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TITLE OF THE INVENTION (280 characters max)

COMPUTER CONSOLE WITH A UNIVERSAL ATTACHED COMPUTER MODULE

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ENCLOSED APPLICATION PARTS (check all that apply)

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

- ☒ No.
☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

SIGNATURE Ararat Kapouytian

Date: May 1, 1998

TYPED or PRINTED NAME: Ararat Kapouytian

REGISTRATION NO.: 40,044

- ☐ Additional inventors are being named on separately numbered sheets attached hereto.

COMPUTER CONSOLE WITH A UNIVERSAL
ATTACHED COMPUTER MODULE

ABSTRACT OF THE DISCLOSURE

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A new type of personal computer referred to as "Attached Personal Computer (AttachPC)" is invented (Fig. 1). AttachPC is made up of a removable computer module, referred to as "Attached Computer Module (ACM)" and a

10 Peripheral Console that has an opening referred to as a "Computer Bay". ACM is implemented as a small enclosure containing the core computing devices and software of a PC, i.e. CPU/cache, core logic, main memory, primary Hard Disk Drive, graphics subsystem, software and data files. The Peripheral Console consists of a chassis with a circuitry and containing the peripheral devices of a

15 desired computer configuration not in ACM, e.g. CD-ROM, Floppy drive, DVD drive, additional HDD, slots for add-on boards, display and input devices, audio device, communication device, power supply, and others. ACM plugs into the Computer Bay of a Peripheral Console to become a functional PC. The Computer Bay provides mechanical security and protection for ACM. An interconnection

20 bus referred to as the "Exchange Interface System Bus (XIS Bus)" provides electrical connection between ACM and peripheral console. Interface Controllers bridge peripheral signals from ACM to Peripheral Console through XIS Bus. The interconnection system between ACM and the Computer Bay uses connectors designed for repeated insertion and removal.

25

AttachPC offers a PC user a new usage model. ACM may be about the size of a videocassette. A PC user can carry his personal ACM anywhere and use it wherever there is a compatible peripheral console. ACM becomes a new form

of mobile PC. The essential computing capability and environment of the user is preserved within ACM. The same computing performance, graphics performance, main memory, hard disk capability, software environment, graphical user interface, and data files are preserved. AttachPC is easier to maintain with
 5 separate ACM and peripheral console. Upgrading to a new console or ACM is as easy as plugging in a new unit. A Corporation can outfit many locations with peripheral consoles and allow an employee to access his or her ACM at those locations. An employee's PC is no longer confined to a fixed office location. New migration paths become possible, e.g., "converting" a desktop computer into
 10 a notebook.

BACKGROUND

To date, most personal computer is designed as a standalone, self-
 15 contained unit. A personal computer is constructed with devices connected to a motherboard inside a single box. The motherboard is the central circuit board that connects all devices, i.e. CPU/cache, core logic, main memory, graphics devices, audio devices, communication devices, power supply, Hard Disk Drive, CDROM, floppy disk drive, add-on cards, and others. A new generation of processor
 20 modules, e.g. Intel's "Slot 1" PII module, or Mobile CPU Module, are also attached to the motherboard through a connector. The motherboard is attached to the computer box and is not removable without opening the chassis. To date, CPU with core logic, and memory cannot be removed from a computer without opening the chassis. There is no mechanism for removing and sharing of devices,
 25 specifically the CPU, core logic, main memory, and graphics subsystem, between any two personal computers.

To date, the most significant partitioning of a desktop PC is the method of a media console. As an example, IBM Aptiva S Series' splits the PC into two units: the media console and the system tower connected by a bus cable. The

media console contains frequently accessed peripherals such as CD-ROM, floppy drive and has connection to keyboard and mouse. The key purpose of this design is to remove the bulky tower from the desktop and up to six feet away. This type of PC partitioning takes a small set of low performance peripherals away from the main computer box as part of a trend of moving some peripheral functions

5 towards the monitor. This type partitioning does not involve the main computing devices in a PC, i.e. CPU, core logic, memory, and primary HDD. The main system unit still houses most of the computing and peripheral devices, storage subsystems, add-on slots, power supply of the personal computer within a large

10 computer box.

There is no industry standard portable motherboard form factor. However all notebook has a central motherboard that is not removable from the chassis. Typical example of portable computers, i.e. Compaq's Armada notebook PC, IBM ThinkPad are provided for reference.

15 A new industry specification known as "Device Bay" defines a mechanism for easily adding and upgrading PC peripheral devices without opening the chassis. Device Bay supports a wide variety of devices such as mass storage devices, communications and connectivity. Device Bay does not support processors or memory.

20

THE INVENTION

The invention details the concept and implementation of a removable "Attached Computer Module (ACM)", a "Computer Bay (CB)" for receiving

25 ACM, an interconnection system between ACM and peripheral console, and a variety of peripheral consoles (Fig. 1). The combined ACM and peripheral console function as a personal computer referred to as AttachPC.

ACM is an enclosed box with one or more connectors on one end that mate with respective connectors in a computer bay of a peripheral console. The

30 inserted ACM, once connected, serves as the central computing unit inside the

combined AttachPC. For a desktop AttachPC, the combined ACM and peripheral console unit functions like a traditional desktop personal computer box. For a portable AttachPC, a small ACM inserts into a portable console. The combined ACM and portable console functions like a traditional portable (notebook) personal computer.

ACM may comprise an enclosure containing the following components (Fig. 5):

- 1) A CPU with or without cache memory,
- 2) Core Logic device or means,
- 10 3) Main memory,
- 4) A physically small primary Hard Disk Drive (HDD), e.g. 3", or 2.5",
- 5) persistent Memory device, e.g., flash memory,
- 6) System BIOS,
- 7) Operating System, application software, data files on primary HDD,
- 15 8) Graphics Subsystem,
- 9) An interface,
- 10) Clocking,
- 11) One or more connectors to peripheral console,
- 12) One or more circuit boards connecting the above components,
- 20 13) and other accessories.

ACM practically unable to function as a standalone computer unless connected to a minimum set of devices: durable power supply, a functional display device to support intended applications, and a functional input device to support intended applications (Figs. 15-16). Another method of distinguishing an ACM from other computing devices is in what ACM does not have. The key missing elements are

- 1) functional Input means, e.g. integrated keyboard or mouse,
- 2) functional Display means, e.g. integrated VGA LCD display,
- 30 3) Removable storage media subsystem, e.g. Floppy drive, CDROM

drive,

- 4) Power supply sufficient to supply the full unit operation.

The general guiding principals of invention in the ACM are:

- 5 1) Small size suitable even for a portable computer,
- 2) Contain high speed, high bandwidth busses for CPU, Main memory
 and Graphics Subsystem, typically each bus bandwidth is greater than
 150 Megabyte/sec). This leaves the peripheral bus to be compressed
 into a low pin count, high performance system bus (XIS Bus) for
10 external interface,
- 3) XIS Bus may be cable-friendly to provide interconnection
 convenience with peripheral consoles,
- 4) Preserve the computing performance within ACM,
- 5) Preserve the software environment and data files for the owner,
- 15 6) Mechanical construction to support repeated insertion and removal,
- 7) Use low-power devices and provide adequate thermal dissipation.

ACM may contain but is not limited to the following high speed system
bus structures: (Figs. 6-12)

- 20 1) CPU to cache memory bus or Memory controller to cache memory bus
- 2) CPU to main memory controller bus
- 3) Memory controller to main memory bus, and
- 4) Memory controller to graphics device.

- 25 The Computer Bay (CB) is an opening in a peripheral console that receives
ACM. CB provides mechanical protection to ACM, mechanical alignment for
connector mating, and connectors at the end of the opening for connecting to
ACM. (Figs. 1, 3, 13, 14)

XIS Bus is made up of 3 bus components: video bus, peripheral bridge bus referred to as Cross Peripheral Bus (XPBus), and power bus (Figs. 6-12). Video Bus consists of video output of graphics devices, e.g. analog RGB and control signals for monitor, or digital video signals to drive flat panel displays. Power bus
 5 supplies the power for ACM. XPBus is a high speed, compressed, peripheral bridge bus.

Multiple types of peripheral consoles are possible. Representative examples include:

- 10 1) A desktop peripheral console type with a computer bay, e.g. a tower unit or a desktop unit with a front load computer bay (Figs. 1,2)
- 2) A portable peripheral console type with a computer bay, e.g. a notebook with a front or side load computer bay (Figs. 3,4)
- 3) A handheld peripheral unit with, e.g., a rear computer bay. (Fig. 13)
- 15 4) A television/entertainment peripheral unit with, e.g., a front load computer bay (Fig. 14).

An ACM may also be employed by connection of external devices without the use of a computer bay (Figs. 15, 16).

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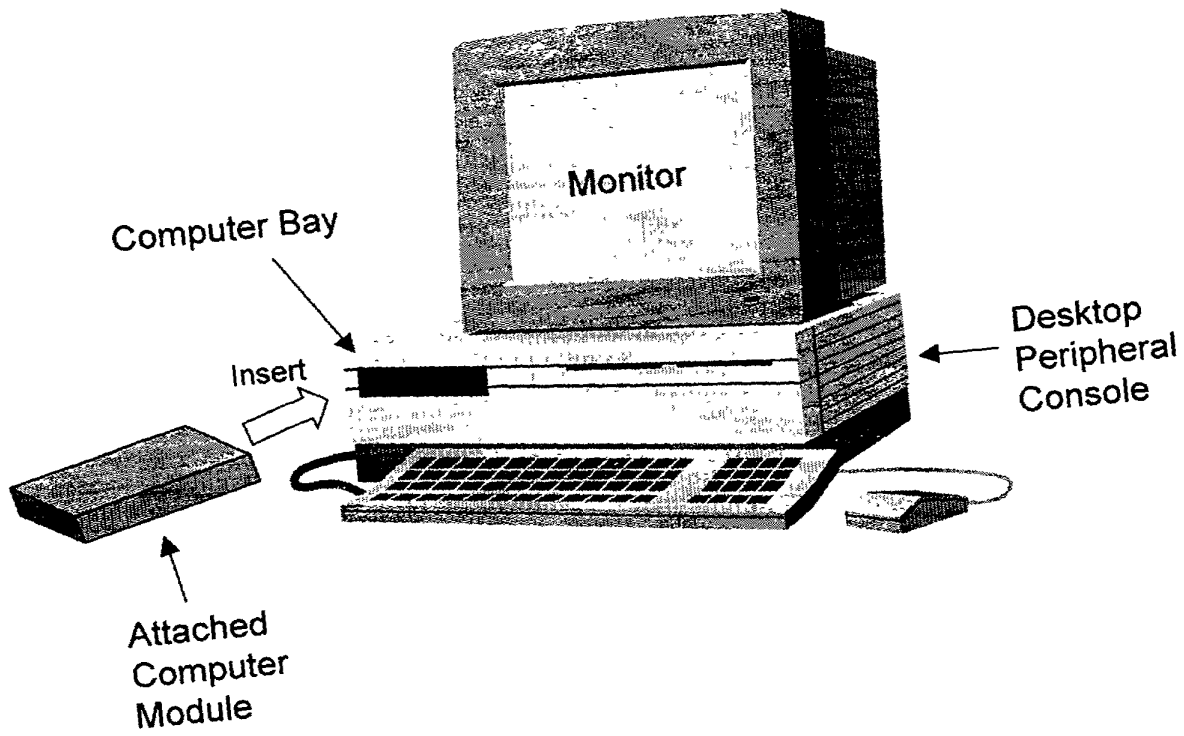


Figure 1. Desktop Attached Personal Computer

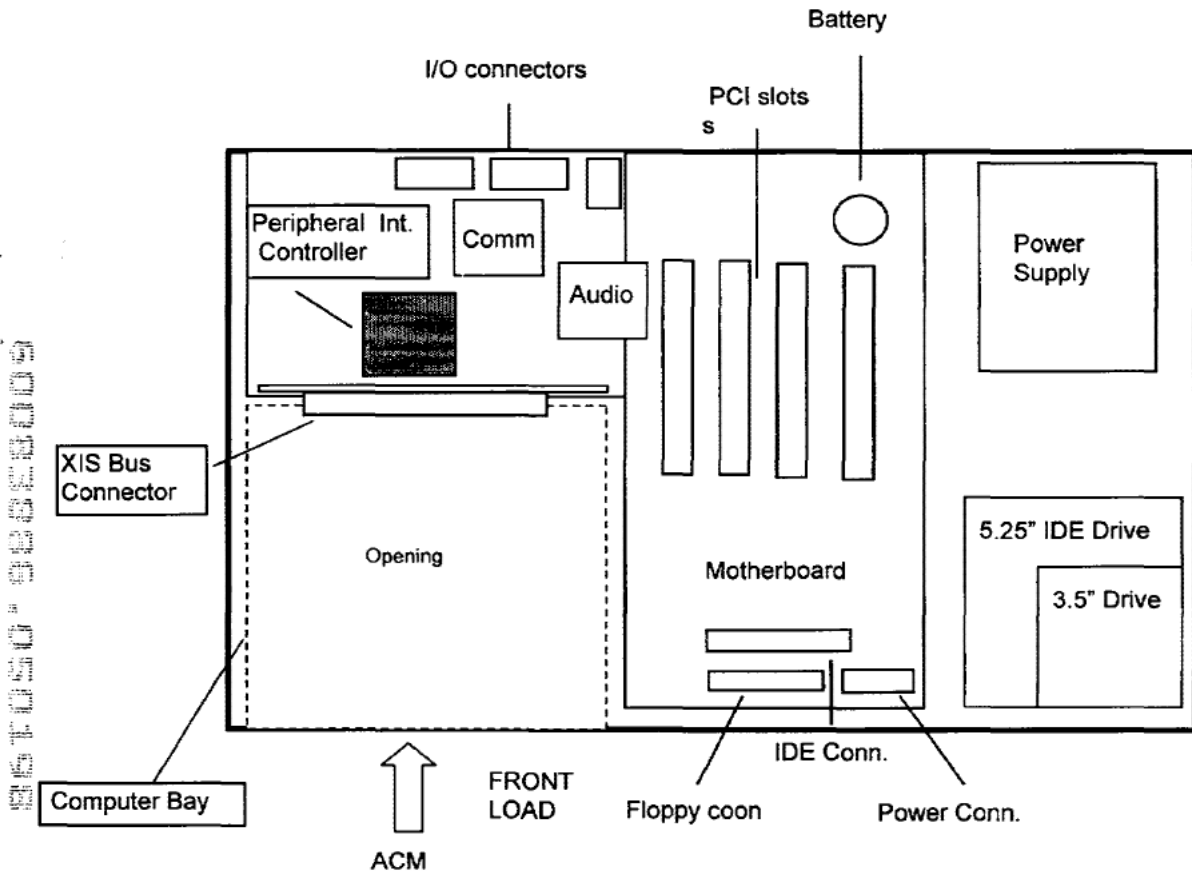


Figure 2. Example of a Desktop Peripheral Console with a front load Computer Bay

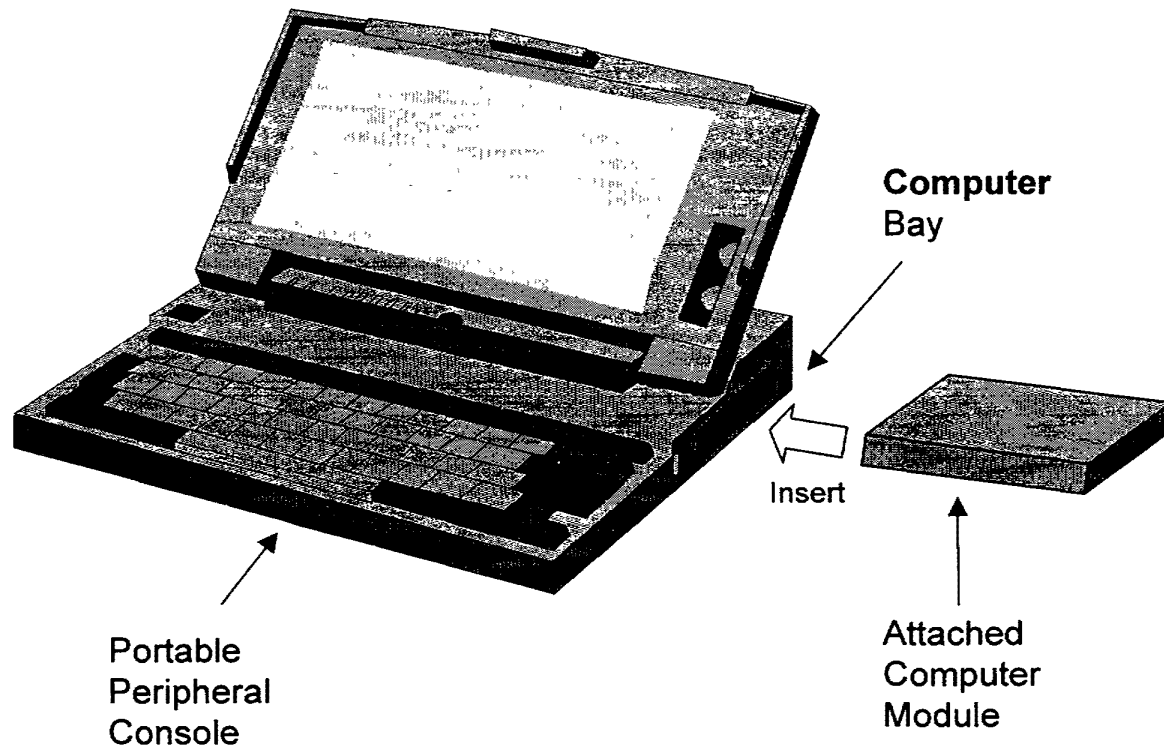


Figure 3. Portable Attached Personal Computer

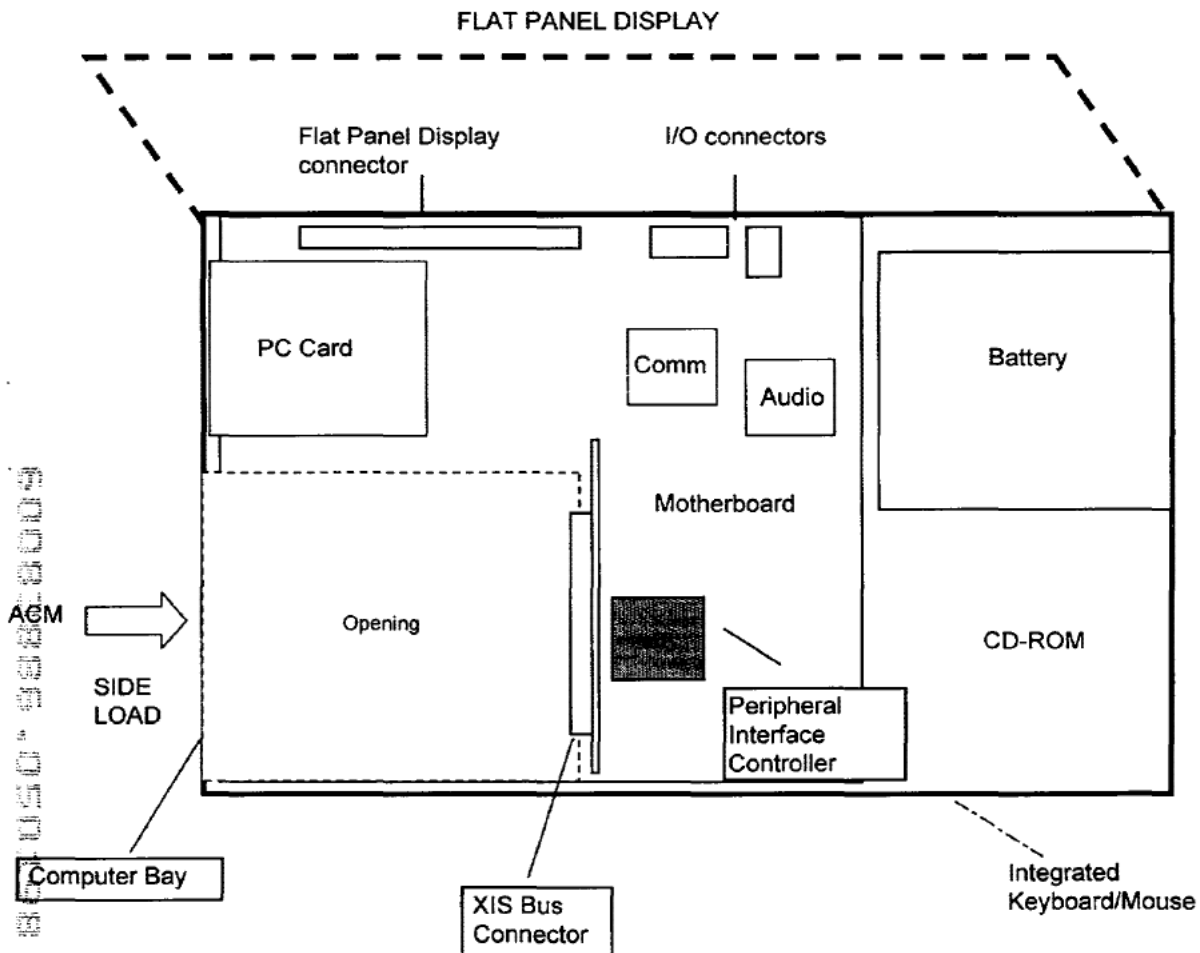


Figure 4. Example of a Portable Peripheral Console with a side load Computer Bay

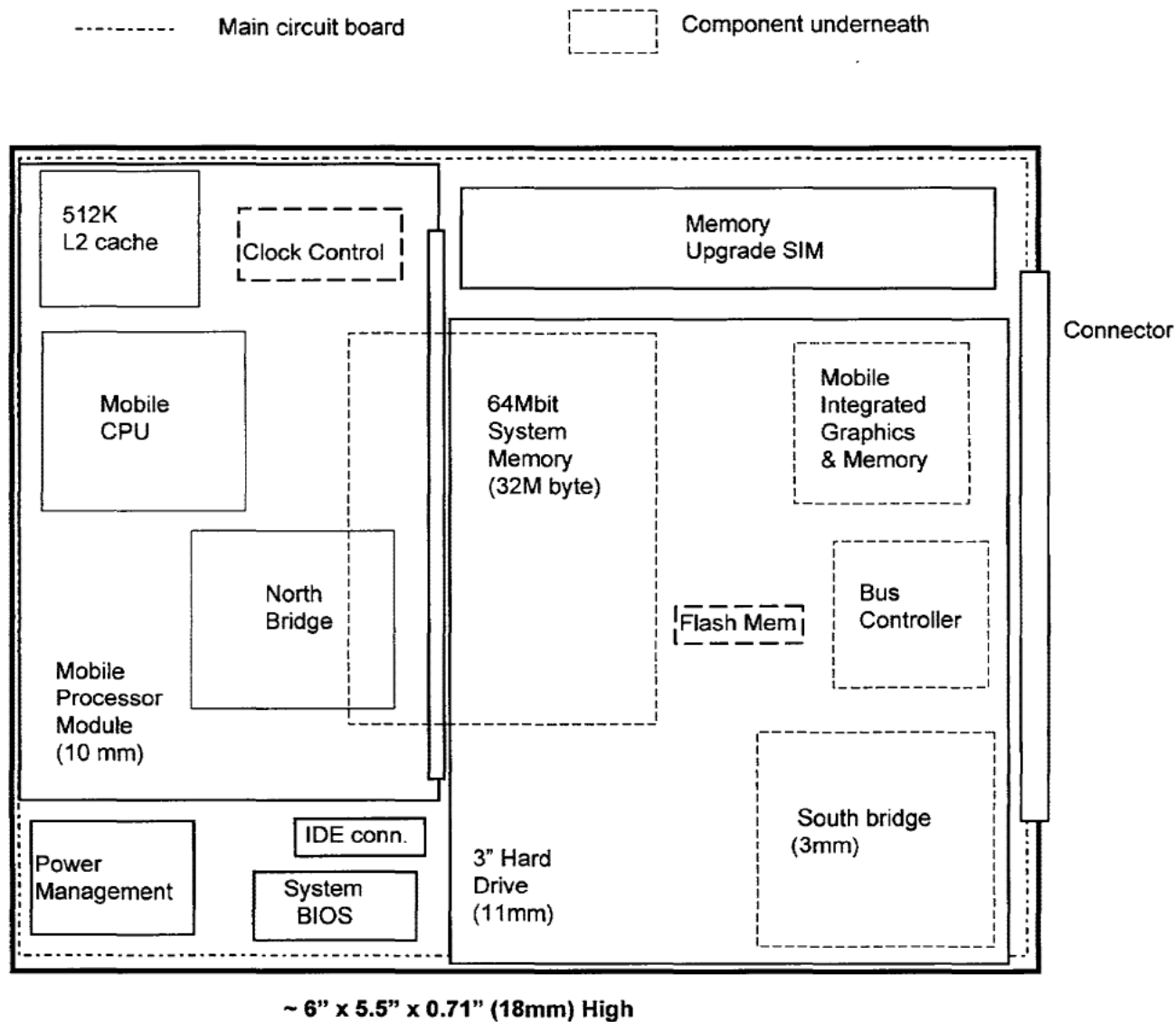


Figure 5. Conceptual example of an Attached Computer Module (Top view) with approximate dimension and height of components

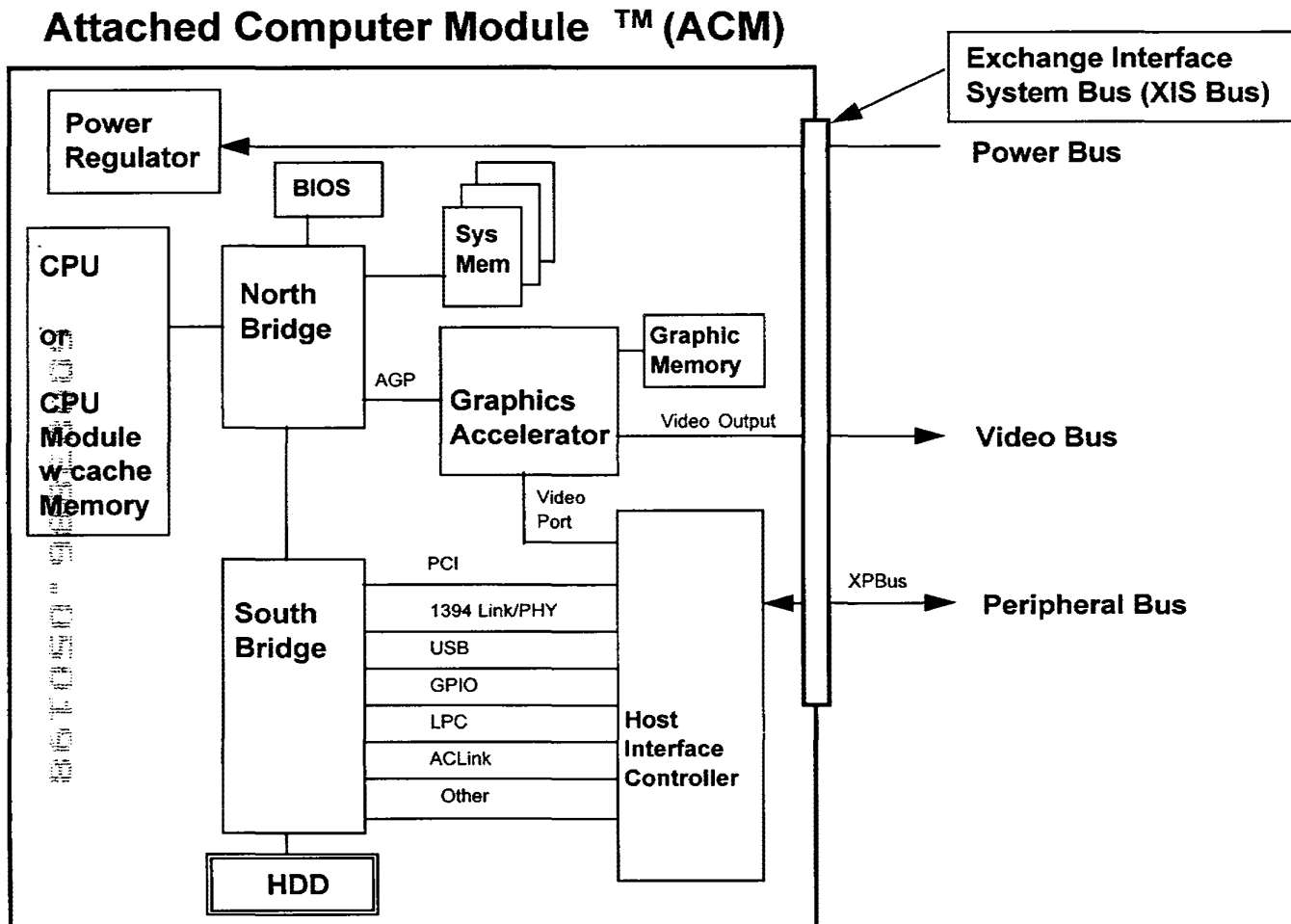


Figure 6. An example implementation of Attached Computer Module with Host Interface Controller and XIS Bus

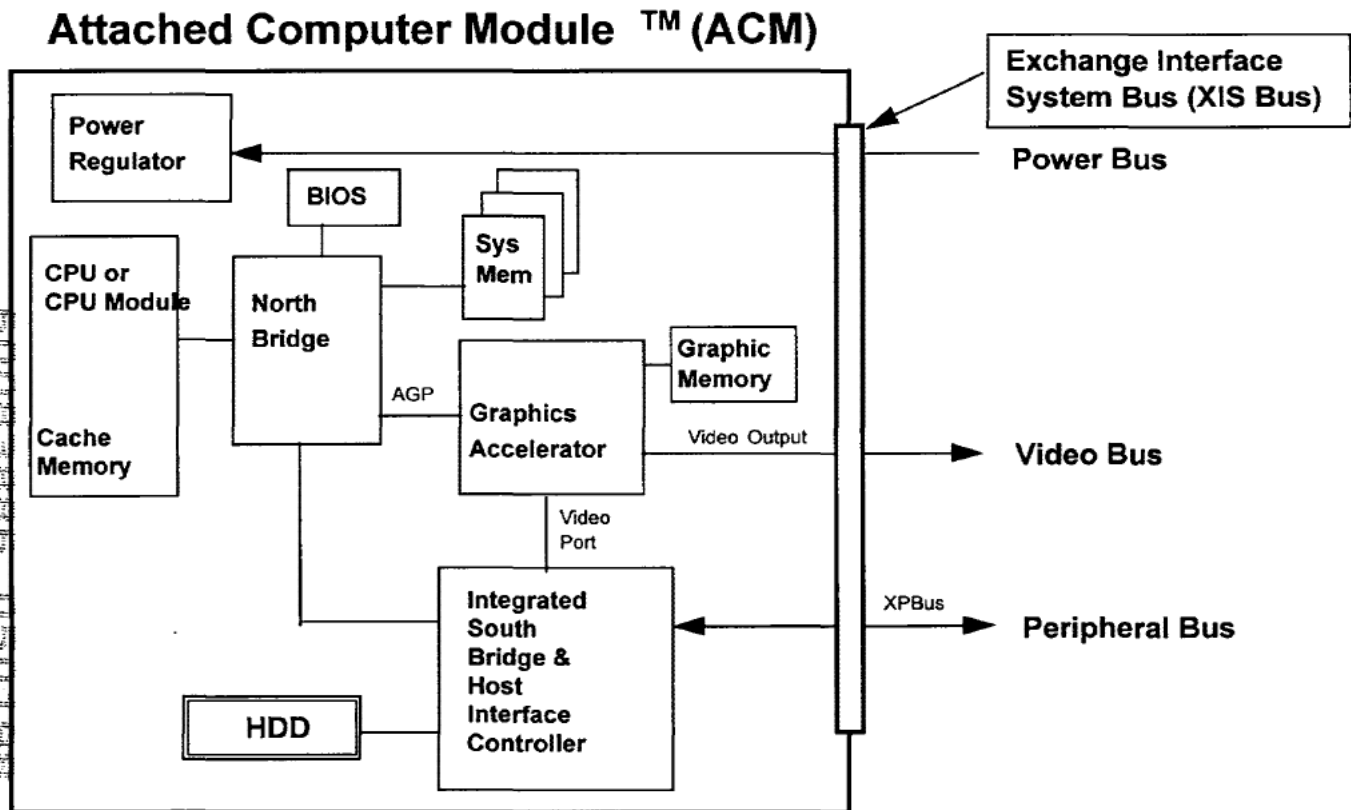


Figure 7. With South Bridge in ACM, Host Interface Controller and South Bridge can be integrated in Attached Computer Module

Attached Computer Module TM (ACM)

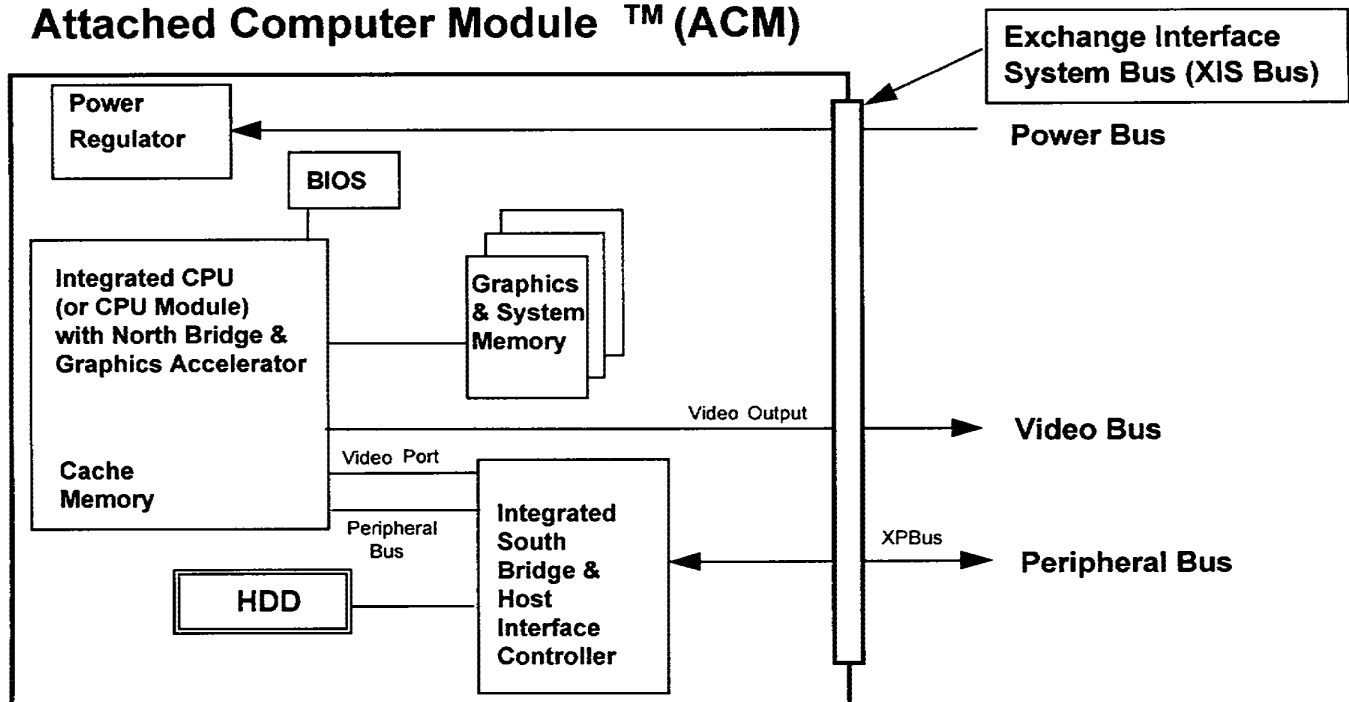


Figure 8. Attached Computer Module with Integrated CPU/NB/Graphics and Integrated HIC/SB

Attached Computer Module™ (ACM)

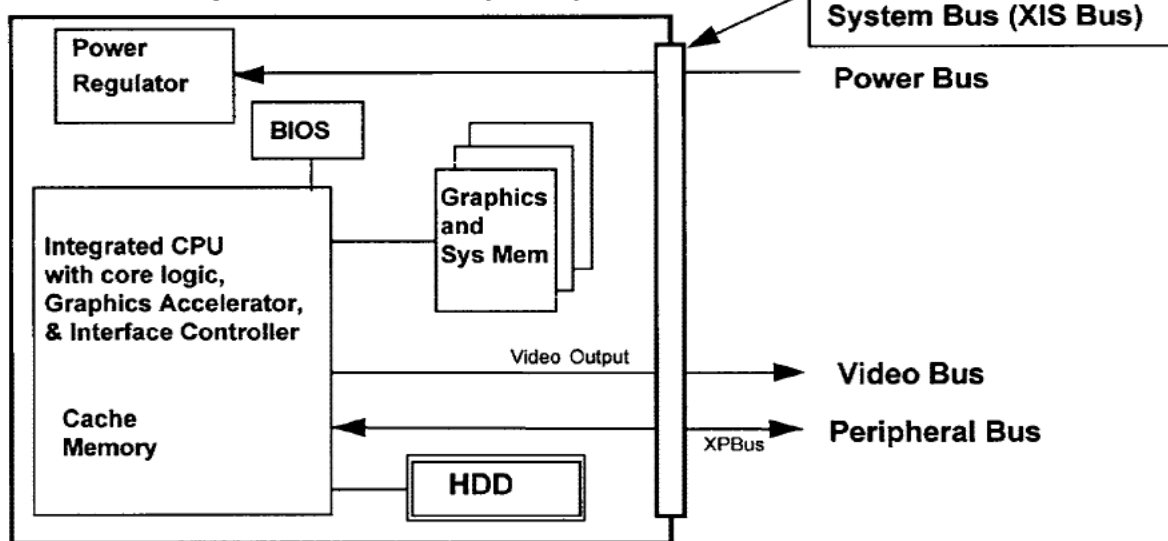


Figure 9. Attached Computer Module with Single Chip fully integrated: CPU, Cache, Core logic, Graphics controller and Interface controller

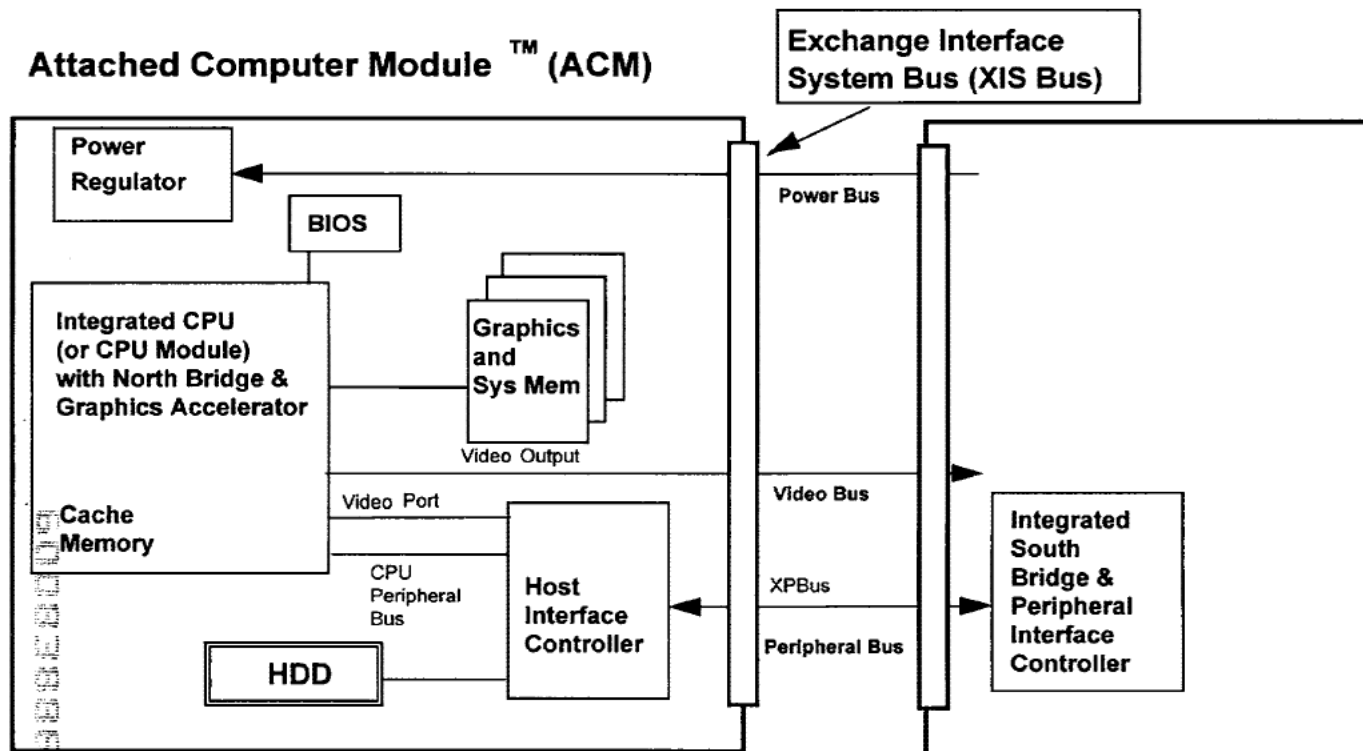


Figure 10. In the implementation with South Bridge in Peripheral Console, an example of Attached Computer Module with Integrated CPU/North Bridge/Graphics and Peripheral Console with Integrated Peripheral Interface Controller and South Bridge

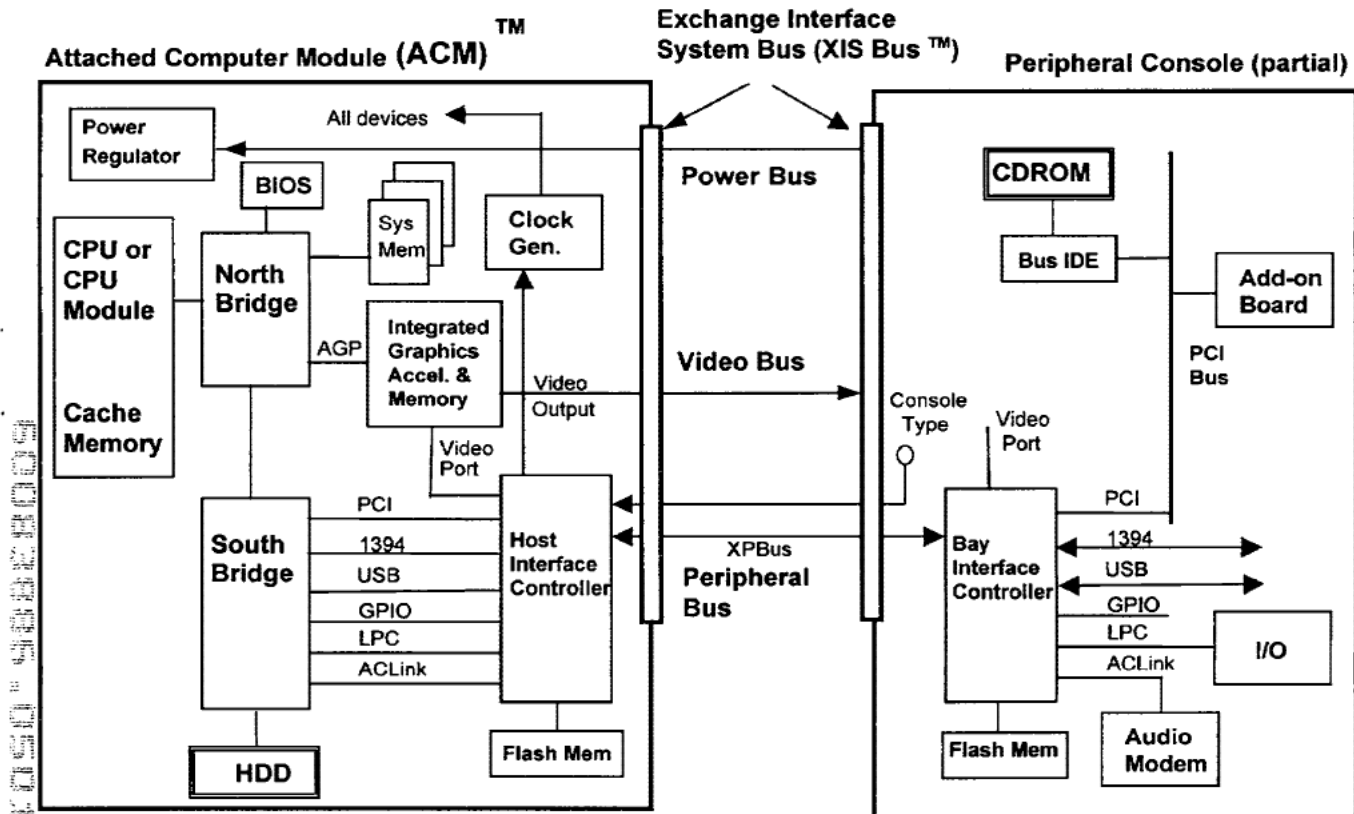


Figure 11. Example implementation of ACM and peripheral console: Clock Generator, Configuration Flash Memories, Hard-wired Console Type signals, ACM and peripheral console components, and XIS Bus interface

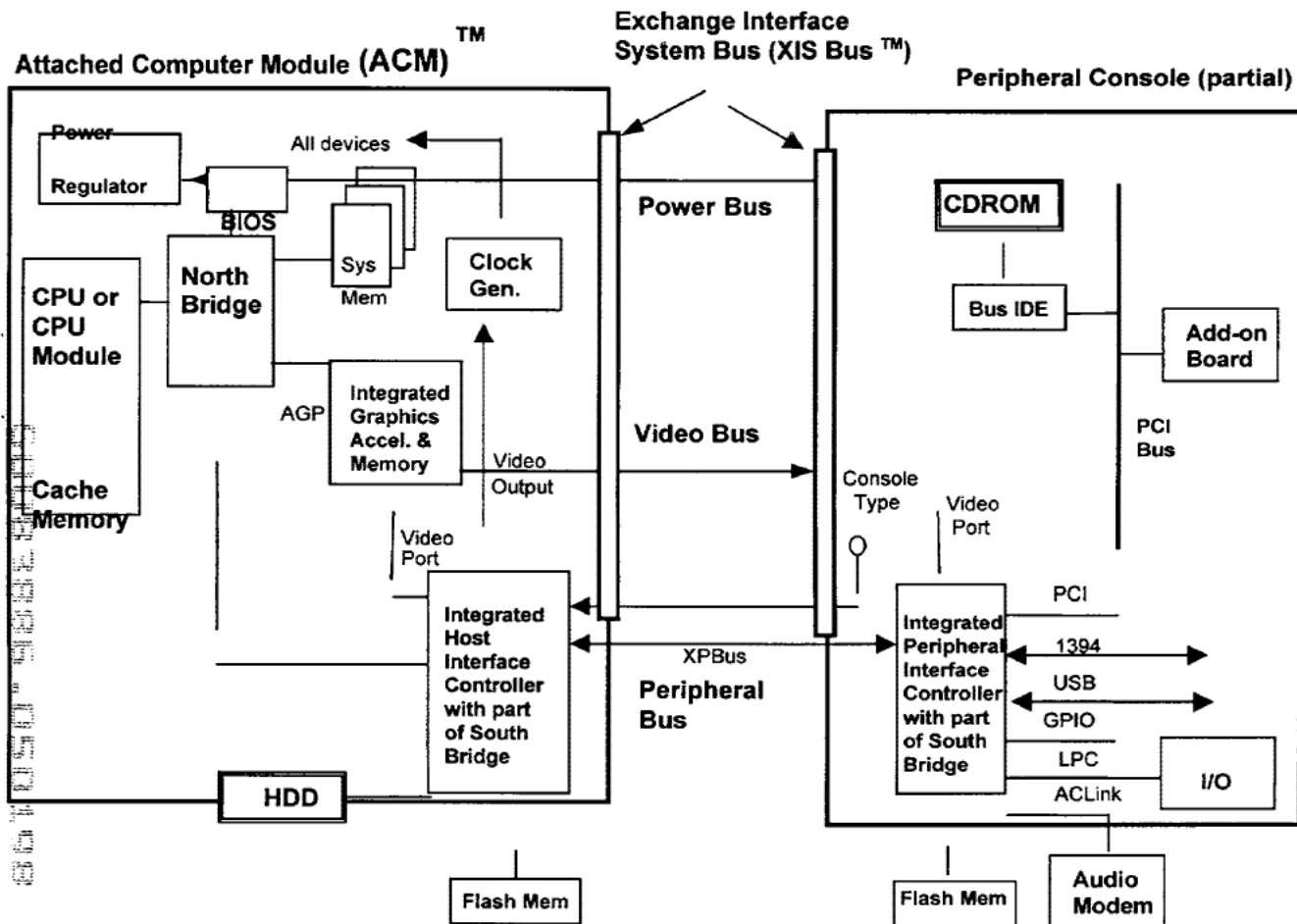


Figure 12. Example implementation of ACM and peripheral console: Integrated Interface Controllers with South Bridge, Clock Generator, Configuration Flash Memories, Hard-wired Console Type signals, ACM and peripheral console components, and XIS Bus interface

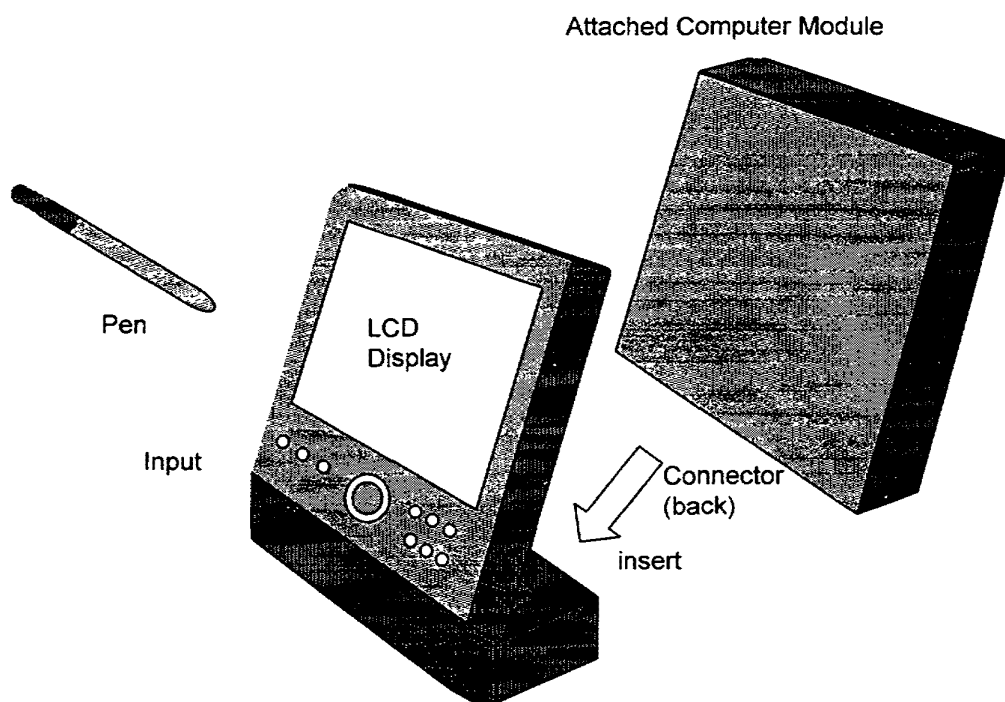


Figure 13. Example of a pen-based Handheld Console that mates with a Universal Attached Computer Module

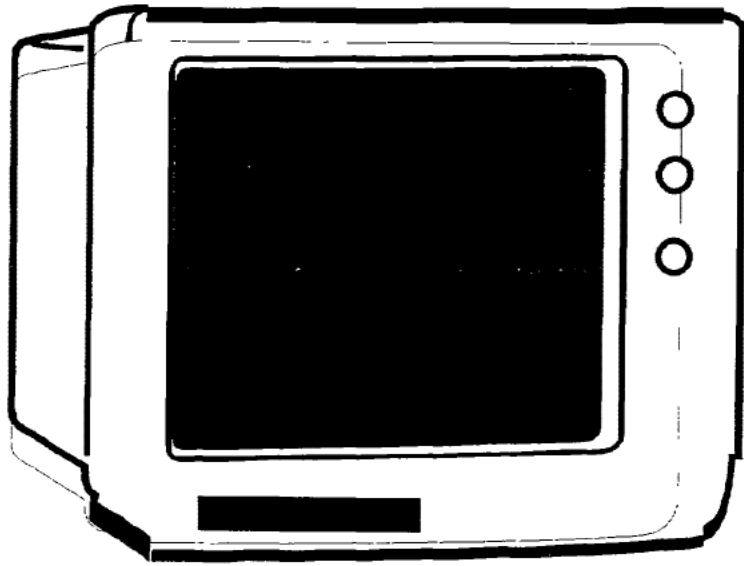


Figure 14. Television Peripheral Console.

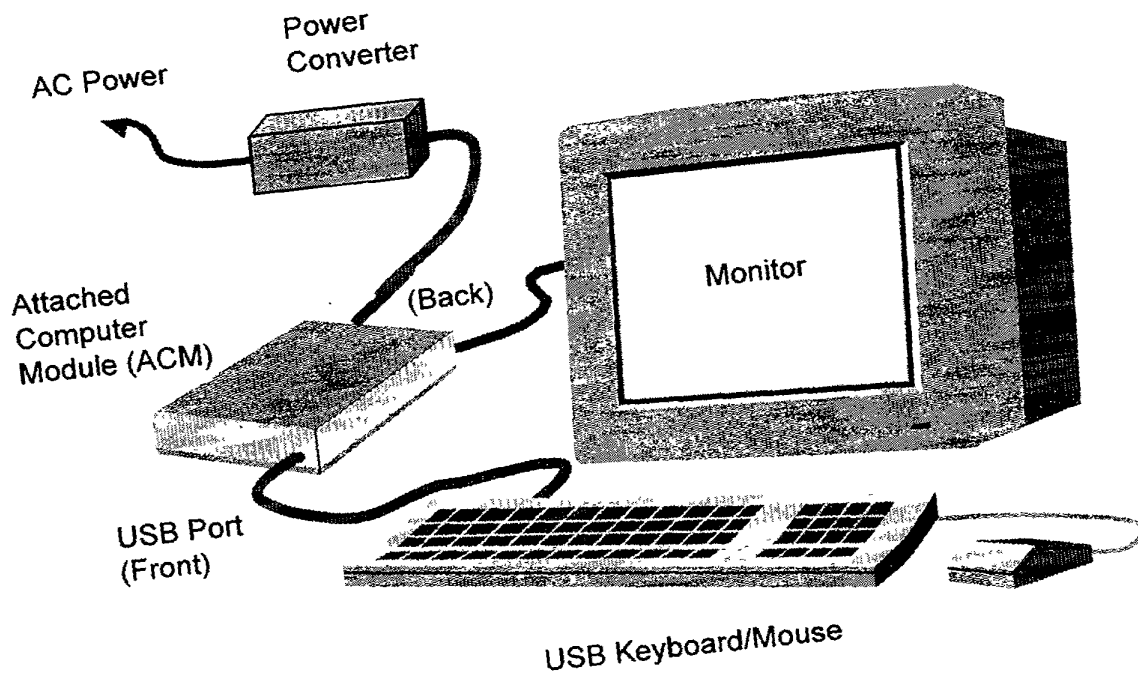


Figure 15. Attached Computer Module with an USB port, direct power and monitor connection.

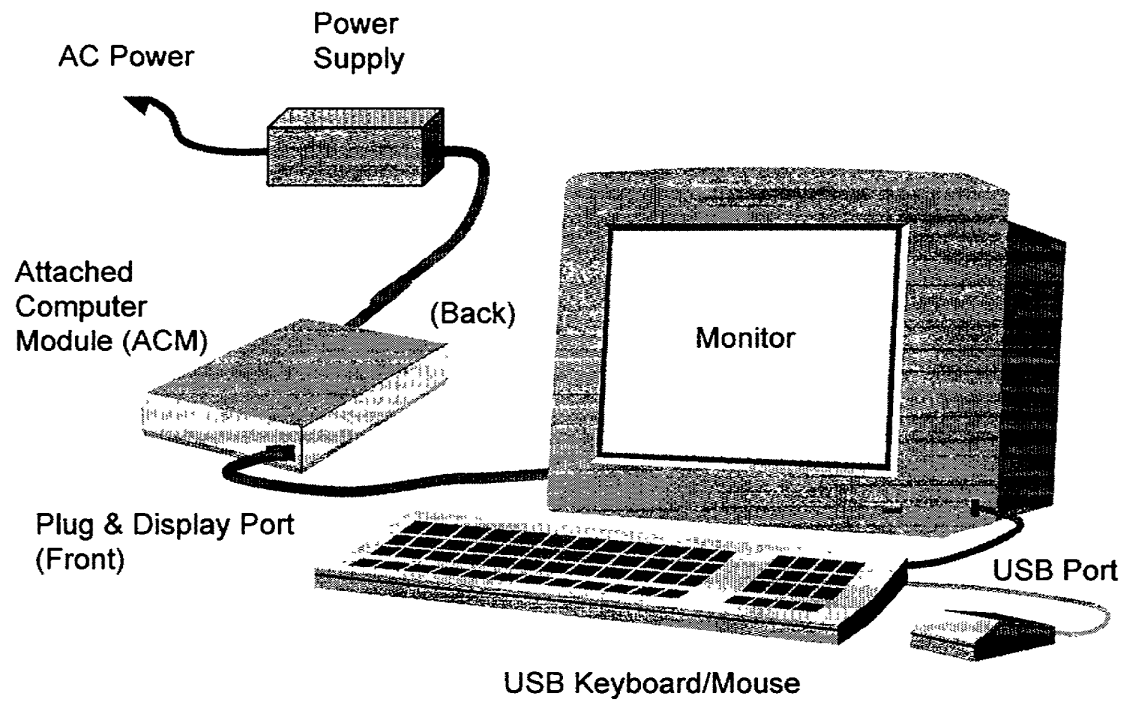


Figure 16. Attached Computer Module with a “Plug & Display” port and direct power connection.