amdahl

AMDAHL 580

Amdahl 580
Model 5860

The new Amdahl 580 Model 5860 is the most powerful uniprocessor that Amdahl has ever produced. It provides twice the processing power of the Amdahl 470V/8 in typical commercial environments. This new addition to the Amdahl family represents an evolutionary extension to the product line and offers a compatible growth path for Amdahl 470 users.

The Amdahl 580 builds upon the company's leadership position in Large-Scale Integration (LSI) technology and continues the Amdahl philosophy of protecting the customer's investment in application and systems software. Advanced design concepts, including expanded channel and main memory capability and the application of microcode and Macrocode techniques, demonstrate Amdahl's innovative approach to present and future customer requirements.

Highlights

The Amdahl 580 concept is consistent with Amdahl's objective of applying advanced technology and original design to large-scale computers, with emphasis on performance, compatibility, and availability.

- Twice the processing power of the Amdahl 470V/8 in typical commercial environments.
- Like the 470, supported by MVS/SP, VM/SP, and ACP.
- Up to 32 megabytes (MBs) of main memory.
- Up to 34 channels, made up of 32 block multiplexers and two byte multiplexers.
- Supports the Data Streaming feature for all channels.
- Fully compatible with the Amdahl 470 series.
- CPU and channels for basic system implemented on eight multiple chip carriers (MCCs) housed in a 5.6 cu.ft. stack.
- Enhanced reliability through the use of advanced error-checking and correction circuitry.

- Functional packaging that permits fewer connections and more rapid fault isolation.
- Compact in size and weight.
- Extensive use of distributed microcode and a new class of firmware – Macrocode.
- Console implemented in LSI, utilizing microcode and a subset of the Amdahl 580 instructions. The Console Processor is contained on a single MCC for reliability and performs both local and remote diagnosis.
- A 400-circuit LSI chip.
- Continues with the Amdahl-developed air-cooling.

Performance

The processing power of the Amdahl 580 is made possible by improvements in design, technology, and packaging.

Design
- The pipeline design reduces the average number of cycles per instruction and permits a maximum execution rate of one instruction per cycle.
- A high-performance random access memory (RAM) technology permits the use of distributed microcode in the Instruction Unit (I-Unit), Execution Unit (E-Unit), I/O Processors (IOPs), Memory Bus Controller (MBC), and the Console.
- Dual 32K High-Speed Buffers (HSBs) are two-way set associative and retain operands and instructions separately.

- Primary data paths are eight bytes wide.
- The IOP contains 16 block-multiplexer channels. A second IOP may be added to increase the number of block-multiplexer channels to 32. The first IOP has a maximum aggregate data rate of 50 MBs per second. A higher aggregate data rate is realized with the addition of 16 more channels through a second IOP. Each block-multiplexer channel can transmit data at up to 6 MBs per second.
- The IOP design includes 256 subchannels on every channel, and incorporates subchannel queuing.

Technology and Packaging
- The advanced LSI chip permits the continued use of air cooling.
- A fast, 4K RAM module has been designed for microcode control stores, HSBs, and registers.
- The 14-layer MCC can contain a total of 121 logic and RAM chips.
- The LSI stack holds up to 13 MCCs in just 5.6 cubic feet (0.156 cubic meters). The basic system is contained in 8 MCCs, and all the inter-MCC connections are contained in two 12-layer printed circuit boards that form the stack sidewalls.

Compatibility

Amdahl is committed to maintaining compatibility through innovative design.

- Flexibility is ensured by the use of microcode on the I-Unit, E-Unit, IOPs, MBC, and the Console. The control store is distributed to each functional unit, permitting optimization of the control word format.
- The I/O protocol is determined for each channel by the Channel Interface Handler card, permitting compatibility with future I/O protocols.
- A hardware/firmware facility, called Macrocode, supports the machine check and channel check capabilities of the 580. In addition, Macrocode may be used to implement Amdahl-designated opcodes.

Availability

Reliability, availability, and serviceability are important to the large-system user's environment. The Amdahl 580 addresses this requirement by its approaches to design, technology, and packaging.

Design
- Advanced error-checking and correction circuitry includes main memory ECC, buffer ECC, bus parity checking, E-Unit parity and residue checking, and instruction retry.
- Special history RAMs record bus and microcode transactions to provide a readily available audit trail of system activity.
- Each MCC contains its own error diagnosis circuitry.

Technology and Packaging
- Denser LSI permits an entire system function to reside on its own MCC, which results in more rapid fault isolation.
- The LSI and MCC packaging results in fewer connections, and therefore reliability is enhanced.

- MCC interconnections are through 12-layer printed circuit boards.
- RAMs and LSI are packaged on the same MCC.

Future Enhancements. The Amdahl 580 has been designed to grow with and adapt to future requirements in the data processing industry. The system incorporates microcode and Macrocode for rapid adjustment to new features. The Amdahl 580 will permit expansion beyond 32 MBs. Also, the Amdahl 5860 is field-upgradeable to the 5880, a tightly coupled dual processor that provides 3.4 to 3.6 times the processing power of the 470V/8.

First Customer Shipment. First customer shipments of the Amdahl 580 Model 5860 are scheduled for April, 1982.

Service and Support

Amdahl's field service organization provides a full range of activities, including central and local support.

In the 5860, serviceability and maintainability are centered around an advanced Console Complex. Reliability of the Console Complex is achieved with advanced LSI technology controlled by microcode. The Console Complex enhances system serviceability with such advanced capabilities as:
- Scan-In/Scan-Out records and re-creates the failing system condition.

- FRU Error Code Generation identifies and communicates the failing Field Replaceable Units via the system console.
- Enhanced Maintenance Analysis Language allows support personnel to view log information and execute diagnostic command procedures via the system console.
- Error logging captures the failing system environment, including SCP-related information, for future failure analysis.
- Interface to Hardware History Tables augments the logged out information to assist in error identification.
- Dynamic Error Analysis executes in the Console Complex to analyze the captured logs.
- Interface to Integrated Channel Analyzer provides dynamic monitoring of selected I/O channel interfaces.
- Enhanced AMDAC offers the following data link capabilities:
  - Amdahl Support Centers can remotely, via the 5860 console and switched telecommunications facilities, perform diagnostic functions relating to hardware failures or operate SCP-based diagnostic programs and utilities.
  - Support Centers can also deliver remedial information (PTFs) to the 5860 console for retrieval at a later time by customer SCP-based programs.

- Support personnel, using a 5860 display console, can access Amdahl's Support Center on-line data bases for hardware and software support information.
- To ensure security, customers have complete control of access to AMDAC.

Serviceability of the Console Complex results from a built-in microprocessor, which uses generated error codes to provide rapid local or remote isolation of failures.

Software. System/370 operating systems will execute on the Amdahl 580. Amdahl will support:
- MVS/SP1, SP2, and SP3
- ACP
- VM/SP Release 1
- All currently available Amdahl software products.

System Organization

The Amdahl 580 system consists of a 10' x 3' (312 cm x 91 cm) mainframe; a 4' x 3' (130 cm x 91 cm) Power Distribution Unit (PDU); and up to four operator's consoles. The first operator's console is considered local and must be attached to the electronics cabinet for a total size of 3' x 5' (91 cm x 147 cm); the second console is also considered local and measures 2 1/2' x 3' (84 cm x 91 cm); the remaining two are the same size and are remote. The mainframe contains the LSI stack; the main storage unit (MSU), which provides up to 32 MBs of main memory; the Channel Interface Handler cards; and certain Console components.

The stack, which occupies only 5.6 cubic feet (0.16 cubic meters), contains most of the LSI. Although the stack can accommodate 13 MCCs, the basic system requires only 8 MCCs. A ninth MCC is required to expand the basic 16 MB x 18 channel system to 34 channels. The CPU requires 5 MCCs. The IOP, Console Processor, and MBC utilize the remaining three. The MCCs are interconnected by two 12-layer printed circuit boards that comprise the stack sidewalls.

The Amdahl 580 utilizes a dual bus structure, which provides eight-byte-wide data paths (72 bits including parity or checking bits) to interconnect all functional units. The MBC functions as the system's message router and memory controller. The A-Bus carries data from the Console, IOPs, and CPU to the MBC. The B-Bus carries data from the MBC or the MSU to the Console, IOPs, and the CPU.

The Console contains the keyboard, CRT, hard disk, floppy disks, and the AMDAC modem. All functions of the console (support processor, console CPU with 2 MBs of memory, system scan facility, and the two byte-multiplexer channels) are housed in LSI in the stack and on the adjoining frame. The Console Complex is Amdahl's primary tool for performing both local and remote system diagnosis.

Physical Characteristics

UNIT/COMPLEX	SIZE * (L x W x H)	WEIGHT LBS. (KGS)	MAINTENANCE CLEARANCE			
			FRONT	REAR	LEFT	RIGHT
Mainframe Complex (Up to 18 I/O Channels)	123"x36"x70" (312cm x 91cm x 178cm)	4400 (1998)	60" (152cm)	48" (122cm)	36" (91cm)	48" (122cm)
Mainframe Complex (more than 18 I/O Channels	147"x36"x70" (373cm x 91cm x 178cm)	4650 (2111)	60" (152cm)	48" (122cm)	36" (91cm)	48" (122cm)
Main Operator's Console – Single Terminal Station	58"x35"x49" ** (147cm x 89cm x 125cm)	750 (340)	36" (91cm)	36" (91cm)	36" (91cm)	12" (30cm)
– Dual Terminal Station	88"x35"x49" ** (224cm x 89cm x 125cm)	1070 (485)	36" (91cm)	36" (91cm)	36" (91cm)	36" (91cm)
Remote Operator's Complex	33"x35"x49" ** (84cm x 89cm x 125cm)	340 (154)	36" (91cm)	18" (46cm)	36" (91cm)	—
Power Distribution Complex	51"x36"x70" (130cm x 91cm x 178cm)	1400 (635)	36" (91cm)	36" (91cm)	36" (91cm)	36" (91cm)

*   Includes Doors
**   From Floor to Top of Terminal

Unit Floor Plan   (Scale: 3/8 in. = 1 ft.)

MAIN OPERATOR'S CONSOLE COMPLEX

REMOTE OPERATOR'S CONSOLE COMPLEX
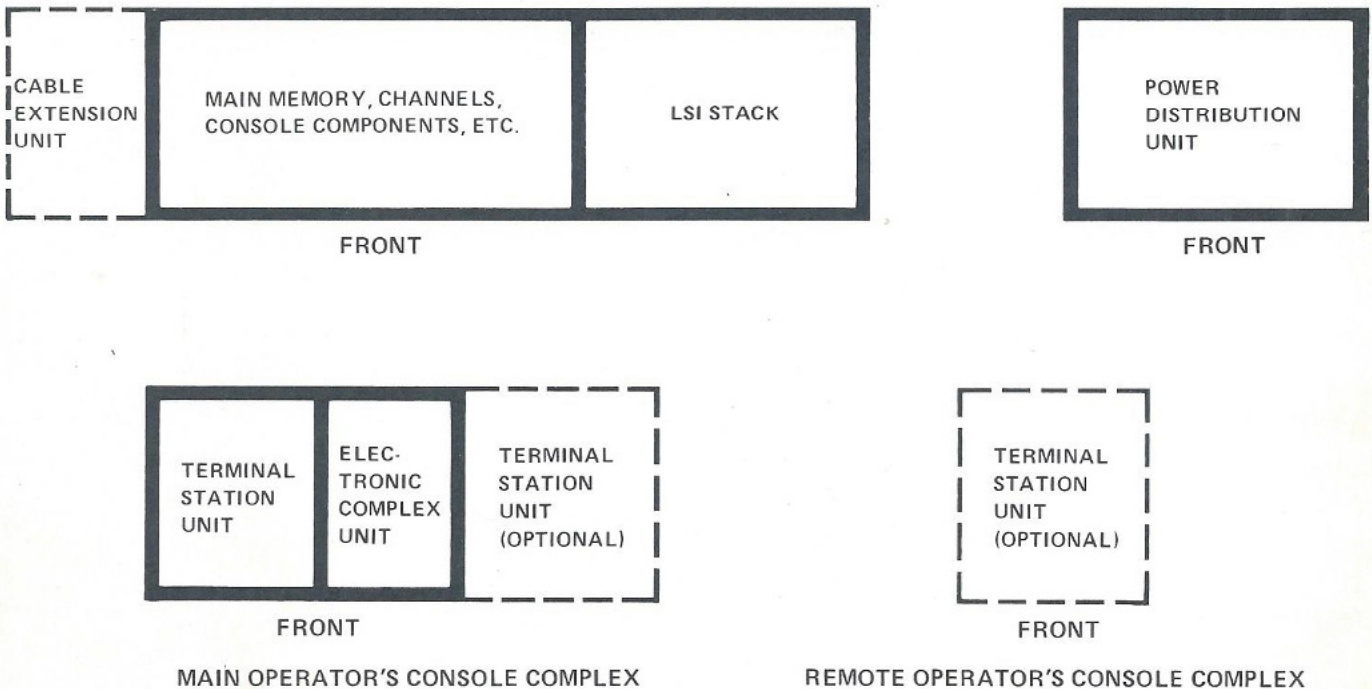
Specifications

Performance
- Two times the Amdahl 470V/8 in a typical commercial environment.
- A new, 5-phase pipeline which can complete one instruction per cycle, at its maximum rate.
- Channel aggregate data rate – 50 MBs/second.
- Block-multiplexer channel data rate – 6 MBs per second.
- Byte-multiplexer channel data rate – 0.2 MBs per second.

Configurations

	Std. Config.	Expand to	In Incr. of
Memory (MBs)	16	32	8
Block Multiplexer	16	32	4
Byte Multiplexer	2	—	—
Total Channels	18	34	4
Channel-to-Channel Adapters	—	2	1
Local Consoles	1	2	1
Remote Consoles	—	2	1

Environmental
- Voltages: 208V, 415 Hz, 3ϕ and 208V, 60 Hz, 3ϕ
  or
  208V, 415 Hz, 3ϕ and 380V (or 415V), 50 Hz, 3ϕ
- Power consumption: 35 – 40 KVA
- Heat output: 83,500 BTUs per hour
- Air conditioning:
  - Humidity: Room – 30% to 70% relative humidity (no condensation). Maximum wet bulb 78°F (26°C). Under floor – 50% to 70% relative humidity (no condensation). Maximum wet bulb 78°F (26°C).
  - Pressure: .05 inches H_2O (minimum)
- Input temperature range (under floor): 50°F to 67°F (10°C to 19°C)
- Room temperature: 60 to 90°F (16 to 32°C)

Features
- Air cooling
- Multiple Chip Carrier (MCC)
  - Capacity – 121 chips and RAMs
  - Board layers – 14
  - Size – 11 3/8" × 13 1/4" (29 cm × 34 cm)
  - Connectors – 1152 I/Os per MCC, of which 768 are signal I/Os and the remainder are power and ground.
- LSI Stack
  - Size – 20" × 20" × 24" (51 cm × 51 cm × 61 cm)
  - Capacity – 13 MCCs
  - Standard system – 8 MCCs (9 MCCs if 2nd IOP is installed)
  - Inter-MCC Connection – two 12-layer printed circuit boards which comprise the stack sidewalls.
- High-Speed Buffers (HSBs)
  - Size – two 32KB RAMs, one for instruction and one for operands.
  - Organization – two-way set associative
  - Access rate – 8 bytes/cycle/buffer (In excess of 300 MBs/second/buffer.)
- Primary data paths – 8 bytes
- Microcode – I-Unit, E-Unit, IOPs, Console, MBC
- Macrocode

Specifications are subject to change without notice.