SMART CARD DATABASE PROGRAMMING

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UNIVERSITI MALAYSIA SARAWAK

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Universiti Malaysia Sarawak
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fk

BORANG PENYERAHAN TESIS

Judul: Smart Card Database Programming

SESI PENGAJIAN: 1999 - 2002

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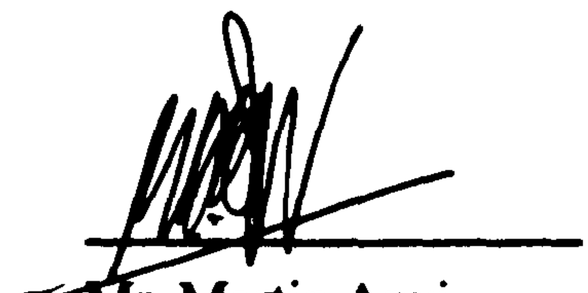
APPROVAL SHEET

This project report attached hereto, entitled "SMART CARD DATABASE PROGRAMMING". Prepared and submitted by HALLIMATON SA'ADIAH BT. SA'ADI as a particular fulfillment of the requirement for the degree of Bachelor of Engineering with Honors of Electronics and Telecommunication is hereby approved by :



Mr. Martin Anyi

Date : 11.03.03

Supervisor

Thank you Allah... for giving me strength to finish this project

ACKNOWLEDGEMENT

Firstly, I would like to tank God for blessing me with a good health in the process of finishing this project.

I was really indebted to my supervisor for his kindly supervision and assistance during the preparation of this final year project. Here I would like to thank my supervisor, Mr. Martin Anyi for sharing the ideas and guidance for me.

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ABSTRACT

Smart Card becomes the necessity of modern lifestyle. As the project concern with the development of the smart card database system, the main objective of this project is to store personal employee data in Microsoft Access and Graphic User Interface (GUI) using Visual Basic 6.0 programming and process the displayed data. The software used to run the project are Microsoft Access for the database, Visual Basic 6.0 for the interface and ZCBasic to store data in the smart card. The software program will use to record the employee data and working hours. The program also able to read the employees ID number in the smart card and allow the employee to record their attendance everyday. The program was designed in such way it is available for both employee and administration

ABSTRAK

Smart Card adalah satu kemestian dalam cara hidup moden. Projek ini adalah berkenaan tentang pembinaan system pangkalan data bagi smart card dan objektif utamanya adalah untuk menghasilkan pangkalan data bagi menyimpan maklumat pekerja dan diakses menggunakan amtara muka (graphic user interface) dihasilkan menggunakan perisian Visual Basic 6.0 dan turut memproses data yang ipaparkan. Perisian yang digunakan untuk menjalankan projek ini ialah Microsoft Access untuk menghasilkan pangkalan data, Visual Basic 6.0 untuk antara muka dan pemprogaman ZC Basic untuk menyimpan data di dalam smart card.Program perisian yang dihasilkan adalah untuk data peribadi pekerja dan masa bekerja. Program ini mampu membaca data berupa nombor ID pekerja di dalam smart card dan ini bertujuan untuk merekodkan masa masuk dan masa tamat pekerjaan setiap hari. Penghasilan program ini adalah untuk kegunaan pekerja dan pihak pengurusan.

CHAPTER 1

INTRODUCTION

A smart card – a type of chip card – is a plastic card embedded with a computer chip that stores and transacts data between users. This data is associated with either value or information or both and is stored and processed within the card's chip, either a memory or microprocessor. The card is transacted via a reader that is a part of computing system.

1.0 Objectives and Purposes

The goals of this project are :

1) **Create a program**

This project is to create employees database using Microsoft Access and GUI in Visual Basic 6.0

2) **Linking the Database and GUI**

The database and GUI is done separately by linking the GUI and the database, user can view and changing the information in the database using the interface instead of going directly open the database.

3) **Display and manipulate the data.**

The time when employee punch in and punch out will be record inn sequential file. From here the data will be retrieve in the interface and manipulate it to calculate total working hours and salary.

4) **Besides reading the data programmed in Access, the GUI is to read and display data programmed in a smart card.**

The data in the smart card contains the employee ID that will be use to record the time without doing it manually.

1.1 What is a Smart Card?

The term Smart Card is loosely to describe any card with capability to relate information to particular application such as magnetic stripe, optical, memory and microprocessor card. It is more precise, however to refer to memory and microprocessor card as smart cards.

A smart card is a card that is embedded with either a microprocessor and a memory chip or only a memory chip with non – programmable logic. The microprocessor can add, delete and otherwise manipulate information on the card, while a memory – chip card (for example, pre paid phone card) can only undertake a pre – defined operation.

1.2 Development History of Smart Card.

1974 – Roland Moreno in France acquired IC Card Patent – Established Innovatron Co.

1979 – BULL developed CP8 SPOM Card.

1983 – Telecom France applied Smart Card to Phone Card and MiniTel.

1986 – France adopted Smart Card as a standard off – line Credit Card.

1986 – Established ISO 7816 –1

1988 – Financial Organization in France issued Credit Card.

1989 – Adopted GSM SIM IC Card

1991 – Started standardization of EUROPAY, MASTERCARD, VISA : EMV

1992 – Finland Electronic Purse – AVANT, Denmark Electronic Purse : DANMONT.

1993 – UK Electronic Money : MONDEX.

1994 – Belgium : PROTON

1996 – Started common standardization of PC/SC

1996 – Cyberflex Card of 32 – bit Smart Card (Schlumberger Co.)

1998 – Bus & Subway Cards in Seoul, Hanaro Bus & Subway Cards in Pusan

1.3 Smart Card Categories

Today, there are three categories of smart cards, all of which are evolving rapidly into new markets and applications.

1.3.1 Integrated Circuit (IC) Microprocessor Card

The microprocessor type of Smart Card defined as an IC chip contact card with a microprocessor and memory. Microprocessor cards also generally referred to by the industry as "chip cards" offer greater memory storage and security of data than a traditional magnetic stripe card. No bigger than a credit card, this smart card contains a dime – size microchip that can be process and store thousand of bits of electronic data. The current generation of chip cards has an eight – bit processor, 16KB read – only memory, and 512 bytes of random – access memory. This gives them the equivalent processing power of the original IBM – XT computer, albeit with slightly less memory capacity.

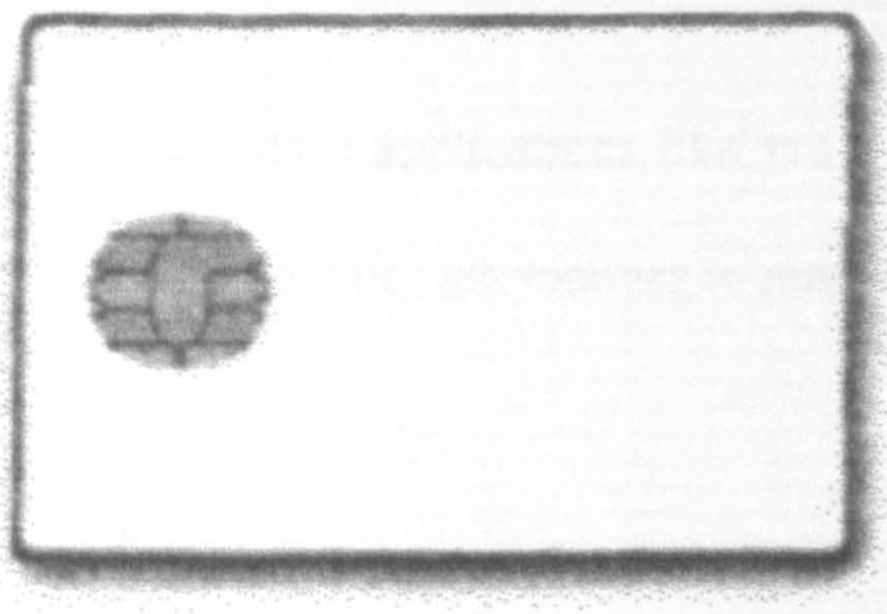


Figure 1.0 Microprocessor Smart Card.

These cards are used for variety applications, especially those that have cryptography built in, which requires manipulation of large numbers. Thus, chip cards have been the main platform for cards that hold a secure digital identity. Some examples of these cards are :

- Cards that hold money ("stored value cards")
- Card that hold money equivalents (for example, affinity card)

- Cards that provide secure access to a network
- Cards that secure cellular phones from fraud
- Cards that allow set – top boxes on televisions to remain secure from piracy

1.3.2 Integrated Circuit (IC) Memory Cards

IC memory cards can hold up to 1 – 4 KB of data, but have no processor on the card with which to manipulate that data. Thus, they are dependent on the card reader (also known as the card – accepting device) for the processing and are suitable for uses where the cards perform fixed operation

Memory cards use in disposable – card applications like pre – paid phone cards. Memory cards are popular as high – security alternatives to magnetic stripe cards

1.3.3 Optical Memory Cards

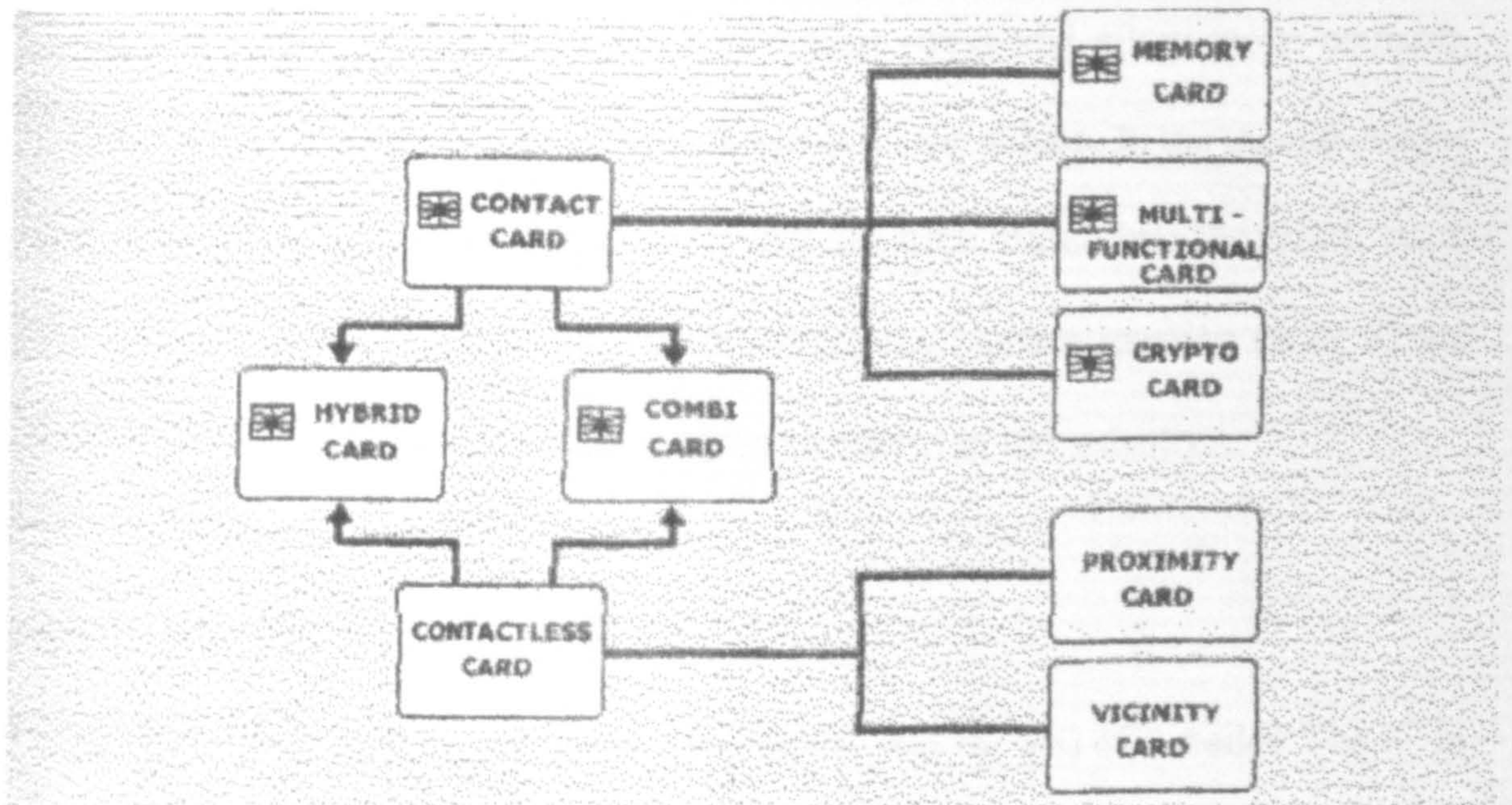
Optical memory cards look like a card with a piece of CD glued on top – which is basically what they are. Optical memory cards can store up to 4MB of data. But once written, the data cannot be changed or removed. Thus, this type of card is ideal for record keeping – for example medical files, driving records, or travel histories. Today, these cards have no processor in them (although this is coming in near future). While the cards are comparable in price to chip cards, the card readers use non – standard protocols and are expensive.

1.4 Smart Card Chip Comparisons

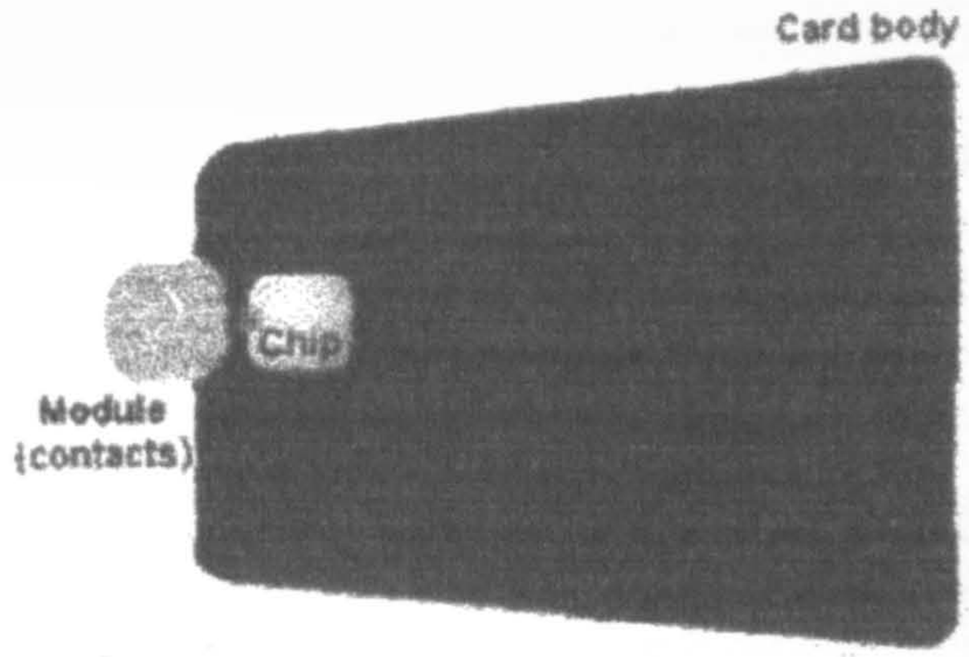
	Maximum Data Capacity	Processing Power	Cost of Card	Cost of Reader and Connection
Magnetic Stripe Cards	140 bytes	None	$0.20 - $0.75	$750
Integrated Circuit Memory Cards	1 Kbyte	None	$1 - $2.50	$500
Integrated Circuit Processor Cards	8 Kbytes	8-bit cpu, moving to 16- and 32-bit	$7-$15	$500
Optical Memory Cards	4.9 Mbytes	None	$7 - $12	$3,500 - $4,000

Source: Gartner Group

1.5 Types of Smart Cards



1.5.1 Contact Smart Cards



Source: Gemplus - All About Smart Cards

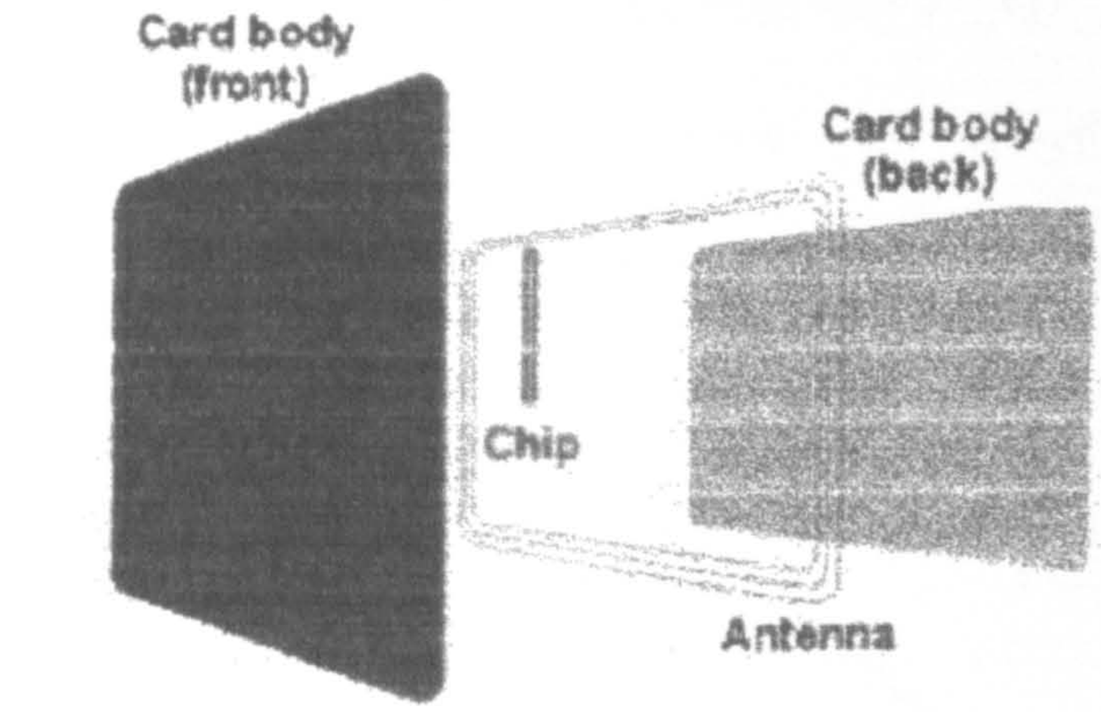
Figure 1.2 Contact Smart Card

Contact Cards require insertion into a smart card reader with a direct connection to conductive micro – module on the surface of the card. The connection between the IC on the card and the card reader (today all readers can also write) is done through mechanical contacts. Smart card ICs are packaged in specialized "module" that protect the silicon (i.e the IC) from mechanical stress and allow metal contacts, planar to the card surface, to connect to the pads on the silicon. In the manufacturing process the module is glued into a cavity that has been milled into the plastic card. The majority of cards are contact cards where the contact location (6 or 8) are standardized (ISO7816), one of the few true standards in the industry.

1.5.2 Contactless Smart Card

Contactless Cards require only close proximity (a few inches) of a reader. The IC in the card communicats vie electromagnetic fields with the reader using an antenna that inserted in the card. The antenna is connected with a specialized module that

encapsulates the IC. Contactless cards usually cannot be identified from the outside as such. All the "smarts" are hidden inside. The two main frequencies used are 125KHz and 13.6 MHz. The latter being the more recent technology.



Source: Gemplus - All About Smart Cards

Figure 1.3 Contactless Smart Card

1.6 The Micromodule

Smart cards are credit card – sized, often made of flexible plastic (polyvinyl chloride or PVC), and are embedded with a micromodule containing a single silicon integrated circuit chip with memory and microprocessor. The micromodule has eight metallic pads on its surface, each designed to international standards for VCC (poer supply volatage),RST (used to reset the microprocessor on the smart card), CLK (clock signal),GND (ground), VPP (programming or write voltage) , and I/O (serial input/output line). Two pads are reserved for future use (RFU). Only the I/o and GND contacts are mandatory on a card to meet international standards; others are optional.

When a smart card is inserted into a Card Acceptance Device or CAD (such as a point – of – sale terminal), the metallic pads come into contact with the CAD's corresponding metallic pins, thereby allowing the card and CAD to communicate. Smart cards are always reset when they are inserted into a CAD. This action causes the smart card to respond by sending as "Answer – to – Reset" (ATR) message, which informs the CAD, what rules govern communication with the card and the processing of a transaction.

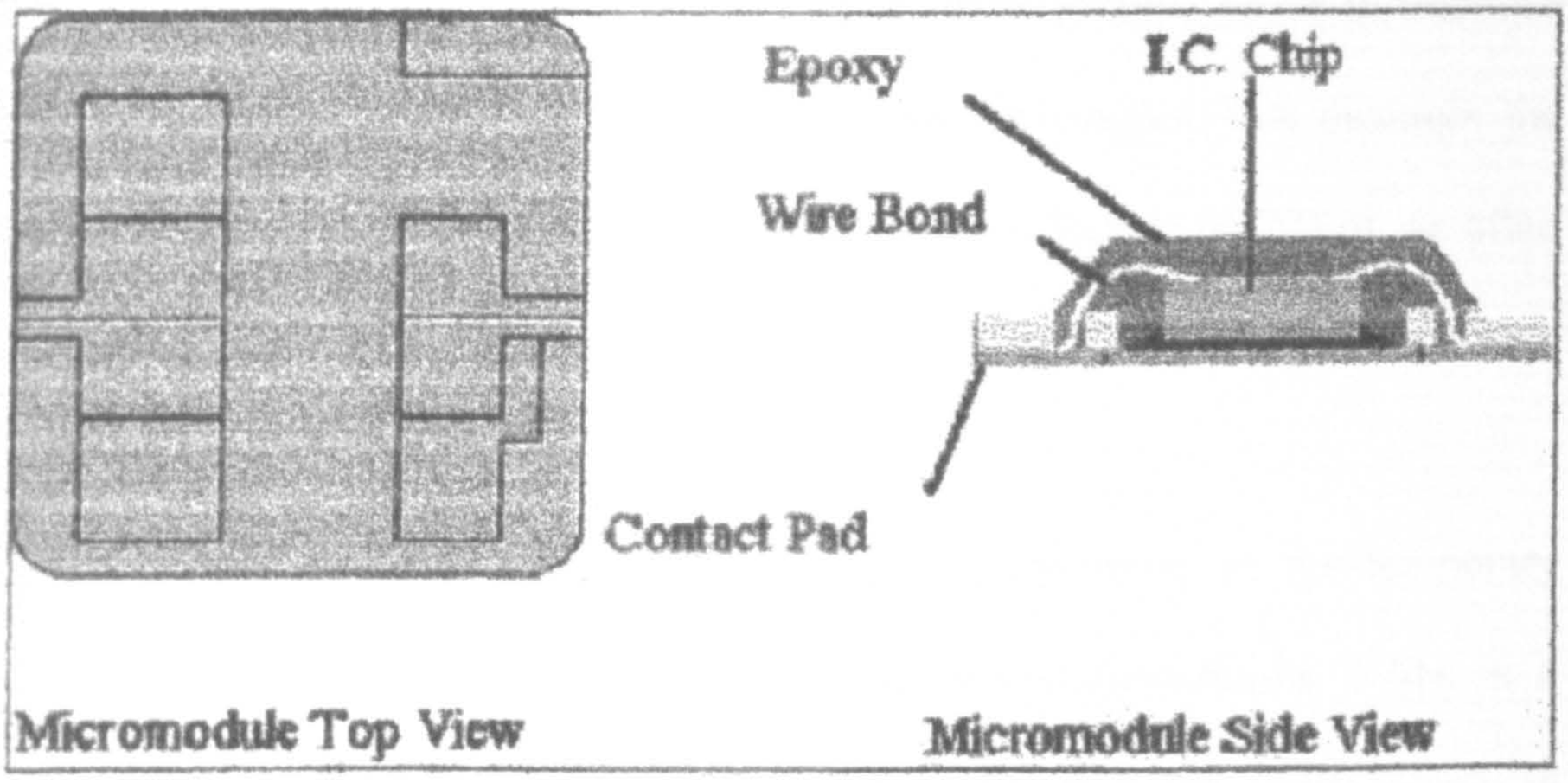


Figure 1.4 The Micromodule

1.7 Micromodule Components.

The micromodule on board the smart card is made up of certain key components that allow it to execute instructions supporting the card's functionality.

The Microprocessor Unit (MPU) executes programmed instructions. Typically older version smart cards are based on relatively slow, 8 – bit embedded microcontrollers.

The trend during the 1990s has been toward using customized controllers with a 32-bit Reduced Instruction set Computing (RISC) processor running at 25 to 32MHz.

The I/O Controller manages the flow of data between the Card Acceptance Device (CAD) and the microprocessor.

Read Only Memory (ROM) of Program Memory is where the instruction are permanently burned into memory by the silicon manufacturer. These instructions (such as when the power supply is activated and the program that manages the password) are the fundamentals of the Chip Operating System (COS) or, as often called the "Mask".

Random Access Memory (RAM) or Working Memory serves as the temporary storage of results from calculation or input/output communications. RAM is a volatile memory and losses information immediately when the power supply is switched off.

Application Memory, which today is almost double E-PROM (Electrically Erasable Programmable Read – Only Memory) can be erased electronically and rewritten. By international standards, this memory should retain data for up to 10 years without electrical power and should support at least 10,000 read-write actions during the life of the card. Applications memory is used by executing application to store information on the card.