Digital is the only minicomputer manufacturer that provides the Symbolic Debugger capability feature on 16-bit minicomputers. Honeywell has always been a good COBOL company, however, with GCOS-6, its COBOL is only Level 1 implementation of ANSI 74.

- Stress Digital's corporate customer support capabilities:

  . Educational facilities
  . CSS capabilities
  . Remote diagnostic capabilities
  . Software support through the Telephone Support Center. Software support for GCOS-6 is only available at district and not branch levels.

COMPANY CONFIDENTIAL

4.1 OVERCOMING HONEYWELL OBJECTIONS

● **When Honeywell Promotes Timesharing Capability...**

MOD 400's scheduling favors batch-type jobs over highly interactive jobs. MOD 600 has not gained a very wide user acceptance (less than 100 systems in 3 1/2 years), whereas Digital has over 1,000 mainframes (DECsystem 10s and 20s), over 5,000 RSTS/E based systems (more than Honeywell's installed base of Level 6s), over 1,000 VMS systems and thousands of RSX based systems that are used in commercial timesharing environment.

● **When Honeywell Promotes Large Program Sizes...**

GCOS-6 allows programs to be as large as 128 Kbytes. However, since the software uses two words (4 bytes) for every address, programs on Level 6 almost always tend to be about 30% - 35% larger than a comparable PDP-11 program.

If a customer needs programs larger than 64 Kbytes, you can propose a VAX-11/750 using VMS.

● **When Honeywell promotes DPS (Distributed Processing Systems)...**

Honeywell has only file transfer functionality. DECnet Phase III is one of the most advanced networking products in the industry. Digital offers a wide variety of interconnect products as well. Honeywell <u>does not</u> have support for CDC, UNIVAC or SNA, and has just announced (<u>August</u>, 1980) support for 3271. Exact details of implementation are not known at this time.

● **When Honeywell Promotes Compatibility...**

The PDP-11 family contains highly compatible computers, including VAX-11/750 and 11/780. Many PDP-11 applications will run on VAX. Level 6/57 is Honeywell's largest minicomputer and provides no growth. Moving to DPS/8 or other systems requires a massive conversion. However, data files are compatible with GCOS-6, GCOS-66, GCOS-8 and MULTICS.

● **Benchmarking Against Honeywell...**

- Avoid compile and link types; Honeywell's compilers and linkers are extremely fast, particularly when compared to TKB on PDP-11s.
- You should include at least one batch stream. This tends to substantially degrade Honeywell's interactive performance.
- Multiuser benchmarks should be for 16 or more users requiring large memories (over 512K bytes). HIS MOD 400 can address memories up to 512K words and does not support swapping (it may also lock out users).

5.0 S P E C I A L   C O N S I D E R A T I O N S

- Honeywell's most significant application package is "Data Entry Facility" (DEF). This package has contributed to the sales success of Level 6 systems within Honeywell's computer base.

  DEF runs on MOD 400 and 600. DEF I supports up to 14 devices on a Level 6 CPU. More than eight data entry devices tend to overload the CPU. This package is very similar to FMS-11 in functionality. It allows a user to define a form and link editing subroutines written in any language. The greatest advantage of DEF is that it allows a Level 6 user to interactively inquire into any file (provided the user has the necessary privileges) on a host Level 66 or Level 68 running GCOS-66, or MULTICS. This has enabled HIS to penetrate its large customer base very successfully.

  The DEF II package provides all the above facilities and contains support for up to 24 devices. DEF I interrupts the CPU on every character input like a DZ-11 on PDP-11s, while DEF II is designed to take advantage of microprocessor based MLCP in that it interrupts the CPU only at the end of each transaction. Hence, the support of more (32) devices. The only other major difference is that the screen generated by DEF II can be called from any program and written out to the VIP 7200 CRT.